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Abstract

Researchers have not yet devoted sufficient attention to the effect of prison architecture on inmate misconduct. Using data from the population of male prisoners in Texas, the authors explored the association between two prison architectural design types (as determined by satellite imagery) and inmate misconduct. The results from multilevel statistical analyses suggest that architectural design is associated with nonviolent misconduct but not violent misconduct. Policy implications and directions for future research are discussed.

Keywords

prison architecture, inmate misconduct, prison environment, inmate behavior, satellite imagery

Introduction

Prison researchers have devoted considerable attention to identifying factors associated with inmate misconduct. It is clear that a variety of individual- and prison-level variables are associated with inmate behavior (for reviews of this literature, see Camp, Gaes, Langan, & Saylor, 2003; Lahm, 2008; Wooldredge, Griffin, & Pratt, 2001), but the effect of architecture remains unclear. This despite that fact that several scholars have called for research on the links between prison architecture and inmate misconduct (e.g., Lahm, 2008; Useem & Piehl, 2006;

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Wooldredge et al., 2001) and highlighted the importance of architecture in prison administration (e.g., Dilulio, 1987; Useem & Goldstone, 2002).[1]

If prison architecture influences inmate behavior (directly or indirectly), then exploring the role of architecture may help better inform corrections theory and policy. From a policy perspective, a better understanding of the relationships between architectural design and inmate behavior could help solve administrative burdens, ranging from improving security and safety to reducing fiscal and operational demands. Such knowledge could also be relevant to prison construction (or remodeling), as one design type could be less conducive to internal strife than the next. From a theoretical standpoint, if architecture sets the stage for inmate misconduct (or influences it indirectly), theories of misconduct may need to be revised to account for such an eventuality.

Using official data collected from the state of Texas, we employed multilevel models to explore the effects (direct and indirect) of prison architecture on violent and nonviolent inmate misconduct. In so doing, we emulated recent multilevel misconduct studies by the likes of Wooldredge et al. (2001) and Steiner and Wooldredge (2009a, 2009b), but in addition to modeling a range of popular inmate- and prison-level variables, we developed and included an explicit prison-level measure of architectural design type, based on images captured by satellites. Though this measure does not perfectly capture the effect of architecture on misconduct, it takes us closer to a more complete understanding of how the design of prisons influences inmate behavior.

Prison Architecture and Inmate Misconduct

It is not unreasonable to expect that a prison surrounded by high walls, drab and cramped cage-like cells, and low guard visibility sends a qualitatively different message to both inmates and guards than a more modern campus-like prison characterized by an open, more inviting, environment (see Wener, 2006). Yet only a few studies, mostly small-scale case studies, have addressed the possible linkages between prison architecture and inmate misconduct.

In a trend analysis of the New York City Department of Correction, Useem and Goldstone (2002) found that declining rates of inmate violence were not because of changes in the architecture of the Riker Island facility. Rather, declining trends were apparently because of additional and improved security measures.[2] Dilulio (1987) studied the role of architectural design and physical security measures of prisons in three states. His case study suggested that prison architecture was not supportive of "architectural determinism"; however, Dilulio noted that corrections officials staunchly support the idea that prison architecture is central to daily operations of any prison. Useem and Piehl (2006) suggested

that the existing body of literature surrounding prison architecture and prison violence tends to favor increased security as a means of reducing prison violence. However, such studies are quite limited in their scope and external validity. The role that architecture plays in misconduct, if any, has been largely unexplored to date.

Prison Architectural Designs

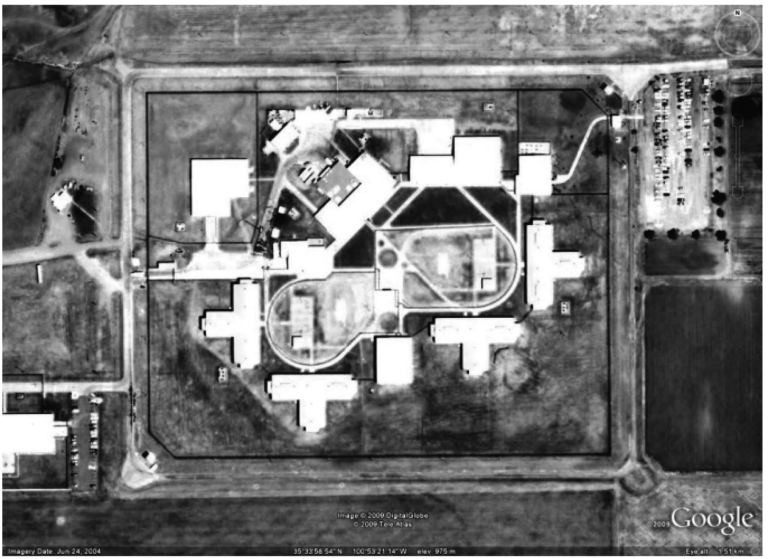
Since the mid-19th century, prisons in the United States have undergone relatively few architectural design modifications (Johnston, 2000, 2009). However, recent decades have seen design modifications of older prisons and the emergence of newer prisons designed specifically for increased security (Irwin, 2005). Examples include the use of wings, separate buildings, and the construction of dormitories rather than cells for many inmates. Still there are only a handful of distinct design types used in U.S prisons. Two of the more common designs found today include the older telephone pole layout and the more modern campus plan, both of which originated in Europe in the 1800s (Johnston, 2000) and dominate the Texas prison system landscape (see Figure 1).[3]

The telephone pole design is characterized by several rows of parallel multistory buildings, or pavilions, connected by one or two main corridors. From the air such buildings resemble the rungs of a typical above-ground telephone pole. The first prison of this type in the United States opened in 1914 (Johnston, 2009). The telephone pole layout grew in prominence in the United States between the two World Wars, especially in Texas (Johnston, 2000).

