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Reassessing the process-based model: Do procedural justice and police legitimacy lead to reporting neighborhood problems to the police over time?

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ABSTRACT

Objective: The process-based model, which emphasizes enhancing procedural justice and police legitimacy, is regarded as a key approach to fostering community members' cooperation with police. Despite its prominence, research on how these perceptions influence actual cooperative behaviors remains scarce, particularly in the context of longitudinal data. This study aims to address these gaps.

Data/methods: Multilevel logistic regression modeling was applied to three waves of survey data, primarily collected from crime hot spots in Baltimore City, Maryland, to examine the longitudinal impacts of procedural justice and police legitimacy on the likelihood of reporting neighborhood problems to the police. KHB mediation analysis was used to assess the indirect effect of procedural justice on reporting behavior through legitimacy.

Results: The findings provide limited support for the process-based model, revealing that while police legitimacy significantly influenced reporting behavior, there was no evidence of either a direct or indirect effect of procedural justice on reporting neighborhood problems to the police.

Conclusions/implications: These results question the widely held belief that improvements in procedural justice will lead to public cooperation with law enforcement. Thus, if the goal is to foster long-term cooperation from community members, police strategies may need to extend beyond simply integrating procedural justice principles.

1. Introduction

For successful crime control and the establishment of community safety, it is crucial for the police to elicit cooperation from local residents (Lyons, 2002; Tyler, 2011; Tyler & Fagan, 2008). These outcomes cannot be achieved by either law enforcement or community members alone; they require a collaboration approach (Weisburd et al., 2021; Weisburd & Majmundar, 2018; Weisburd, Wilson, et al., 2024). The process-based model of policing has emerged as a normative framework that provides insights into how to enhance citizens' acceptance of police authority and foster their cooperation with the police (see Tyler, 2004, 2011; Tyler et al., 2015). This model posits that when individuals perceive the police as treating people in a procedurally fair manner, they are more likely to view the police as a legitimate authority and, consequently, are more inclined to cooperate willingly with law enforcement (Sunshine & Tyler, 2003; Tyler & Fagan, 2008; Tyler & Jackson, 2014). This proposed pathway of the process-based model is supported by a large body of research (for a review, see Bolger & Walters, 2019).

However, the literature examining the association between procedural justice, police legitimacy, and cooperation with the police has notable gaps. Firstly, most studies measure *willingness* to cooperate rather than *actual* cooperative behaviors (Bradford & Jackson, 2016), which may lead to an overestimation of the impact of perceptions of procedural justice and police legitimacy on cooperation. Secondly, research focuses on reporting *crime* or *victimization,* even though the majority of citizen calls to the police involve non-criminal social mat-

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ters—such as mental health crises, intoxicated individuals, noise complaints, neighbor disputes, and traffic issues (see Lum et al., 2022; Weisburd, Wilson, et al., 2024). Thus, incorporating reports of non-criminal social problems could provide a more comprehensive understanding of citizen engagement with the police. Lastly, the scarcity of longitudinal research may lead to overestimated effect sizes across studies (Weisburd et al., 2001), raising questions about the robustness of the link between procedural justice, police legitimacy, and cooperation with the police found in the literature (Pina-Sánchez & Brunton-Smith, 2020).

Addressing these significant gaps, this study rigorously reexamines a key mechanism within the process-based model of policing: the association between procedural justice, police legitimacy, and actual cooperative behaviors with law enforcement. Specifically, it employs a longitudinal approach using three waves of survey data collected primarily from crime hot spots in Baltimore City, Maryland, and focuses on community members' actual cooperation with the police (i.e., reporting a problem in their neighborhood to the police) rather than their willingness to cooperate.

2. Reporting neighborhood problems as cooperation with the police

Police must secure community members' cooperation, as it is essential for effective policing. Without their cooperation, the police face difficulties in effectively addressing crime and other social problems (Weisburd et al., 2021; Weisburd, Wilson, et al., 2024). As Skogan (1984) emphasized, community members can be co-producers of police services. Their cooperation not only enhances the accuracy and efficiency of police investigations, but also bolsters crime prevention efforts by encouraging the residents to share valuable information, report suspicious activities, and serve as the eyes and ears of their communities (Eck, 1983). In other words, while society establishes police to tackle matters pertaining to social order, the effectiveness of the police is inevitably connected to the attitudes and actions of residents within the affected communities (Tyler & Fagan, 2008; Weisburd, Uding, et al., 2024). Additionally, without community members' reporting, the police gather biased crime data, making it challenging to estimate the prevalence of crime in various locations (Xie & Baumer, 2019a). This information gap hinders the development of effective strategies and the allocation of resources for combating crime. In this regard, the reluctance of community members to report crimes or social problems to the police negatively impacts not only the efficiency of the police but also the overall effectiveness of criminal justice system.

Given the importance of community members' cooperation with the police, many perspectives have been considered to understand what influences their cooperation, such as crime reporting. Prior research has identified diverse factors that affect crime/victimization reporting or the willingness to cooperate with law enforcement, including socioeconomic status (Murphy & Cherney, 2011; Sun et al., 2017; Tyler & Jackson, 2014), race (Slocum et al., 2010; Xie & Lauristen, 2012), neighborhood structural characteristics (Xie & Baumer, 2019b; Xie & Lauristen, 2012), the seriousness of crime (Gottfredson & Hindelang, 1979), and perceptions of the neighborhood (Khatchatourian et al., 2022; Sun et al., 2017). However, one of the most consistently reported predictors relates to how people perceive the police (Murphy et al., 2008; Murphy & Cherney, 2011; Slocum et al., 2010; Sun et al., 2017; Sunshine & Tyler, 2003; Tyler & Fagan, 2008; Tyler & Jackson, 2014). Focusing on the process-based model of policing (Sunshine & Tyler, 2003; Tyler, 2004, 2011), the next section delves into how perceptions of the police, particularly procedural justice and police legitimacy, can influence cooperation with the police.

3. The relationship between procedural justice, police legitimacy, and cooperation with the police

In his book *Why People Cooperate*, Tom Tyler (2011) defines cooperation as " actively helping legal authorities to combat crime" (p. 74). He specifically emphasized the necessity for police to have "community cooperation in the form of reporting crime and criminals" (Tyler, 2011, p. 68). Tyler (2011) refutes the long-standing idea that individuals' cooperation is largely driven by self-interest. Instead, he posits that the application of fair processes in the exercise of authority, along with a belief in the benevolence and sincerity of authorities among group members, plays a crucial role in shaping the attitudes and values that promote cooperation (see also Madon et al., 2017). In this sense, the process-based model proposed by Tyler and colleagues provides a normative framework for understanding citizens' acceptance of the authority of police and their cooperative behaviors with police (Sunshine & Tyler, 2003; Tyler, 2004, 2011; Tyler et al., 2015; Tyler & Jackson, 2014; Tyler & Meares, 2019).