The idea behind the telephone pole design was increased security and restricted movement of inmates outside of the corridors (Johnston, 2000). Many telephone pole cellblock corridors were notorious for being dramatically long, making it difficult for guards to observe all inmates all the time. Though the design was intended to overcome security problems and make it easier for administrators to classify agricultural work squads during times of racial segregation, the design actually amplified problems for prison administrators. An example is that telephone pole prisons may cause difficulty in controlling riots, particularly when such prisons were built to house large numbers of inmates (Johnston, 2000, 2009).

In contrast to the telephone pole design, the campus design is characterized by freestanding buildings surrounded by a large open space, often in the shape of a rectangle (Johnston, 2000). Campus-style prisons were originally developed for housing women and juvenile inmates and were first seen in France beginning in 1840 (Johnston, 2009). Modified versions have served as the architectural basis for many prisons in the United States built since 1980 (Johnston, 2000).

Telephone Pole Design (Luther Unit)



Campus Design (Jordan Unit)

Figure 1. Prison architectural designs (aerial view): (A) Telephone pole design (Luther unit); (B) Campus design (Jordan unit)

Such prisons typically consist of several small housing and operations builds, sometimes referred to as "pods," that allow for more direct supervision of inmates. Campus facilities are also much less expensive to build than facilities relying on high walls and guard towers, which are design features found in many telephone pole prison facilities.

Although most Texas prisons fit either the telephone pole or campus design type, many can also be characterized as fitting a "mixed" design type that combines elements of a campus design and a telephone pole design. A handful of prisons in the state cannot be characterized as either mixed, campus, or of the telephone pole design. From the air they appear as hodge-podge of buildings laid out in no particular order or theme. To avoid such variation in architecture, however, this study focuses exclusively on campus- and telephone pole–style prisons.

Correlates of Inmate Misconduct

Research on the correlates of inmate misconduct has been grounded in the deprivation (Goffman, 1961; Sykes, 1958; see also Goodstein & Wright, 1989), importation (Irwin & Cressey, 1962), and situational (Steinke, 1991; Wener, 2006) perspectives. The deprivation model of inmate misconduct posits that the prison atmosphere/environment shapes personal beliefs and attitudes, thereby influencing inmate behavior on an inmate's incarceration (Goodstein & Wright, 1989; Sykes, 1958). In other words, the "pains of imprisonment" may stimulate acts of misconduct or nonconformity. According to this theory, inmate misconduct can be explained by prison- or punishment-specific factors. The importation perspective is more concerned with the "baggage" inmates bring with them to prison. Finally, the situational perspective is mostly self-explanatory, suggesting that misconduct is influenced by a range of contextual factors.

The Deprivation Perspective

Deprivation theory posits that when a person (inmate) is subjected to a restrictive environment, such as that of prison, certain basic needs may go unsatisfied and an inmate may adapt to the situation by satisfying needs via maladaptive behavior (Clemmer, 1940; Sykes, 1958). Thus, environmental factors such as prison crowding, the ratio of security staff to inmates, prison gangs, sentence length, time to parole eligibility, custody status (i.e., security classification), and facility type each play a role in the relative harshness of the imprisonment experience for any given inmate. Several studies have explored the role of these factors in predicting inmate behavior and many of these factors have been

viewed through the lens of deprivation theory, which is why we discuss them in this section.

Researchers have explored the effects of prison gang membership (separate from street gang membership) on misconduct. Here the evidence is more consistent; several studies have reported a positive link between misconduct and membership in a prison gang (e.g., Cunningham & Sorensen, 2007; DeLisi, Berg, & Hochstetler, 2004; Drury & DeLisi, 2008; Gaes, Wallace, Gilman, Klein-Saffran, & Suppa, 2002; Griffin & Hepburn, 2006; Sorensen & Pilgrim, 2000). Sentence length and time to parole eligibility have also been regular control variables in studies of inmate misconduct, yet their effects on misconduct have been mixed. For example, several studies have reported that sentence length is positively associated with misconduct (e.g., Camp et al., 2003; Craddock, 1996; Jiang & Fisher-Giorlando, 2002). Yet others report that longer-term inmates are less likely to engage in misconduct (Cunningham & Sorensen, 2006). Morris, Longmire, Buffington-Vollum, and Vollum (2010) found that capital inmates sentenced to more than 35 years were at a lower risk of many types of misconduct compared with those sentenced to 15 years or less. Other studies report null findings in regard to sentence length (e.g., DeLisi et al., 2004). In all, the mixed findings on sentence length are largely attributable to varying contexts between misconduct studies.

The effects of custody status on misconduct have been mixed, as well. Cunningham and Sorensen (2006) found that that traditional importation theory predictors of misconduct hold across custody types. Similarly, Bench and Allen (2003), using experimental data, found no difference in the likelihood of misconduct between custody levels. Also using an experimental design, Camp and Gaes (2005) found that the security level of an institution was not predictive of misconduct. However, other studies have reported that a higher initial custody level is predictive of misconduct (Camp et al., 2003; Morris et al., 2010). Some research has also focused on organization structure as an aspect of the deprivation model. For example, Feld (1981) found that among juveniles, institutions that were more custodial rather than treatment oriented were generally more debilitating in regard to behavior and were conducive to misconduct and stress.

An argument can be made that prison architecture fits as a factor under the deprivation model. Though no previous research has explored this directly through empirical research, certain architectural designs (or aspects of a design) may aggravate, or mitigate, adjustment to prison life. This, in turn, may directly or indirectly influence inmate behavior. For example, telephone pole–style prison units may result in increased stress among inmates because of their monotone structure, lack of open space, and close confines. Or, increased privacy in telephone designs may provide for additional opportunities to engage in some

forms of misconduct. Conversely, a campus-style unit may either increase or decrease the propensity for certain types of misconduct. For example, an open campus–style design may allow for decreases in privacy, and thus more infractions are recorded by the administration.