According to the process-based model, individuals' internalized sense of police legitimacy acts as a mediator between their perceptions of procedural justice and their decisions to cooperate with the police.[1] In other words, this model suggests that when individuals perceive the police as an authority that treats people in a procedurally fair manner and makes neutral decisions, they are more inclined to view the police as a legitimate authority, leading them to voluntarily cooperate with law enforcement (Sunshine & Tyler, 2003; Tyler, 2004; Tyler & Fagan, 2008; Tyler & Jackson, 2014). A large body of research has found a robust relationship between perceptions of police legitimacy and cooperation with the police (for a review, see Bolger & Walters, 2019). This strong association generally holds regardless of how police legitimacy is conceptualized and operationalized: obligation to obey the police (Dirikx & Van den Bulck, 2014; Kochel et al., 2013; Sun et al., 2017; Tyler & Jackson, 2014; Woo et al., 2018), trust in the police (Dirikx & Van den Bulck, 2014; Murphy et al., 2008; Murphy & Cherney, 2011; Tyler & Jackson, 2014), normative alignment (Kyprianides et al., 2021; Tyler & Jackson, 2014), or a combination of these constructs (Madon et al., 2017; Sunshine & Tyler, 2003; Tyler & Fagan, 2008). Moreover, based on the strong association between perceptions of procedural justice and perceived police legitimacy found in a large body of research (Bradford et al., 2020; Gau, 2011; Gau et al., 2012; Jackson et al., 2021; Kuen et al., 2024; Madon et al., 2017; Murphy et al., 2008; Sargeant et al., 2014; Wolfe et al., 2016), it is widely acknowledged that perceptions of procedural justice are indirectly associated with cooperation with law enforcement via perceived police legitimacy (Kyprianides et al., 2021; Madon et al., 2017; Murphy et al., 2008; Reisig et al., 2007; Sun et al., 2017; Sunshine & Tyler, 2003; Tyler & Fagan, 2008; Tyler & Jackson, 2014; Woo et al., 2018).

Additionally, studies examining the process-based model have

[1] Although beyond the scope of this study, it is important to note current scholarly debates about the appropriate conceptualization and measurement of perceived police legitimacy. Scholars have proposed and tested a variety of theoretical models to assess its sources, components, and consequences, but they have not converged on a single perspective. Two examples illustrate the varied approaches in the literature. First, although Tyler and colleagues originally emphasized obligation to obey and trust in the police as the key concepts for capturing legitimacy (Sunshine & Tyler, 2003), more recent scholarship has recognized normative alignment—the belief that police share similar values and goals with the community—as another key component of police legitimacy (Bradford et al., 2020; Tyler & Jackson, 2014). Second, following Beetham's (1991) conceptualization of legitimacy, some scholars have argued that police legitimacy encompasses lawfulness and the shared values of procedural justice, police effectiveness, distributive justice—concepts that Tyler and colleagues consider precursors to legitimacy rather than components of it (Bottoms & Tankebe, 2012; Tankebe, 2013). This view also regards obligation to obey as an outcome of police legitimacy.

identified a direct link between citizens' perceptions of procedural justice and their willingness to cooperate with the police (e.g., see Bradford & Jackson, 2016; Kochel, 2018; Madon et al., 2017; Murphy et al., 2008; Murphy & Cherney, 2011; Pryce et al., 2017; Sun et al., 2017). In other words, the mere perception of procedurally fair treatment by the police can signal to community members that they should cooperate with law enforcement, even without an increase in perceived police legitimacy. This relationship is supported by a recent meta-analytic study, which found that overall perceptions of procedural justice have a significant direct association, as well as an indirect association (via police legitimacy), with the willingness to cooperate with the police (Bolger & Walters, 2019), albeit with a modest overall association ($r = 0.20$). Research also indicates that in the United States, and in Western societies more broadly, procedural justice plays a more important role than instrumental factors, such as police effectiveness and distributive justice, in fostering willingness to cooperate with the police (Dirikx & Van den Bulck, 2014; Khatchatourian et al., 2022; Murphy et al., 2008; Sunshine & Tyler, 2003; Tyler & Jackson, 2014).

The pathway suggested by the process-based model (procedural justice → legitimacy → cooperation) has also been examined more rigorously in terms of internal validity. Although limited in number, several randomized controlled trials have explored the link between procedural justice, police legitimacy, and cooperation with the police. For example, in the Queensland Community Engagement Trial (QCET) study, Mazerolle et al. (2013) found that a single police-initiated encounter based on procedural justice principles led to improved citizens' perceptions of procedural justice specific to that encounter. This, in turn, enhanced their perceptions of police legitimacy and increased subsequent willingness to cooperate with the police.

However, Thompson and Pickett (2021) recently argued that Mazerolle et al. (2013) did not use a full experimental design, as it employed a non-randomized mediator (i.e., perceptions of encounter-specific procedural justice) in examining the relationship between the procedural justice intervention, perceptions of police legitimacy, and willingness to cooperate with the police. The use of a nonrandomized mediator raises strong concerns regarding the causal claims of the study (see Elwert & Winship, 2014). Additionally, a subsequent replication study with a similar experimental design did not find a significant impact of police officers' procedurally fair behaviors on citizens' perceptions of police legitimacy (MacQueen & Bradford, 2015).

Overall, while the association between individuals' procedural justice, police legitimacy, and willingness to cooperate with the police is well supported in cross-sectional studies, this relationship remains uncertain when examined using stronger research designs with greater internal validity.

4. Gaps in the literature

There are three major gaps identified in the literature. First, most studies examining the impact of citizen perceptions of procedural justice and police legitimacy on cooperation with the police focus on *willingness* to cooperate rather than *actual* cooperative behaviors (e.g., see Bolger & Walters, 2019; Bradford & Jackson, 2016; Murphy et al., 2008; Reisig et al., 2007; Sun et al., 2017; Sunshine & Tyler, 2003; Tankebe, 2009; Tyler & Jackson, 2014). For example, the measures typically used to capture cooperation include survey respondents' willingness to (1) report a crime occurring in their community, (2) report suspicious or dangerous activities in their communities, or (3) help the police locate someone suspected of criminal activity by supplying information (see Murphy et al., 2008; Sargeant et al., 2014; Sun et al., 2017; Sunshine & Tyler, 2003; Tyler & Jackson, 2014). However, as Dirikx and Van den Bulck (2014) noted, "willingness and actual cooperative behaviour are presumably not perfectly identical" (p. 357). This discrepancy may represent a critical gap, as willingness measures may be susceptible to social desirability bias (Bradford & Jackson, 2016). For example, people may express a *willingness to* report a crime to the police because it appears socially acceptable, even though they may not actually do so. Conversely, if asked whether they have reported a crime or problem to the police in their neighborhood, people might be less likely to falsely claim they have done so.[2] In other words, the significant impact of procedural justice and police legitimacy on citizen cooperation with law enforcement found in the literature may be overestimated due to the use of *willingness* measures rather than *experiential* measures. Thus, studies should consider using experiential measures of cooperation more frequently rather than depending solely on willingness to cooperate.

Second, research often focuses on reporting crime or victimization to the police—mainly the willingness to report such matters—as a measure of cooperation with law enforcement (e.g., see Kochel et al., 2013; Stanek et al., 2023). However, a broader measure that includes reporting *any problems* to the police may better capture citizens' cooperation, as individuals contact the police not only for crimes or victimization but also for various social issues.[3] Indeed, a large proportion of citizen-initiated calls for service includes non-criminal matters, such as mental health crises, intoxicated individuals, noise complaints, neighbor disputes, and traffic issues (Lum et al., 2022; Weisburd, Wilson, et al., 2024). By focusing solely on crime or victimization reporting, the full scope of citizen cooperation with the police in addressing diverse community issues may not be captured. Expanding the measure of cooperation to include reporting non-criminal social problems would provide a more comprehensive understanding of how residents engage with the police and how their perceptions of procedural justice and police legitimacy influence these interactions.

Lastly, little research employs a longitudinal approach in this area. A recent meta-analysis study by Bolger and Walters (2019) examining the relationship between procedural justice, police legitimacy, and cooperation with law enforcement reported that only two out of the 56 studies are based on longitudinal data. This presents a significant concern, as using cross-sectional data, compared to longitudinal data, may lead to inflated effect sizes for the relationships between variables of interest (Weisburd et al., 2001). In other words, had more research been conducted using longitudinal data rather than cross-sectional data, the prevalent conclusion regarding the strong relationship between procedural justice, police legitimacy, and cooperation with the police might have been called into question.

5. Current study

Addressing the three major gaps identified in the literature, this study employs a longitudinal approach to examine whether and how community members' perceptions of procedural justice and police legitimacy affect their *actual* reporting of problems in the neighborhood to the police. Given the robust association between perceptions of procedural justice and police legitimacy found in the literature (Sunshine & Tyler, 2003; Tyler & Jackson, 2014; Wolfe et al., 2016), this study also examines the indirect effect of procedural justice on reporting behavior via police legitimacy (i.e., obligation to obey). This study uses three waves of longitudinal survey data gathered from the Baltimore Longitudinal Study of Community Health and Anti-Social Behavior at Crime Hot Spots (see Weisburd et al., 2011).

[2] It is reasonable to assume that when people are asked about their experiences, they tend to provide more accurate and honest responses, as they are less influenced by perceived expectations of others and the desire to present themselves in a socially favorable light. Additionally, there is little motivation to provide a false response in this context, as it is not directly related to admitting one's own negative behaviors, such as misdemeanors or offenses, which might be susceptible to social desirability bias (see Grimm, 2010).

[3] Measures of reporting of problems in the neighborhood to the police likely include reporting crime, as crime is considered a type of community problem.

5.1. Study context: Baltimore City, Maryland

Baltimore has a population of over 600,000 individuals residing within an area of 92.1 mile^2 (US Census Bureau, 2016). The city has a substantial minority population, with 64 % being Black individuals, and a poverty rate of 24 %, significantly higher than the national average of 15.1 % (US Census Bureau, 2015). At the start of the project, Baltimore City had a violent crime rate almost four times higher than the national average (City Data, 2012). Drug-related offenses have been a major issue in the city, with over 52,000 police calls for service (CFS) reported as drug crimes as of 2010. Police-community relations have been strained for a long time in Baltimore. The implementation of zero-tolerance policing, which disproportionately impacted Black communities, combined with racial segregation and widespread poverty in Baltimore, has created a challenging dynamic between law enforcement and the community (White et al., 2018; also see Hinkle et al., 2023). Additionally, Baltimore has a significant history of police violence, as evidenced by the numerous lawsuits filed between 2011 and 2014 for incidents of police brutality and false arrests, which led to settlements totaling $5.7 million (Puente & Donovan, 2015). Although data from Baltimore may have limited external validity, it can provide valuable insights into how communities view the police amidst frequent exposure to crime, disorder, and potential police conflicts, which has rarely been explored in prior research (Weisburd, Jonathan-Zamir, et al., 2024).

5.2. Identification of the sample

The study began with the entire population of 25,045 street segments in Baltimore City, Maryland. CFS data from the Baltimore City Police Department (BCPD) for 2012 were geocoded (with a match rate of 98.8 %) to create aggregate counts of violent crime CFS (rape, aggravated assault, common assault, robbery, bank hold up, carjacking, abduction, and sniper) and drug crime CFS (narcotics, narcotics on-view, and narcotics outside). The original goal was to identify a sample of 450 street segments (i.e., both block faces intersection to intersection), with a larger portion being crime hot spots (about two-thirds) and the remainder serving as a comparison group of streets not classified as hot spots.

Crime hot spots were defined as streets ranking in the top 3 % for violent or drug CFS, ensuring a sample of extremely high crime streets. Three crime hot spot categories were created: drug, violent, and combined violent/drug hot spots (streets that met the minimum threshold for both drug and violent crime calls).[4] Since the original study focused on street-level features, data was collected on a minimum number of subjects at each street segment rather than using random sampling from all streets. Given the finite population of households on each street segment, the expected response rate of a survey was taken into account in relation to this finite population. With an assumed response rate of 35 %, it was estimated that at least 20 occupied households on a street would yield approximately 7 survey responses. This criterion narrowed the sampling frame to 4630 streets. Adjusting for the finite population correction, the standard error for this sample size is 82.7 % of what it would be for an equivalent sample from a large or infinite population.[5]

Hot spot streets were then sampled from the three crime hot spot categories using a random sampling method in Model Builder (in ArcGIS), which ensured that no two sampled streets were within a one-block buffer zone of each other. Following selection, field researchers conducted physical surveys of each street to identify any unique barriers that would change the street's layout (e.g., bridges, alleys), and to verify that the street met the criteria for occupied dwellings. Street segments that did not meet the sampling criteria after this survey were replaced as necessary to reach the sample goals. A comparison group of "non-hot spot" streets was sampled, employing the same methodology used for the hot spot streets. Based on an analysis of crime call distributions on these "non-hot spot" streets, they were further categorized into "cold" spots (three or fewer CFS for drug or violent crime) and "cool spots" (four or more CFS for drug or violent crime, but below the hot spot threshold).

The original study's sample street segments comprised 47 cold spots, 100 cool spots, 121 drug hot spots, 126 violent hot spots, and 55 combined drug and violent crime hot spots. The oversampling of crime hot spots provides a sample where police-citizen contacts are more common, which enables an examination of perceptions of the police that may be deeply influenced by their direct and indirect experiences (Weisburd, Jonathan-Zamir, et al., 2024). Moreover, this approach ensures that there was a sufficient number of issues or incidents within their residential block for residents to report to the police, a condition that was not often addressed in previous research.

5.3. Data collection

After identifying the sample of street segments and establishing the sampling frame for occupied residential units on those streets, door-to-door surveys were conducted from August 2013 to June 2014 for the first wave of the study. The data collection for the second wave of the survey took place between April and December 2015, and the third wave of the data collection was conducted between April 2017 and March 2018. Residential dwelling units were randomly selected, and trained field researchers interviewed the first adult (aged 21 or older) resident encountered who had lived in their unit for at least three months. Face-to-face surveys were conducted using Scantron bubble forms; the researchers read the questions to the participants and recorded their responses on the forms. Participants received a $15 compensation for their participation, and the survey took approximately 20–25 min to complete. The contact rate for the Wave 1 survey was 71 %, with a cooperation rate of 61 %. In the second wave, the contact rate and cooperation rate were 80 % and 72 %, respectively; during the third wave, they were 79 % and 58 %, respectively. These outcomes surpass average results for door-to-door survey approaches (Babbie, 2020).

In Wave 1, a total of 3738 residential surveys were carried out, averaging eight surveys completed on each street; the second wave of the survey saw 3615 surveys conducted, maintaining an average of eight surveys for each street; and, during the third wave of the survey, 3141 surveys were conducted, with an average of seven surveys completed per street segment. It is important to note that the original study is a longitudinal study based on street segments rather than individuals, leading to a certain degree of attrition over the waves at the individual

[4] Initially, the threshold for drug-related and violent crime was set at 18 drug CFS and 19 violence CFS, representing the top 2.5 % of city segments in each category. This threshold is the midpoint between the 1 % and 5 % levels commonly used to identify crime hot spots (Weisburd, Zastrow, et al., 2024). However, to achieve the sampling goals for streets with high levels of violence or drug crime, the thresholds were adjusted to 17 violent CFS and 16 drug CFS, aligning with approximately the top 3 % of street segments in each category. Additionally, to ensure consistent drug or violent crime throughout the year, a criterion was set that required calls to be distributed over at least 6 months. For full details of the study's methodology, see https://cebcp.org/wp-content/uploads/2020/07/NIDA-Methodology.pdf.