The Importation Perspective

The importation model suggests that inmate behavior is determined by an inmate's attitude, experiences, and characteristics that are developed prior to the inmate's entry into prison (Irwin & Cressey, 1962). According to this view, the factors that define inmates' attitudes and behavior on the outside influence their adjustment to prison life. Such factors include those that cannot be directly mediated by prison life (Thomas, 1977). Importation theory variables have included characteristics such as age, race, gender, social class, education level, socioeconomic status prior to entry, criminal history, and social network (e.g., marriage) *and* subjective attitudes and beliefs.

Not surprisingly, researchers have found that an inmate's age is one of the more robust predictors of misconduct. Younger inmates are more likely to engage in misconduct (e.g., Berk, Kriegler, & Baek, 2006; Ellis, Grasmick, & Gilman, 1974; Gendreau, Goggin, & Law, 1997; Morris et al., 2010; Proctor, 1994; Sorensen & Cunningham, 2009; Sorensen & Wrinkle, 1996; Wooldredge, 1991, 1994; Wooldredge et al., 2001). Other importation-related findings have been mixed.

A number of researchers have explored whether inmates convicted of violent offenses are more violent inside prison than inmates convicted of nonviolent offenses. Some studies suggest that inmates sentenced for a violent offense are more violent inside prison walls (see Gendreau et al., 1997, for a review), yet others have found this is not the case (DeLisi et al., 2004; Porporino, 1986; Sorensen & Cunningham, 2009; Wooldredge et al., 2001). Race, too, has commonly been linked to misconduct; however, the direction of the relationship has been mixed across various studies (Ellis et al., 1974; Flanagan, 1983; Myers & Levy, 1978; Petersilia & Honig, 1980; Ramirez, 1983; Sorensen & Wrinkle, 1996; Toch & Adams, 1986; Wooldredge et al., 2001; Wright, 1989, 1991).

Other factors such as educational attainment (Cao, Zhao, & Van Dine, 1997; Cunningham & Sorensen, 2006) and social support (e.g., being married—see Jiang & Winfree, 2006) have been found to attenuate the likelihood of misconduct—for an exception, see Berk, Ladd, Graziano, and Baek (2003). Many researchers have also explored the role of inmate incarceration/criminal history in predicting misconduct. Some have found that prior incarceration history increases the likelihood of misconduct (Cunningham & Sorensen, 2006,

2007; Griffin & Hepburn, 2006; Jiang & Winfree, 2006; Lahm, 2008; Sorensen & Pilgrim, 2000; Wooldredge et al., 2001), though others have found the opposite or no effect at all (Cao et al., 1997; Morris et al., 2010; Wolfgang, 1961; Wooldredge, 1994).

The Situational Perspective

The situational model posits that inmate misconduct is contextually based on temporal, environmental, and sociological circumstances (see Steinke, 1991). In other words, situational predictors of misconduct include the factors that define the prison atmosphere specific to an incident at any given time.

One example of the situational perspective, developed by Wener (2000), suggests that prison architecture, prison organization, and the staff/inmate social system will

> influence the way inmates perceive their situation (in particular, how safe they feel, competition for scarce resources, and how likely they are to suffer from the consequences of actions), and . . . lead to behaviors that directly and indirectly affect the likelihood of violent action. (p. 50)

Situational factors may depend on prison architecture, crowding, staff characteristics, geography, climate, inmate mobility, and any other factor of the situation that might play a role in misconduct. In other words, variables that represent the situational model cover where, when, and with who else misconduct takes place (Steinke, 1991). For example, geographic location, temperatures, and staff characteristics have been linked with misconduct (Steinke, 1991). More recently, Camp et al. (2003) found an association between staff characteristics and rates of misconduct. Jiang and Fisher-Giorlando (2002) conducted an explicit test of situational misconduct, finding that importation, deprivation, and situational predictors of misconduct varied between types of misconduct. However, their findings also lent modest support to the notion that situational factors may play a stronger role in misconduct than importation or deprivation factors. Prison architecture may be tied to the situational perspective simply for the fact that the architecture of the prison unit is likely to define a sizable part of any given situation in the prison environment. For example, in campus-style units, there is typically less privacy among inmates. This may affect opportunities for certain types of misconduct and in turn affect the outcome of a specific situation.

Each of the aforementioned theories of inmate misconduct have helped scholars understand the factors associated with and predictive of inmate behavior. However, it is important to keep in mind that some correlates of misconduct

are not necessarily mutually exclusive to one particular theory. In some cases, the context of a factor may fog the lines between one theory and another. For example, gang membership prior to prison entry (e.g., street gang membership) might be considered as representing importation rather than deprivation theory. For this reason it is risky to categorize any one study, or specific correlate, as representative of only one particular theory (i.e., deprivation, importation, or situational perspective)—see Goodstein and Wright (1989) and Wooldredge (2003). The true correlates of misconduct are complex and variable—and are best understood by considering multiple theories in tandem (i.e., some correlates of inmate misconduct are not mutually exclusive to on particular theory)—see Wooldrege (2003) for a detailed discussion. Although the underlying goal of our study was to assess the role of prison architecture in explaining misconduct rather than an explicit test of a particular theory, we also capitalized on a number of measures that draw on importation and situational perspectives. We feel this "combined" approach contributes further to our understanding of inmate misconduct.

Method

The data for this study were obtained from the Texas Department of Criminal Justice (TDCJ). The analyses presented here were based on a simple random sample of 2,500 inmate disciplinary histories from the cohort of male inmates (excluding death sentenced inmates) entering a campus- or telephone pole–style prison between August 2004 and June 2006. To be included in the sample, each inmate must have served a complete 3 years from the date of entry to prison, for the offense of record. Several studies have suggested that the first 3 years of incarceration is the period in which inmates are most likely to engage in misconduct, if ever (Adams, 1992; Bottoms, 1999; Flanagan, 1980; Griffin & Hepburn, 2006; Zamble, 1992). Inmates serving less than 3 years in prison were excluded from our sample. In short, the data were based on longitudinal disciplinary records for each individual inmate entering prison during the above-mentioned window and who met the criteria for entry into the sample.