[5] The correction is calculated using the equation: $\sqrt{\frac{\text{N of population} - \text{n of surveys}}{\text{N of population} - 1}}$ (see Ramachandran & Tsokos, 2009)

Table 1
Principal axis factor analysis with oblimin rotation

Var	Item	Factor	
		1	2
PJ 1	Police officers treat people fairly.	0.766	
PJ 2	In general, the police care about problems on your block.	0.778	
PJ 3	In general, police officers treat people with respect.	0.759	
TP 1	The police are dishonest (reversed).	0.423	
TP 2	The police can be trusted to make a decision that are right for your block.	0.805	
TP 3	Peoples' basic rights are well protected by the police on your block.	0.788	
OO 1	If a person is doing something and a police officer tells them to stop, they should stop even if they think what they are doing is legal.		0.731
OO 2	I always try to follow the law even if I think it is wrong.		0.794
OO 3	People should obey the law even if it goes against what they think is right.		0.546

Note: PJ = procedural justice, TP = trust in the police, OO = obligation to obey the police/law; Kaiser-Meyer-Olkin measure of sampling adequacy = 0.84; eigen values for factor 1 and factor 2 are 3.585 and 1.247, respectively.

level. Specifically, among the 3141 surveys completed in Wave 3, 617 respondents (20 %) participated in all three waves of the survey. The analyses for the current study are based on the 617 respondents who participated in all three waves.

5.4. Measures

5.4.1. Dependent variable

Reporting a neighborhood problem to the police was measured using an item from Wave 3 of the survey: "In the past year, about how many times have you called the police to report a problem in your home or neighborhood?" Responses were recoded into binary values (1 = yes, 0 = no) to focus on *whether* respondents reported a problem to the police rather than how many times they reported.[6]

5.4.2. Independent variables

This study includes two independent variables: *procedural justice* and *police legitimacy*.[7] The items for these variables were rated using a 4-point Likert scale, with response options ranging from 1 = *strongly disagree* to 4 = *strongly agree*. Mean scores are calculated for both procedural justice and police legitimacy scales. It is important to note that procedural justice was assessed using data from Wave 1 and police legitimacy from Wave 2. This time order reflects the idea that perceptions of procedural justice shape subsequent views of legitimacy, both of which are expected to precede reporting behavior drawn from Wave 3, following the temporal pathway proposed by the process-based model (Sunshine & Tyler, 2003; Tyler & Fagan, 2008; Tyler & Jackson, 2014).

The *procedural justice* scale, capturing perceptions of police treatment of citizens, consisted of three items from the Wave 1 survey (α = 0.80): (1) "*Police officers treat people fairly*"; (2) "*In general, the police care about your problems on your block*"; and (3) "*In general, police officers treat people with respect*". It should be noted that, of the four components of procedural justice, only respect and trustworthiness were measured, while neutrality and voice were not.[8] Thus, the study's findings are limited to the two elements of procedural fairness: respect and trustworthiness.

In this study, *police legitimacy* is conceptualized as obligation to obey—a belief that the police and law are entitled to be obeyed—measured with three items from the Wave 2 survey (α = 0.74): (1) "If a person is doing something wrong and a police officer tells them to stop, they should stop even if they think what they are doing is legal"; (2) "I always try to follow the law even if I think it is wrong"; and (3) "people should obey the law even if it goes against what they think is right" (see White et al., 2018). These items capture global measures of obligation, encompassing both the obligation to obey the police and a moral sense to obey the law, rather than solely the former.[9] An exploratory factor analysis (i.e., principal axis factor analysis with oblimin rotation) using the Wave 3 survey data indicated that measures of trust in the police are not empirically distinct from those of procedural justice (see Table 1). As a result, trust in the police measures were not included in this study (Gau, 2011; also see Pryce et al., 2017).[10]

5.4.3. Control variables

A large body of literature suggests that demographics (Murphy & Cherney, 2011; Sun et al., 2017; Tyler & Jackson, 2014), victimization (Bradford & Jackson, 2016; Xie & Lauristen, 2012), experiences with the police (Rengifo et al., 2019), perceptions of their neighborhoods, such as disorder and collective efficacy (Bradford & Jackson, 2016; Khatchatourian et al., 2022; Sun et al., 2017; Tyler & Fagan, 2008), and crime levels (Baumer, 2002) can influence an individual's willingness to cooperate with the police or the reporting of a crime, victimization, or neighborhood issue to the police. Thus, these factors were accounted for in this study.

[6] A sensitivity analysis was conducted using the original count variable (see Appendix B), The main results for the key independent variables, procedural justice and police legitimacy, were very similar when comparing multilevel negative binomial models based on the count variable to multilevel logistic regression models using the binary outcome variable.

[7] Again, while I acknowledge the scholarly debate surrounding the measurement and conceptualization of police legitimacy (Gau, 2011; Kuen, 2024; McLean & Nix, 2022; Sun et al., 2017; Tankebe, 2013; Tyler & Jackson, 2013), I chose to use measures consistent with Tyler's (2004) conceptualization, rather than Tankebe's (2013). This is because obligation to obey is commonly used to measure perceived police legitimacy in the literature (Dirikx & Van den Bulck, 2014., Kochel et al., 2013; Sun et al., 2017; Tyler & Jackson, 2014; Woo et al., 2018 Wolfe et al., 2016), which enables comparisons across a large number of prior studies.

[8] The other three survey items related to procedural justice—"The police take time to listen to people on your block," "Police make decisions based on facts and the law and not on their own personal opinion," and "People's basic rights are well-protected by the police on your block"—are not included in this study, as they are only present in the Wave 3 survey data.

[9] The items were combined based on the result of an exploratory factor analysis, which showed that all three items loaded onto a single factor (see Table 1). I conducted a sensitivity analysis using only the first item of 'obligation to obey,' which directly pertains to perceptions of the police. The overall results were consistent with those from the main analyses in this study (analyses available upon request).

[10] When trust in the police was included in the analyses, it was not significant, and its effect on reporting a neighborhood problem to the police was very small, similar to that of procedural justice (analyses available upon request). Given the low discriminant validity between these two constructs in this study, it is unclear whether this result reflects the true influence of trust in the police or procedural justice.

To account for the baseline level of actual cooperation with the police, *reporting a neighborhood problem to the police* in the past year (1 = yes, 0 = no) during the Wave 1 survey was included (see above). Respondents' other experiences with the police were also measured using two variables: *filing a complaint about the police* in their lifetime (1 = yes, 0 = no) and *being arrested* in the past year (1 = yes, 0 = no). *Victimization* in the past year (1 = yes, 0 = no)[11] and *offending* in the past year (1 = yes, 0 = no)[12] were also accounted for. Additionally, demographic variables were considered, including *race* (with two dummy variables representing White individuals and other race groups, using Black individuals as the reference category), *gender* (1 = female, 0 = male), *age* (measured continuously), *education* (1 = less than college education, 0 = some college education or higher), and *homeownership* (1 = homeowner; 0 = renter).