For the sake of consistency, we also limited the data to inmates housed in the state's Correction Institutions Division (CID), which excludes state jails, private prisons, transfer facilities, and substance abuse felony punishment facilities.[4] The inmates in the sample were housed in 30 different prison units across the state representing either a telephone pole or campus design—see Table 1 for summary statistics. The total number of inmates meeting the aforementioned criteria and, thus eligible for inclusion in the sample, was 12,981.

Table 1. Descriptive Statistics for Individual- and Prison-Level Predictors

	Mean	*SD*	Minimum	Maximum
Dependent variables				
Inmate-on-Inmate Violence	0.50	0.50	0	1
Security Related	0.31	0.46	0	1
Property	0.15	0.36	0	1
Drugs	0.10	0.30	0	1
Contraband	0.40	0.49	0	1
Inmate-on-Staff Violence	0.06	0.24	0	1
Inmate-level variables				
Age at Entry	32.09	11.57	16.2	79.2
Percentage of Sentence Served	0.33	0.23	0	1.3
Prior Incarceration History	0.32	0.47	0	1
Gang Member	0.10	0.30	0	1
Married	0.16	0.37	0	1
Sentence Length (natural log)	8.07	1.40	6.6	16.1
Violent Offense (OOR)	0.52	0.50	0	1
Drug Offense (OOR)	0.17	0.37	0	1
Race (*White* = 1; *non-White* = 0)	0.30	0.46	0	1
Education	6.76	3.96	0	13
High Custody	0.16	0.17	0	1
Prison-level variables				
Unit Age	41.57	35.86	14	126
Architecture (*Telephone* = 1; *Campus* = 0)	0.53	0.51	0	1
Percentage With Priors	0.35	0.12	0.17	0.56
Deprivation Scale	–0.17	0.78	–1.12	1.71

It is also important to consider how an inmate in Texas is assigned to a particular prison unit. At the start of a sentence, an inmate goes through a reception and evaluation process carried out by a State Classification Committee (SCC). During this process, which lasts several weeks, data are collected from each inmate in regard to his or her criminal, social, institutional, educational, employment, family, military, and substance use history (TDCJ, 2004). Based on this information (in addition to a psychological screening), the SCC assigns an inmate to a specific unit, based on the offender's safety, security, and treatment needs. The inmate's level of supervision (i.e., custody status) is also determined by the SCC. As a reminder, Texas prisons are not security classification

specific (i.e., most units contain every security level, excluding death row). Inmates have no right to choose the unit to which they are assigned, and general inmates may or may not be assigned to a facility that is closest to their county of residence (note that substance abuse and state jail inmates are assigned to units closest to their home county)—see TDCJ (2004).

Transfers between different units for TDCJ inmates do occur; however, this is not altogether common. Inmates may be transferred for departmental or offender needs but are not transferred to be closer to their home county. It is possible, however uncommon, that an inmate may commit an infraction(s) in one unit, be transferred as a result to another only to commit additional infractions. In such cases, a statistical model would need to account for inmate transfers. We avoid this issue here because our focus is on the first reported act of misconduct only (see below). Furthermore, the data provided to us signified the specific unit in which each infraction occurred. In other words, if an inmate committed an infraction, the unit to which he was assigned on the date of the infraction was used as his Level 2 (prison unit) identifier. If no infractions were reported, the inmate's unit identifier reflected the unit of original assignment.

Measures

Dependent variables. We developed six measures of inmate misconduct, partially following the work of Camp et al. (2003). The descriptive statistics for these measures (and those discussed below) are also presented in Table 1. The TDCJ data used here accounted for every officially reported act of misconduct occurring over the observation period (3 years) and identified the prison unit for which the inmate resided on the date of the infraction (i.e., when and where the infraction occurred). Since several misconduct types were lacking in frequency, we dichotomized each dependent variable (1 = *one or more infractions*; 0 = *no infractions*). Therefore, this study accounts for the first reported act of misconduct (i.e., misconduct onset), if any, and not continuity in or desistance from institutional misconduct. The misconduct measures included violence, property crimes, security-related infractions, drug-related infractions, and the possession of contraband. We bifurcated violence between actual physical violence against another inmate (i.e., physical assaults resulting in at least a minor injury) and actual physical violence against a staff member where at least a minor injury was reported. Property crimes included acts such as stealing, trafficking and trading, and unauthorized business. Security-related infractions included acts such as nonphysical assaultive behavior (i.e., making threats), creating a disturbance, possession of a weapon, exposing others to bodily fluids, and violating safety rules. Drug infractions included all acts of misconduct

associated with the use and/or possession of an illicit substance by an inmate (e.g., drugs or alcohol). Contraband included reports of misconduct that involved the possession of unauthorized property, including a weapon.

Inmate-level predictors. In keeping with previous research, we controlled for several inmate-level factors. Age of the inmate (at the time of entry) was coded as a continuous variable (in years). The amount of time served was operationalized as a proportion of the sentence served on the date of the infraction. Prior incarceration history was coded as a binary variable where 1 represented inmates who had served time in a Texas prison prior to their current sentence. Confirmed prison gang affiliation was coded dichotomously (*confirmed gang member* = 1). A variable was also included to capture marital status at the time of entry (*married* = 1). Furthermore, we controlled for sentence length (natural log transformed due to positive skew) in days as well as the offense of record type. Two offense-type variables were included, one for inmates serving time for a violent offense (*violent* = 1) and another for those imprisoned for a drug-related offense (*drug offense* = 1). All other offenses of record (generally property offenses) served as the reference category. Other predictors included inmate custody level at entry (*high security* = 1), race (*White* = 1, *non-White* = 0), and education level. Education level was based on an educational achievement exam that was administered during the initial phase of incarceration and was operationalized as scale ranging from 1 to 13. Values on the scale indicated the estimated grade level of education. A score of 12 indicated at least a high school graduate level of education, whereas a value of 13 indicated at least some college education.

Prison-level predictors. Our focus variable at the prison level was prison architecture. We developed a categorical variable reflecting whether an inmate's facility was a telephone pole–style institution (33% of all CID units; $n = 16$) or a campus-style facility (21% of all CID units; $n = 14$). For purposes of the analysis, telephone pole–style units were coded with a "1." The architecture style was determined by evaluating satellite photographs of each Texas CID prison unit and assigning it to one of two architecture types (campus or telephone pole) or excluding the unit from analysis if it did not fit either style.[5]

Other prison-level predictors include the age of the prison unit (i.e., number of years in operation), the proportion of inmates in the unit with a history of incarceration preceding their current sentence, and a deprivation index. The latter was based on five indicators, including (1) the proportion of inmates in the unit who were confirmed gang members, (2) the proportion of inmates classified to high-security custody (G4 or G5), (3) the unit's maximum inmate capacity,[6] (4) the proportion of inmates who had been incarcerated for a violent offense,[7] and (5) a prison gang composition index[8] reflecting the balance of different prison gangs in a particular unit. The deprivation measure was strong

in internal consistency ($\alpha = .87$). Factor analysis of the deprivation scale suggested a singular construct (eigenvalue difference = 2.19) with high factor loadings and communalities for each indicator.[9] Factor scores were calculated to represent the deprivation scale with higher scores reflecting increased deprivation. It is also important to note that the proportion of inmates classified as high security is probably the best indicator of prison security level among Texas prisons. In Texas, prisons are not classified by security level. Rather, nearly every unit houses all levels of security (aside from death row, which is housed in a single unit). The age of the prison unit was included in the analysis to control for potential variation in prison guard culture (or administrative culture in general) that may have developed in some geographic areas where prisons employ large proportions of residents.

Analytical Procedure

Multilevel models have become the standard practice in the study of inmate misconduct (e.g., Camp et al., 2003; Jiang & Winfree, 2006; Lahm, 2008; Steiner & Wooldredge, 2009a; Wooldredge et al., 2001). Since the data we analyzed were nested, we too relied on this approach. In particular, we capitalized on the hierarchical linear modeling (HLM) procedure outlined by Raudenbush and Bryk (2002).

HLM has several advantages over pooled regression approaches (see Wooldredge et al., 2001, for details specific to corrections research). It relaxes the assumption of independence of observations and allows for error structures between cases to be correlated. Additionally, HLM accounts for potential collinearity among individual- and unit-level predictors, which is important since inmates are not randomly distributed across prison units. Also, in pooled regression, macro-level error variances may be problematic (i.e., heteroscedasticity) because of varying numbers of individuals in lower-level units. If data may be nested and multilevel procedures are not used, the calculation of standard errors, and ultimately tests of null hypotheses, may be biased and potentially result in Type I and/or Type II errors. The HLM approach accounts for each of these issues.

The analysis presented here was carried out in three steps.[10] The first step involved estimating empty (i.e., unconditional) models with the aim of determining whether the Level 1 intercepts (prison misconduct) varied across prison units.[11] The results of the empty models (not shown) suggested that each outcome contained a significant amount of variation at the prison level. Intraclass correlations ranged from 8% to 12%.[12]

The second step involved the development of random-coefficient models, allowing the inmate-level predictors to vary across prison units (i.e., specified

as a random effect). Each inmate-level predictor was initially specified as random.[13] In the end all but two models (inmate on staff violence and drug infractions) were found to have Level 1 predictors whose effects significantly varied between prison units and were thus specified as random effects. For the inmate-on-inmate violence model, the impact of gang membership and sentence length were allowed to vary between prison units. For property offenses, sentence length and race were allowed to vary across units. For security infractions, age, sentence length, and custody status were allowed to vary randomly. For contraband, the proportion of time served and sentence length were each allowed to vary randomly. Again, for the violence against staff and the drug violation models, all Level 1 predictors were modeled as fixed effects since none of the Level 1 predictors for these models were found to vary between units.

The third step in the analytical procedure was to incorporate prison-level predictors into the model (the full model). This step allowed for us to account for variation between prisons in estimating the model intercepts as well as in estimating inmate-level predictors (i.e., intercepts and slopes were allowed to vary randomly between prison units). Level 2 predictors (i.e., prison-specific factors) were regressed on the intercept of each model as well as on Level 1 predictors that were allowed to vary across prison units (i.e., interactions). In the end, the third step of the procedure was specified as follows:

$$\begin{aligned}\text{Level 1: Logit (Misconduct}_{ij}) = {} & \beta_{0j} + \beta_{1j}\,(\text{Age}) + \beta_{2j}\,(\text{Percentage Time Served}) + \beta_{3j}\,(\text{Prior Incarceration}) \\ & + \beta_{4j}\,(\text{Gang Member}) + \beta_{5j}\,(\text{Married}) + \beta_{6j}\,(\text{Sentence Length}) \\ & + \beta_{7j}\,(\text{Violent Offender}) + \beta_{8j}\,(\text{Drug Offender}) \\ & + \beta_{9j}\,(\text{High Security}) + \beta_{10j}\,(\text{White}) + \beta_{11j}\,(\text{Education}) + e_{it},\end{aligned} \tag{1}$$

$$\begin{aligned}\text{Level 2: } \beta_{kj} = {} & \theta_{k0} + \theta_{k1}\,(\text{Unit Age}) + \theta_{k2}\,(\text{Telephone Pole}) \\ & + \theta_{k3}\,(\text{Proportion with Priors}) + \theta_{k4}\,(\text{Deprivation Index}) \\ & + U_{kj} \text{ for } k = \text{specified as random},\end{aligned} \tag{2}$$

$$\beta_{kj} = \theta_{k0} \text{ for } k = \text{specified as fixed.} \tag{3}$$

Results

The results suggest that that prison architecture, as measured here, matters in predicting some forms of inmate misconduct but not others. Other findings were somewhat mixed between types of misconduct. The population-averaged results of the full models are presented in Table 2.