To capture street characteristics that may relate to reporting a problem to the police, this study included measures of *perceptions of social disorder*, *physical disorder, collective efficacy* (i.e., *social cohesion and informal social control*), and *fear of crime* (see Appendix A for a full list of items and Cronbach's alpha for each construct). To account for the duration of residence, *the number of years the respondents have lived on the street* was included. *Street segment type*, categorized by calls for service related to crimes, was used to control for the objective level of crime and was represented by four dummy variables: cool spots, drug hot spots, violent hot spots, and combined drug/violent hot spots, with cold spots as the reference group.

5.5. Analytic strategy

In this study, the primary analytical technique employed is mixed-effects logistic regression modeling. Given the binary nature of the outcome (i.e., whether a problem in the neighborhood is reported to the police), a logistic regression approach was used. Furthermore, considering that the decision to report a problem to the police may be heavily influenced by environmental characteristics of the streets, which vary by street segments, mixed-effects modeling was used to account for clustering at the street level (i.e., random intercept model).

For a rigorous examination, the baseline level (Wave 1) of residents' problem reporting to the police was accounted for, which enables an examination of the extent to which the independent variables—procedural justice and police legitimacy—affect the *residualized change* in residents' reporting a problem in the neighborhood to the police from Wave 1 to Wave 3.[13] The effect size of the independent variables reflects the impact of procedural justice at Wave 1 and police legitimacy at Wave 2 on the change in problem reporting to the police from Wave 1 to Wave 3. To account for the possibility that individual characteristics or living environments may influence problem reporting to the police, it is important to account for key individual characteristics, experiences with the police, and perceptions of street characteristics, and street segment type classified by crime (see above). The estimated full model can be represented as:

$$\text{logit}\left\{Pr\left(y_{ij}=1|\,x_{ij}\right)\right\}=\beta_{0j}+\beta_1 x_{1ij}+\beta_2 x_{2ij}+\beta_3 x_{3ij}+\cdots+\beta_k x_{kij}+\epsilon_{ij}$$

$$\beta_{0j}=\gamma_0+\gamma_1\omega_{1j}+\gamma_2\omega_{2j}+\cdots+\gamma_m\omega_{mj}+u_j$$

where the outcome, $\text{logit}\left\{Pr\left(y_{ij}=1|\,x_{ij}\right)\right\}$, is the log-odds of $y_{ij}=1$, indicating whether an individual i reports a problem in the neighborhood to the police, given x_{ij}, which includes all covariates for individual i nested within street j. Here, β_{0j} is the intercept for each street. Variables x_{1ij} and x_{2ij} correspond to procedural justice at Wave 1 and police legitimacy at Wave 2, respectively, while x_{3ij} through x_{kij} include the baseline level of residents' reporting behavior and other control variables at Wave 1 at the individual-level. ϵ_{ij} is the individual-level error term. The street-level intercept (β_{0j}) is modeled by the second equation, where γ_0 is the intercept across street segments. The variables ω_{1j} through ω_{mj} represent street-level predictors (i.e., dummy variables for different street segment types, excluding the reference group, cold spot), and u_j is the random effect for the street-level intercept, accounting for the nesting of individuals within streets. In this model, the level one regression coefficients are represented as β_k, while the level two regression coefficients are denoted as γ_m.

In multilevel modeling, estimating the proportion of variability at each level is crucial. The residual error term in a multilevel logistic regression model has an underlying logistic distribution with a known variance, σ^2, which is approximately equal to $\frac{\pi^2}{3}$ or about 3.29 (Raudenbush & Bryk, 2002). The level 2 residual variance, denoted as τ_{00}, is assumed to be normally distributed. The intra-class correlation coefficient (ICC) at the street level is calculated using the equation: $\rho=\frac{\tau_{00}}{\tau_{00}+\sigma^2}$, where ρ represents the proportion of the total variance in problem reporting attributable to differences between street segments. To estimate the ICC, an unconditional model (without covariates) was estimated first. Subsequently, Model 1, which includes procedural justice and all control variables, and Model 2, which further incorporates police legitimacy, were estimated.

Given the robust association between perceptions of procedural justice and police legitimacy found in the literature (Bolger & Walters, 2019; Sunshine & Tyler, 2003; Wolfe et al., 2016), this study also examined the indirect effect of procedural justice at Wave 1 on problem reporting behavior at Wave 3 via police legitimacy at Wave 2. It is important to note that applying a traditional mediation approach to nonlinear regression models can result in inaccurate estimates and standard errors (Mustillo et al., 2018). Thus, the Karlson–Holm–Breen (KHB) mediation method was employed. This method decomposes the total effect into the direct and indirect effects in nonlinear regression models, such as logistic regression model, ensuring accurate estimates and standard errors by accounting for rescaling in non-linear models (Karlson et al., 2012). All analyses in this study were conducted using Stata 18.

6. Findings

6.1. Descriptive statistics

Descriptive statistics are provided in Table 2. For the dependent variable—reporting a neighborhood problem to the police at Wave 3—34.5 % of the respondents reported doing so in the past year, which is slightly lower than the 37.9 % reported at Wave 1. Regarding perceptions of the police, the respondents generally tended to feel obliged to

[11] To assess victimization, three survey items were used. Property victimization was measured through two questions: (1) whether someone had broken into respondents' home in the past year and (2) whether any items had been stolen from their porch, yard, driveway or somewhere else surrounding their residence in the past year. For assessing violent victimization respondents were asked, "In the past year has anyone used violence against you - like in a fight, mugging, or physical assault?"

[12] Offending was measured using multiple items of self-reported offending in the past 12 months. Offenses included various illegal activities, such as purposely damaging someone else's property, driving a car under the influence of alcohol, taking something that didn't belong to you, fraudulently using someone else's personal check or credit card, owning or carrying a gun without a license, breaking into a business or home to steal something, selling illegal drugs, stealing a car or other types of motor vehicle, taking something from someone using violence, and engaging in violence against someone, like a fist fight or assault.

[13] It was confirmed that excluding the baseline reporting behavior does not change the study's main results, which suggests the robustness of the findings (see Appendix C). In other words, there was no evidence that perceptions of procedural justice at Wave 1 affect either the reporting behavior at Wave 3 or the change in reporting behavior from Wave 1 to Wave 3.

Table 2
Descriptive statistics of study variables

Variables	*N*	Mean/%	SD	Range
Dependent variables				
Reporting a problem to the police (W3)	611	34.53 %	–	0–1
Independent variables				
Police legitimacy (W2)	613	3.05	0.40	1–4
Procedural justice (W1)	608	2.67	0.56	1–4
Control variables				
Reporting a problem to the police (W1)	612	37.91 %	–	0–1
Arrested (W1)	617	4.86 %	–	0–1
Filing a complaint (W1)	615	13.50 %	–	0–1
Victimization (W1)	606	27.89 %	–	0–1
Offending (W1)	612	6.70 %	–	0–1
Race	617			
Black (W1; reference)		76.18 %	–	0–1
White (W1)		17.50 %	–	0–1
Other race (W1)		6.32 %	–	0–1
Female (W1)	609	63.22 %	–	0–1
Age (W1)	616	53.54	14.89	21–94
Below college (W1)	616	53.73 %	–	0–1
Homeowner (W1)	613	59.38 %	–	0–1
Social disorder (W1)	616	1.71	0.86	1–4
Physical disorder (W1)	617	1.41	0.45	1–3
Collective efficacy (W1)	617	3.72	0.65	1–5
Fear of crime (W1)	617	2.22	0.45	1–4
Living years (W1)	617	16.25	15.38	0.25–70
Segment type	617			
Cold spots (W1; reference)		12.80 %	–	0–1
Cool spots (W1)		24.15 %	–	0–1
Drug spots (W1)		26.09 %	–	0–1
Violent spots (W1)		26.42 %	–	0–1
Drug/violent spots (W1)		10.53 %	–	0–1

Note: W1 = Wave 1; W2 = Wave 2; W3 = Wave 3.

obey the police and the law, with a mean score of 3.05 at Wave 2 (SD = 0.40). Procedural justice, measured at Wave 1, had a lower mean of 2.67 with a slightly higher SD of 0.56, indicating some variability in the respondents' perceptions of police procedural justice.

The control variables provide insights into various aspects of respondents' experiences, demographics, and the characteristics of the street they lived on. For instance, about 5 % of respondents reported being arrested at Wave 1, and 13.5 % filed a complaint about the police. Victimization and offending rates were 27.9 % and 6.7 %, respectively. Demographically, the majority of the sample were Black residents (76.2 %), followed by White residents (17.5 %), and those of other races (6.3 %). Females comprised 63.2 % of the sample. The mean age was 53.5 years that ranged from 21 to 93, showing a wide adult age distribution. Over half of the respondents (53.7 %) had not pursued college education. Homeowners accounted for 59.4 % of the sample, indicating a relatively stable residential status. Perceptions of social disorder (Mean = 1.71 and SD = 0.86) and physical disorder (Mean = 1.41 and SD = 0.45) were reported at moderate levels, while collective efficacy (Mean = 3.72 and SD = 0.65) and fear of crime (Mean = 2.22 and SD = 0.45) were higher. Respondents had lived on their streets for an average of 16 years. Additionally, over 60 % of respondents lived at hot spots of crime—26.1 % at drug hot spots, 26.4 % violent hot spots, and 10.5 % at combined drug/violent crime hot spots.

As noted in Table 2, the data for the analyses contain a small amount of missing data. No variable had more than 2 % of missing data, and the total number of cases with missing data was less than 9 % (54 out of 617 respondents). Given the minimal level of missing data, listwise deletion was employed in the current analyses (see Schafer, 1999).[14]

6.2. Main results (mixed-effects models)

First, according to the result of the unconditional model, which includes no covariates, the likelihood ratio test comparing the mixed-effects logistic regression model to the one-level logistic regression model was significant ($x^2 = 2.79$, $df = 1$, $p < 0.05$). This indicates that the likelihood of reporting a neighborhood problem to the police varies significantly across street segments, which supports the use of a multilevel approach.[15] The ICC of the unconditional model was 0.112, indicating that 11.2 % of the variance in reporting a problem to the police is attributable to differences between street segments, while the remaining variance is at the individual level.

Model 1, which includes procedural justice along with all control variables, is presented in Table 3. All street-level variance was explained in the model ($\tau_{00} = 0$). Not surprisingly, individuals who reported a problem to the police in the past year at Wave 1 had 3.102 times greater odds (exp[1.132]) of reporting a problem to the police at Wave 3 compared to those who did not report at Wave 1 ($p < 0.001$). Fear of crime was a strong and significant predictor of reporting behavior; a one-unit increase in the fear of crime scale was associated with a 118.1 % increase in the odds ((exp[0.780]-1) x 100) of reporting a problem to the police ($p < 0.01$). However, most importantly, there was no evidence that perceptions of procedural justice significantly impacted reporting behavior (odds ratio = 1.004, $p = 0.983$). It should be noted that the effect was extremely small.

Model 2, which incorporates police legitimacy (i.e., obligation to

[14] Sensitivity analyses confirmed that the application of a multiple imputation method yielded very similar results.

[15] Unconditional models for (1) the two-level multilevel model with communities ($n = 47$ community statistical areas) as level 2 units, and (2) the three-level multilevel model, with streets and communities as level 2 and level 3 units respectively, were not significant ($x^2 = 1.56$, $df = 1$, $p = 0.106$ for the former, and $x^2 = 3.47$, $df = 2$, $p = 0.176$ for the latter). This indicates that there is little variance in neighborhood problem reporting to the police at the community level, leading to the decision to not include communities from the models.

Table 3
Mixed-effects logistic regression models predicting reporting a neighborhood problem to the police at Wave 3

	Model 1			Model 2		
	b	SE	OR	*b*	SE	OR
Fixed effects						
Intercept	−3.517**	1.250	–	−5.134***	1.474	–
Police legitimacy (W2)	–	–	–	0.546*	0.253	1.726
Procedural Justice (W1)	0.004	0.192	1.004	−0.048	0.194	0.953
Reporting to police (W1)	1.132***	0.212	3.102	1.133***	0.213	3.106
Arrested (W1)	−0.429	0.488	0.651	−0.396	0.489	0.673
Filing a complaint (W1)	0.124	0.304	1.133	0.126	0.307	1.134
Victimization (W1)	−0.071	0.231	0.931	−0.054	0.232	0.948
Offending (W1)	−0.115	0.407	0.891	−0.083	0.412	0.920
Race (ref = Black)						
White (W1)	0.218	0.273	1.244	0.271	0.276	1.311
Other race (W1)	−0.123	0.448	0.884	−0.105	0.452	0.900
Female (W1)	0.138	0.215	1.149	0.102	0.217	1.107
Age (W1)	−0.016	0.008	0.985	−0.016*	0.008	0.984
Below college (W1)	−0.395	0.209	0.674	−0.366	0.210	0.693
Homeowner (W1)	0.098	0.241	1.103	0.129	0.243	1.138
Social disorder (W1)	0.192	0.156	1.212	0.173	0.158	1.189
Physical disorder (W1)	0.306	0.255	1.358	0.303	0.255	1.354
Collective efficacy (W1)	0.172	0.175	1.188	0.189	0.177	1.209
Fear of crime (W1)	0.780**	0.287	2.181	0.797**	0.291	2.220
Living years (W1)	0.009	0.008	1.009	0.009	0.008	1.009
Segment type (ref = Cold spots)						
Cool spots (W1)	0.018	0.349	1.018	0.056	0.351	1.058
Drug spots (W1)	−0.038	0.370	0.962	0.004	0.372	1.004
Violent spots (W1)	−0.256	0.365	0.774	−0.199	0.369	0.820
Drug/violent spots (W1)	0.176	0.461	1.192	0.261	0.467	1.299
Random effects						
τ_{00}		0.00			0.00	
χ^2		0.00			0.00	
Log likelihood		−315.250			−312.888	

Note: $n = 563$ individuals (level 1); $n = 310$ street segments (level 2); * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$ (two-tailed); OR = odds ratio.

Table 4
KHB mediation analysis examining the indirect effect of procedural justice on reporting a neighborhood problem via police legitimacy

	b	SE	OR [95 % CI]	*p*-value
Total effect	0.004	0.203	1.004 [0.674, 1.495]	0.986
Direct effect	−0.048	0.204	0.953 [0.639, 1.421]	0.812
Indirect effect	0.052	0.032	1.053 [0.989, 1.122]	0.105

Note: CI = confidential intervals, OR = odds ratio; SE = bootstrapped standard error; *p*-values are from two-tailed test.

obey), is also presented in Table 3. Importantly, obligation to obey at Wave 2 significantly impacted the likelihood of reporting a problem to the police at Wave 3, with a one-unit increase in obligation to obey associated with a 72.6 % increase in the odds ((exp[0.546]-1) x 100) of reporting ($p < 0.05$). Reporting behavior at the baseline remained the strongest predictor, with individuals who reported a problem to the police in the past year at Wave 1 having 3.106 times greater odds (exp [1.133]) of reporting at Wave 3 compared to those who did not report a problem at Wave 1 ($p < 0.001$). Fear of crime continued to be an important predictor: a one-unit increase in the fear of crime scale was associated with a 122.0 % increase in the odds ((exp[0.797]-1) x 100) of reporting a problem to the police ($p < 0.01$). In this model, age was negatively associated with reporting behavior, with each additional year of age leading to a 1.6 % decrease in the odds ((1-exp[−0.016]) x 100) of reporting ($p < 0.05$). Still, there was no evidence that perceptions of procedural justice significantly affected reporting behavior, with an odds ratio of 0.953 ($p = 0.803$), indicating a negligible influence.