Table 2. HLM Model Results: Unstandardized Coefficients, Odds Ratios, and Standard Errors

	Violence (Inmate)			Violence (Staff)			Property		
	b	OR	*SE*	*b*	OR	*SE*	*b*	OR	*SE*
Intercept	0.09	0.91	.070	−3.40	0.03	.153**	−2.11	0.12	.078**
Inmate-level factors									
Age	−0.06	0.94	.006**	−0.04	0.96	.014**	−0.05	0.95	.007**
Percentage Time Served	1.88	6.56	.227**	0.98	2.68	.431*	1.50	4.46	.224**
Prior Incarceration	−0.12	0.88	.138	−0.30	0.74	.213	0.09	1.09	.098
Gang Member	0.29	1.33	.145	0.49	1.63	.242*	0.12	1.13	.152
Married	−0.24	0.78	.095*	−0.28	0.75	.300	−0.08	0.92	.164
Sentence Length	0.33	1.39	.062**	0.09	1.09	.050	0.12	1.36	.067
Violent Inmate	0.33	1.38	.115**	−0.10	0.90	.180	−0.08	1.07	.136
Drug Inmate	−0.02	0.98	.145	−0.46	0.63	.307	0.31	1.04	.169
G5 Inmate	1.58	4.87	.146**	1.63	5.10	.215**	0.07	1.87	.161**
White	−0.33	0.71	.116**	0.04	1.04	.223	0.04	0.85	.174
Education	−0.01	0.99	.011	−0.01	0.99	.021	0.63	0.98	.017
Unit-level factors (on intercept)									
Unit Age	0.00	1.00	.002	0.01	1.01	.004	0.01	1.01	.002**
Telephone Pole	−0.47	0.62	.194	−0.20	0.82	.388	−0.52	0.59	.164**
Percentage With Priors	−0.56	0.57	.057	−0.22	0.80	.163	−0.44	0.64	.063**
Deprivation	0.24	1.27	.104	0.60	1.82	.161**	0.38	1.47	.078**

(continued)

Table 2. (continued)

	Security			Drugs			Contraband		
	b	OR	*SE*	*b*	OR	*SE*	*b*	OR	*SE*
Intercept	−1.09	0.33	.064**	−2.62	0.07	.087**	−0.52	0.59	.078**
Inmate-level factors									
Age	−0.05	0.95	.007**	−0.06	0.94	.010**	−0.05	0.95	.005**
Percentage Time Served	1.46	4.29	.300**	0.73	2.07	.266**	2.21	9.07	.329**
Prior Incarceration	0.39	1.47	.123**	0.24	1.26	.161	0.13	1.14	.089
Gang Member	0.38	1.46	.207	0.45	1.57	.227*	0.30	1.40	.190
Married	−0.03	0.96	.150	−0.04	0.96	.182	−0.15	0.86	.111
Sentence Length	0.30	1.35	.070**	0.16	1.18	.042**	0.55	1.73	.091**
Violent Inmate	0.25	1.29	.116*	0.15	1.16	.144	−0.02	1.00	.110
Drug Inmate	0.21	1.23	.127	0.10	1.09	.151	−0.19	0.97	.139
G5 Inmate	1.24	3.45	.204**	1.14	3.12	.181**	0.14	0.83	.127
Race	0.17	0.89	.094	0.27	1.31	.163	−0.08	1.15	.108
Education	−0.01	0.99	.012	0.01	1.01	.017	−0.02	0.92	.009
Unit-level factors (on intercept)									
Unit Age	0.00	1.00	.001	0.01	1.01	.002**	0.00	1.00	.003
Telephone Pole	−0.33	0.72	.133*	0.08	1.09	.221	−0.44	0.64	.234
Percentage With Priors	−0.49	0.61	.075**	−0.54	0.59	.084**	−0.30	0.74	.079**
Deprivation	0.45	1.57	.052**	0.26	1.30	.108*	0.18	1.20	.081*

Note: The reference category for Race is "non-White."
*$p < .05$. **$p < .01$.

Prison-Level Effects

The findings suggest that prison architecture, as defined here, plays a modest role in the odds of some, but not all, types of inmate misconduct. On one hand, compared with campus style units, telephone pole–style units were negatively associated with property infractions and security-related infractions, on average. Specifically, being assigned to a campus-style unit increased the odds of at least one reported act of a property infraction by 69.5%. Similarly, a campus unit assignment increased the odds of a security-related infraction by 38.9%. On the other hand, prison architecture alone does not have a direct impact on inmate violence (against other inmates or against staff), drug-related misconduct, or reported possession of contraband.

The role of prison architecture as an indirect effect (i.e., cross-level interactions) in predicting misconduct was also explored (model results available on request). In the property misconduct model, being housed in a telephone pole–style unit had a weakening (negative) effect on the role of sentence length in predicting the outcome. In other words, for property misconduct, the positive impact of sentence length on the odds of property misconduct appeared to be enhanced for inmates assigned to campus-style facilities. Conversely, in the security-related misconduct model, being assigned to a campus facility strengthened the slope of sentence length in predicting the outcome. Interaction effects between other prison-level covariates were not explored here as they are beyond the scope of the present study but warrant further study.

The direct effects of prison-level predictors are also worth mentioning. The deprivation scale was positively and significantly associated with inmate-on-staff violence, property misconduct, security-related infractions, drug infractions, and contraband infractions. Interestingly, none of the unit-level factors were significant in predicting inmate-on-inmate violence. Increases in the proportion of inmates with an incarceration history had a negative impact on the odds of all four nonviolent misconduct types. Unit age had a positive impact on reported property infractions and drug infractions; for each model, for every year that the unit had been in operation, the odds of misconduct increased by 1% (mean = 41 years).