6.3. Mediation analysis

Lastly, KHB mediation with bootstrapped standard errors (5000 replications) was conducted to examine the indirect effect of perceptions of procedural justice on reporting a problem to the police via police legitimacy (see Table 4). The result indicated no significant indirect effect of procedural justice on reporting a problem to the police via police legitimacy ($b = 0.052$, odds ratio = 1.053, odds ratio 95 % CI = 0.989–1.122, $p = 0.105$).

7. Discussion

Effective crime prevention and community safety require the cooperation of community members with the police (Kochel, 2018; Lyons, 2002; Tyler & Meares, 2019; Weisburd & Majmundar, 2018; Weisburd, Wilson et al., 2024). Given its importance, numerous studies have explored factors that influence people's cooperation with the police (e.g., Baumer, 2002; Murphy & Cherney, 2011; Rengifo et al., 2019; Xie & Lauristen, 2012). In particular, the process-based model of policing, which focuses on enhancing procedural justice and police legitimacy, has become central in explaining how to promote community members' cooperation with law enforcement (Bradford & Jackson, 2016; Sunshine & Tyler, 2003; Tyler, 2004; Tyler & Fagan, 2008; Tyler & Jackson, 2014).

However, research examining the process-based model reveals several gaps. First, it predominantly focuses on citizens' *willingness* to cooperate instead of their *actual* cooperation (Bradford & Jackson, 2016; Dirikx & Van den Bulck, 2014; Sunshine & Tyler, 2003). Second, studies on cooperation with the police largely center on reporting crime or victimization rather than a broader range of neighborhood problems (Kochel et al., 2013; Stanek et al., 2023). Third, most of the research relies on cross-sectional data (Bolger & Walters, 2019; Nagin & Telep, 2017, 2020). In response to these gaps, this study reevaluated the process-based model of policing by (1) examining the effect of residents' perceptions of procedural justice and police legitimacy on their reporting of neighborhood problems to the police, as opposed to their willingness to do so, and (2) employing a longitudinal approach to better capture the temporal dynamics of these relationships.

This study supports one of the key principles of the process-based

model: community members' cooperation with the police is influenced by their perceptions of police legitimacy (see Bolger & Walters, 2019; Sunshine & Tyler, 2003; Tyler, 2011; Tyler & Jackson, 2014). Specifically, it was found that as people perceived a higher obligation to obey the police and the law, they were more likely to report a problem in their home or neighborhood. In other words, when people view the police as authorities deserving of obedience and deference, they tend to report issues more actively. This finding aligns with previous studies demonstrating that obligation to obey the police and the law plays a key role in promoting *willingness* to cooperate with the police (Dirikx & Van den Bulck, 2014; Sun et al., 2017; Sunshine & Tyler, 2003; Tyler & Jackson, 2014; Woo et al., 2018; see also Kochel et al., 2013). Given the limited scope of legitimacy examined in this study, which does not include other elements such as normative alignment, the interpretation of this result is restricted to the relationship between obligation to obey the police/law and cooperation with the police. Furthermore, due to the low discriminant validity between trust in the police and procedural justice (see Table 1), trust in the police—which previous research has shown to be strongly associated with willingness to cooperate—was not included in the main analyses. This limits the ability to reliably explore the relationship between this trust element and actual cooperative behavior. Nevertheless, this study contributes to the literature by suggesting that the obligation to obey, a key component of perceptions of police legitimacy, can promote not only the intention to cooperate but also actual cooperative behavior.

On the other hand, the findings of this study do not support another key proposition of the process-based model that police procedural justice is essential for enhancing citizens' cooperation with law enforcement (see Bradford & Jackson, 2016; Tyler, 2004, 2011). While previous research has consistently shown that perceived procedural justice directly increases community members' *willingness* to cooperate with the police, such as calling the police to report crime (Bradford & Jackson, 2016; Kochel, 2018; Madon et al., 2017; Murphy et al., 2008; Pryce et al., 2017; Sun et al., 2017) or victimization (Kochel et al., 2013; Stanek et al., 2023), the current study did not find evidence that this perception promotes *actual* cooperative action—specifically, reporting a problem in their home or neighborhood to the police.

Why does this result deviate from those of studies that generally found a strong association between perceptions of procedural justice and cooperation with the police? A possible explanation is that "willingness and actual cooperative behaviour are presumably not perfectly identical" (Dirikx & Van den Bulck, 2014, p. 357). As Bradford and Jackson (2016) noted regarding the limitation of using a willingness measure, "saying one will cooperate may be easy, and more socially acceptable, than the alternative—actually doing so may be more difficult" (p. 127). Indeed, the psychology literature highlights the "intention-behavior gap", which refers to the discrepancy between what people intend to do and their actual actions (Conner & Norman, 2022, p. 2). In other words, the use of willingness measures in previous research might not have adequately captured actual reporting behaviors and could have inflated the impact of perceived procedural justice on cooperation with the police. While prior studies have suggested that perceptions of the police acting in a procedurally fair manner can directly signal to people that they should cooperate with the police (e.g., Bradford & Jackson, 2016; Tyler, 2011; Tyler et al., 2015), this may not be sufficient to change people's actual cooperative behavior, such as reporting a problem to the police.

It is important to note that even the indirect effect of perceptions of procedural justice on reporting behavior via police legitimacy was neither significant nor substantial, which contrasts with previous research (e.g., Bolger & Walters, 2019; Bradford & Jackson, 2016; Dirikx & Van den Bulck, 2014; Madon et al., 2017; Sunshine & Tyler, 2003; Tyler & Fagan, 2008; Woo et al., 2018). This result appears to be largely due to the weak longitudinal association between perceptions of procedural justice and obligation to obey ($r = 0.11$ between procedural justice at Wave 1 and police legitimacy at Wave 2). This weak correlation suggests that prior perceptions of procedural justice are not strongly linked to the feeling of obligation to obey years later (see Kuen, 2024). Given that most studies examining the relationship between procedural justice, police legitimacy, and cooperation with law enforcement are based on cross-sectional designs (Bolger & Walters, 2019), this study suggests that their associations reported in the literature may be overestimated due to an overreliance on cross-sectional data (Pina-Sánchez & Brunton-Smith, 2020; Weisburd et al., 2001).

Unsurprisingly, the most important predictor of reporting behavior was whether people had previously reported a neighborhood problem to the police. In other words, individuals who have reported a neighborhood issue to the police before are likely to do so again. This suggests that such behavior is stable over time, possibly because it is largely dependent on one's disposition and may not be easily affected by external factors. Alternatively, reporting behavior may be influenced by instrumental factors related to individual needs. For instance, the finding on fear of crime in this study revealed that individuals with higher levels of fear of crime were more inclined to report neighborhood problems to the police, possibly hoping the police would address these issues. Although not examined in this study, the certainty of punishment or the risk of sanctions could significantly influence reporting behaviors (see Tankebe, 2009). Understanding the role of non-normative factors is critical to fully grasp what drives individuals to report issues to the police, as opposed to mere willingness, which warrants further investigation in future research.