Inmate-level effects. As expected, younger inmates (at the time of entry) were more likely than older inmates to engage in misconduct. This finding was consistent across misconduct types. The proportion of the sentence served (at the time of the infraction) was also consistent across each model. Greater proportions of the sentence served were associated with increased odds of misconduct. Previous incarceration was positively associated with security infractions. Consistent with previous research (e.g., DeLisi et al., 2004), being

a confirmed gang member increased the odds of being reported for violence against staff as well as drug-related misconduct.

Being married decreased the odds of violence against inmates only; however, the impact of being married on the outcome was modest. Sentence length was fairly consistent across misconduct types. For each outcome, aside from violence against staff and property offenses, longer sentence lengths were associated with higher odds of being reported for misconduct. Regarding the offense of record, having been incarcerated for a violent offense increased the odds of inmate-on-inmate violence and security infractions only, compared with drug sentenced inmates and "other" inmates. Drug offenders were no more or less likely to be reported for misconduct than violent offenders and "other" inmates. As one might expect, entering TDCJ at a high custody level substantively increased the odds of being reported for misconduct for each type except for contraband. This may have been attributable to increased surveillance by security staff or to the fact that the inmates were higher risk inmates to begin with. Race was found significant for one outcome only, inmate-on-inmate violence. Being non-White increased the odds of inmate-on-inmate violence by 40.8%. Finally, education attainment was not significant in predicting any form of misconduct.

Discussion

To date, very few studies have addressed prison architecture as a potential correlate of inmate misconduct. Moreover, no study has addressed this issue on a large scale using multilevel modeling techniques. Based on official disciplinary histories from a random sample of male inmates serving prison terms in 30 different Texas prisons, representing either a campus-style design or a telephone pole–style design, the findings presented here suggest that prison design is only modestly associated with misconduct. For some less serious types of misconduct, including property and security-related violations, inmates housed in campus-style units may be more inclined to commit such acts or are at least at a greater risk of being reported.

Also interesting was the role that deprivation played in directly predicting (i.e., at the intercept) nearly every type of inmate misconduct. However, deprivation, as defined here, was found to condition inmate-level (importation) predictors only where it was *not* a significant predictor of the model intercept (e.g., inmate-on-staff violence). In other words, if the deprivation scale did not have a direct influence in misconduct, it was found to have an *indirect* effect, or influence, through an inmate-specific characteristic (i.e., Level 1 predictor). This finding supports the contention that existing theories of inmate misconduct (e.g., deprivation, importation, and situational) influence one another and may also affect the odds of misconduct directly (Goodstein & Wright, 1989; Wooldredge, 2003).

Limitations

Before getting to the implications of our research, several study limitations must be acknowledged. First, the data were based on official disciplinary records. As with all official data sources of criminal activity, the data did not account for incidents not known to or reported by authorities. Furthermore, our data were limited to a single state's male inmate population housed in only two of several distinct, and varying, styles of prisons (architecturally speaking). Thus, caution should be used when interpreting the findings, as they might not apply to other states. Future studies should explore the role of architecture using varied populations of inmates housed in other prison types in various locales.

Another limitation was that our measure of prison architecture was simplistic. For example, we could not account for acute similarities between prison units (even of the same architectural type) that were not revealed from our interpretation of aerial (satellite) photographs of prison units. This was our reasoning for assessing only two architectural styles (arguably the most distinct designs used in the Texas prison system). Surely specific locations inside prisons, regardless of overall design, bear on the prospect of inmate misconduct. Although we interpret our findings as only modestly supportive of the proposed association between architecture and some types of misconduct, future studies can contribute by exploring additional, more detailed, factors specific to variation in architectural designs. Another limitation lies in the fact that we were unable to measure correctional officer discretion (i.e., decision-making attributes) in writing up misconduct infractions. It is possible that variation in officer characteristics (e.g., age and years of service) and the officer culture specific to a unit may directly and/or indirectly affect the odds of an inmate being written up for a particular offense. The study of inmate misconduct could be improved by incorporating officer-specific variables into models predicting misconduct, such as the average number of years of service for a particular unit, the average officer age, and the proportion of female officers. Unfortunately, a limited number of Level 2 units (here only 30) would have made the inclusion of additional predictor variables at the prison-level questionable.

Implications

Our finding that architecture seemingly has no effect on violent misconduct runs counter to Wener's (2006) concern that some prisons (e.g., telephone pole style) emote a harder, scarier place and thus increase stress that may lead to misconduct. Many would agree that first impressions are important in developing attitudes, regardless of the setting, and some prisons may be scarier than others to inmates and staff. Yet our data did not support this contention. Architectural

design does not appear to be associated with violent misconduct, either directly or indirectly.

That said, for security-related and property-related misconduct, campus environments appear to be more conducive to misconduct. This finding may be partially explained by differences in opportunity structures of offending, as well as in opportunities for officials to discover misconduct in campus-style prison units. By design, telephone pole units should be more controlling and allow for less freedom of movement. In a campus environment, increased access to other inmates may help explain these differences, particularly with regard to property crimes. Campus designs commonly use pods or dormitory housing rather than using cells, which are more common in telephone pole units, and may present opportunities for these types of infractions to occur and be observed/reported by officials. In fact, principles from existing theories of crime, beyond the theories of inmate misconduct, based on environmental design (e.g., crime prevention through environmental design or CPTED) may help explain such findings.

CPTED suggests that the built environment may be manipulated in a manner that can reduce the incidence and fear of crime—the goal being an improved quality of life (Crowe, 2000). For certain, many prisons are (and have traditionally been) designed around concepts that fall under the CPTED framework (e.g., surveillance, access control, etc.)—see Moffat (1983), for example. Such principles may apply more so to telephone pole–style units in comparison with open campus-style prisons (e.g., limited access control and increased target hardening), but some aspects of the theory (e.g., surveillance) may apply more so to campus designs, where there is less privacy. It is important to be mindful of the fact that CPTED principles, and the underlying research, has been focused on residential and commercial environments rather than on prisons. Inmates housed in telephone pole–style units may have a more difficult time engaging in property- and security-type infractions for the reason that targets of opportunity are hardened and there is increased access control—such inmates are more likely to spend time in traditional cells rather than in dormitory-style housing. This may or may not apply to other forms of misconduct, such as violence,[14] yet our finding that telephone pole designs are less associated with security and property misconduct might be considered partially supportive of the theory. Again, refinement specific to prison architecture is warranted and should be considered in future studies.

In summary, we submit that the telephone pole design may deter some types of misconduct. However, embracing this proposition wholeheartedly would be premature. Although design type or design attributes may stave off some forms of maladaptive behavior, other negative effects from design type may exist that we were unable to account for in the present study. The main finding here is that architecture seems to play at least some role in inmate behavior.

The Broader Context and Future Research

As Lovell and Jemelka (1996) argued, misconduct is hearty expenditure that often goes unnoticed. The average cost of an infraction has been estimated at $970 (Lovell & Jemelka, 1996). Although our findings do not suggest any particular design type is associated with violent misconduct, architecture appears to "matter" for certain offense types, and more refined measures of architecture may unveil relationships that were not exposed here. This is information that could prove valuable for prison design.

An important element of considering architecture as a correlate of misconduct (however modest) is that lends itself more readily to manipulation when compared with attempts to directly modify inmate behavior (e.g., via coercive punishments). An interesting anecdote that may benefit from considering architecture lies within the issue of prison (over) crowding. Researchers have become quite fond of studying how prison crowding is associated with misconduct (e.g., Steiner & Wooldredge, 2009b), but in a state such as Texas, overcrowding is, by law, a nonissue. Outside of Texas, building more prisons simply for the purpose of easing overcrowding is more easily said than done.

Future studies should consider incorporating prison-level architecture variables into models of inmate misconduct as well as other unit-specific factors such as guard characteristics and/or unit-specific security measures (e.g., use of video surveillance, cell types, etc.). There are certainly more detailed architectural attributes that may vary between the general design types that we have explored here that could not be ascertained from photographs alone. Future research should explore prison architecture in more detail, which would require time consuming, and costly, site visits to prisons. Also, researchers may wish to replicate our work using data from different prison populations and prison architecture types beyond those used in Texas. Ultimately, work should focus on change in misconduct over time (i.e., trends) in addition to prevalence alone among inmates subjected to varying environments, which may ultimately be guided by the architectural design of the prison and related characteristics. It is possible that inmates housed in prisons of a particular architectural design type may exhibit varying trends of misconduct over the course of their sentences. Inmate misconduct is a costly by-product of incarceration with implications for recidivism that have been largely unexplored. Moreover, theories besides those commonly used to explain inmate behavior (e.g., CPTED) should be considered in future studies of misconduct.

If we can establish individual and environmental links that help reduce the likelihood of recidivism while capitalizing on what can be offered from existing theories of inmate misconduct, as well as other theories that may be relevant to the topic at hand, we can ultimately reduce unnecessary crime and unwanted

public expenditures. Policy makers should be made aware that improvements to prison design, or even a better understanding of them, might help solve many corrections issues. Much more work is needed, but the research presented here takes us a step further in that direction.

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Notes

1. None of these studies, however, have accounted for both inmate-level and prison-level predictors simultaneously in developing statistical models, as suggested by Wooldredge et al. (2001). Many have been case studies rather than empirical research studies.
2. The findings from Useem and Goldstone (2002) should be considered with caution as the results were based on a case study of only one institution's architectural changes.
3. Other design types include the so-called courtyard design and the radial design. The former tends to be characterized by a square structure with a courtyard in the middle where inmates can congregate. The latter resembles an asterisk. Radial designs contain a central building for administration and staff and have cellblocks that radiate out from the middle of the prison (Waid & Clements, 2001). Neither design type has been used in the construction of Texas prisons. As such, for purposes of this study, we ignore courtyard and radial designs.
4. For the full TDCJ unit directory, see http://www.tdcj.state.tx.us/stat/unitdirectory/all.htm.
5. The satellite images (obtained from Google Earth) were evaluated by each author and one independent prison expert who had both worked for and extensively studied the Texas prison system. An architectural classification was assigned to a prison unit only after unanimous agreement between the raters on what was represented in the photograph. There were no disagreements on architectural style classifications.

6. Texas law mandates that no prison be at more than 95% capacity; thus, overcrowding was not a relevant prison-level control variable and was not included here (see Trulson & Marquart, 2009).
7. The proportion of violent inmates in the unit was included in the deprivation index because of the potential for this factor to increase environmental strain (i.e., deprivation).
8. The gang composition index was developed equivalently to the racial composition index outlined in Camp et al. (2003), where the result is a value between 0 and 1. For this approach, a value of 1 is equal to perfect heterogeneity between different prison gangs in a given unit (i.e., every gang is represented equally in the unit). Conversely, a value of 0 would be indicative of one specific prison gang dominating a unit (in terms of gang representation).
9. All 52 male CID units were used in the calculation of factor scores (maximum likelihood estimation was used for the estimation procedure). An indicator for the proportion of security staff to the number inmates per unit was not included in the deprivation scale because of a low factor loading ($\lambda = .06$) and a low bivariate correlation with the remaining indicators.
10. An evaluation of bivariate correlations and variance inflation factor statistics suggested that multicollinearity between Level 1 and Level 2 predictors, respectively, was not present.
11. We assumed that each Level 1 random effect had a standard logistic distribution with a mean of zero and variance $\pi^2/3$ (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999).
12. Complete numerical results and model equations are available on request.
13. All predictor variables were grand mean centered.
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