7.1. Theoretical and policy implications

Theoretical implications can be drawn from this study. The lack of a significant effect of perceptions of procedural justice challenges the widely held belief that enhancing police procedural justice will invariably lead to increased public cooperation with law enforcement, such as reporting neighborhood issues (Sunshine & Tyler, 2003; Tyler, 2004; Tyler & Jackson, 2014). The findings suggest that achieving such cooperation, as opposed to merely fostering a willingness to cooperate, may be more complex than the process-based model suggests. This study calls for more studies employing actual measures of cooperation rather than just assessing the willingness to cooperate with the police. Additionally, the data indicated a null indirect effect of procedural justice on reporting behavior via police legitimacy, which is largely due to the weak longitudinal association between procedural justice and police legitimacy. Most existing evidence on these relationships is based on cross-sectional analysis, which cautions against drawing strong conclusions from the literature (Nagin & Telep, 2017, 2020; Weisburd & Majmundar, 2018). As Tyler and Meares (2019) noted, "the existing studies on policing do not test the complete proposed causal model (procedural justice → legitimacy → behavior) within a single study" (p. 84). This study highlights the need for more research employing longitudinal data and analyses to rigorously examine the association between procedural justice, police legitimacy, and actual cooperation with the police over time.

The theoretical implications have clear relevance to police practices. While the importance of procedural fairness as a fundamental aspect of democratic policing cannot be overstated and should indeed be a priority (Nagin & Telep, 2017, 2020), it may be overly optimistic to assume that merely improving procedurally fair behaviors of police officers will be sufficient to elevate citizens' cooperative behaviors. Although this study found that a feeling of obligation to obey plays an important role in individuals' decisions to report a neighborhood problem to the police, perceptions of procedural justice did not contribute to this relationship. This does not mean that efforts by police to enhance officers' procedurally fair treatment of community members lack merit. Indeed, a growing body of research based on randomized controlled trials has demonstrated that training in procedural justice can improve police-community relations by positively influencing officers' behaviors (Weisburd et al., 2022; Wood et al., 2020). However, there is limited

evidence of a causal link between the relationship between procedural justice and increased cooperation with the police. Therefore, procedural justice should not be viewed as a panacea for fostering community cooperation with law enforcement.

If the goal is to enhance community members' cooperation and engagement in the long run, police strategies need to extend beyond incorporating procedural justice principles and adopt a diverse range of policing tactics and initiatives. For this purpose, policymakers and police practitioners should consider ways to directly encourage neighborhood engagement and cooperation among community members, rather than just focusing on improving procedural fairness. For instance, the Brooklyn Park Assets Coming Together (ACT) Experiment, which aimed to enhance police-community collaboration and increase residents' collective action at crime hot spots, successfully improved community members' reporting of crimes and other issues at these hot spots in Brooklyn Park, Minnesota (Weisburd et al., 2021; Weisburd, Wilson, et al., 2024). During the intervention, police officers identified 'assets'—key community stakeholders, such as local leaders or influential residents—who were willing to collaborate with the police at crime hot spots and help address safety problems; they then utilized these stakeholders to facilitate the reporting of community problems (see Weisburd et al., 2021). Such community-focused efforts, beyond just applying procedural justice principles, may be crucial for fostering meaningful cooperation between residents and the police.

7.2. Limitations and future directions

Firstly, the measures used in the current study are not complete. Due to the low discriminant validity found in the factor analysis between the measures of perceptions of procedural justice, police effectiveness, and trust in the police, the latter two were excluded. Normative alignment, another important component of police legitimacy, was not measured in the survey. It is possible that procedural justice indirectly affects reporting behaviors via normative alignment, but this mechanism could not be examined here. Additionally, this study used only three items each to measure procedural justice and obligation to obey, which do not capture the full scope of the concepts. As noted earlier, the procedural justice measures in this study only assess respect and trustworthiness, excluding the elements of voice and neutrality. Moreover, the obligation to obey scale used in this study may reflect both the obligation to obey the police and a broader moral sense to obey the law, rather than solely the former. Future studies should replicate this study with complete measures of the constructs.

Secondly, the study sample is largely drawn from hot spots of crime in Baltimore City, Maryland, where individuals' perceptions of the police may be more negative compared to safer places or other cities. It can be argued that the sample, comprising residents with more direct and indirect experiences with the police than those in safer places or cities, provides a foundation for assessing perceptions of the police that may be deeply rooted in their varied experiences (see Weisburd, Jonathan-Zamir, et al., 2024). Moreover, the data offer unique insights into perceptions of the police and police-community relations among individuals largely drawn from marginalized communities exposed to crime, disorder, and potential conflicts with the police, which has rarely been investigated in prior research. However, it is crucial to note that in Baltimore City, with its unique and enduring police-community conflicts and low crime clearance rates, community members' reporting behavior may differ from other jurisdictions. Thus, the results of the study may not be generalizable to other places or cities and should be replicated in different contexts. Additionally, the killing of Freddie Gray in early April 2015 in Baltimore coincided with Wave 2 data collection, which may have influenced the study's results, although this is unlikely given prior research (see White et al., 2018).

Lastly, although the current study employed a longitudinal approach by establishing a time order between procedural justice, police legitimacy, and reporting behavior, and by accounting for the baseline level of reporting behavior, this does not ensure a causal examination of the relationship. Future research should apply an experimental design, such as a two-stage randomized design, where both the initial intervention (i.e., procedural justice) and the mediator (i.e., police legitimacy) are sequentially randomized. Although challenging to implement, this approach would allow for a more rigorous examination of the causal pathways between perceptions of procedural justice, police legitimacy, and actual cooperation with the police.

8. Conclusions

In this study, the process-based model was reassessed by examining the impact of community members' perceptions of procedural justice and police legitimacy on their *actual* reporting of a problem to the police, rather than their *willingness* to cooperate, using a longitudinal design. The study revealed nuanced findings: although police legitimacy was an important predictor of residents' reporting behavior, perceptions of procedural justice did not play a significant role in promoting such behavior, either directly or indirectly. This lack of significant impacts of procedural justice does not align with previous studies that identified procedural justice as a key factor in promoting *willingness* to cooperate with the police (e.g., reporting a crime), either directly (Tyler & Jackson, 2014; Woo et al., 2018) or indirectly through enhanced perceptions of police legitimacy (Sunshine & Tyler, 2003).

The prominence of the process-based model has been underscored by research findings that improving procedural justice can lead to increased cooperation with the police (Sunshine & Tyler, 2003; Tyler, 2004; Tyler & Jackson, 2014; Tyler et al., 2010). However, this study suggests that efforts to make police behaviors more procedurally fair, and the resulting increase in community members' perceptions of procedural justice, may not necessarily guarantee a higher level of actual problem reporting to the police. While ensuring procedural fairness is critical for the police in a democratic society and requires continued efforts to improve it (Nagin & Telep, 2017, 2020), the expectation that enhancing this value alone will lead to greater actual cooperation with the police might be overly optimistic.

CRediT authorship contribution statement

Kiseong Kuen: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

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Appendix A. Supplementary data

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