

School Violence: Academic Impacts and Underlying Mechanisms

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Abstract

This paper examines the impact of exposure to violence on academic achievement, focusing on students with a history of violent behavior. Exploiting idiosyncratic variations in the exposure to new violent classmates during the transition from elementary to middle school, the study finds that a higher proportion of violent peers negatively affects performance, with girls being more adversely impacted than boys. These effects are driven by increased classroom disruption and weakened student-teacher and peer relationships. Limited evidence suggests that changes in students' behavior, as well as teachers' workload and satisfaction, may also mediate these effects.

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1 Introduction

Surveys indicate that a violent school climate is widespread globally. For instance, the latest Programme for International Student Assessment (PISA 2022) report by the OECD reveals that approximately 20 percent of students hear threats of violence, witness fights in school resulting in injuries, or are frequently bullied (OECD, 2024).¹ The 2018 Teaching and Learning International Survey also found that 14 percent of principals reported frequent intimidation or bullying among their students (OECD, 2018).

School violence is often linked to lower academic achievement. For example, the 2015 National Youth Risk Behavior Survey found that American students with lower academic grades are more likely than their high-performing peers to be involved in physical fights or to skip school due to an unsafe environment (CDC, 2015). Furthermore, Edward P. Lazear's "bad apple" principle highlights the detrimental effects of a violent school climate. According to this principle, when a student disrupts the class and demands excessive attention from teachers, it not only impedes their own learning but also disrupts the learning of their peers (Lazear, 2001).

In this paper, I investigate the impact of a violent classroom climate on academic achievement. The first part of the study examines how the proportion of violent classmates affects eighth-grade outcomes in Israel, specifically focusing on test scores in Hebrew, science, mathematics, and English. By analyzing these academic metrics, the study aims to quantify the effect of peer violence on students' performance. The second part delves into the mechanisms underlying this impact within the classroom setting. Drawing on Edward P. Lazear's observations, the research explores several intra-classroom factors, including disruptions, student interactions, and relationships between students and teachers. While Lazear's model assumes a fixed probability of misbehavior,

¹In addition, approximately 20 percent of students report incidents of school vandalism, while about 10 percent observe fellow students carrying weapons such as guns or knives, and notice gang activity. The prevalence of frequent bullying remains consistent across surveys, with 19 percent reported in PISA 2015 and 23 percent in PISA 2018.

this study acknowledges that the negative externalities of violence may arise from changes in this probability, such as shifts in students' self-discipline and study efforts. To investigate these dynamics, the analysis compares students' perceptions of their classroom environment with their self-reported behaviors.

This paper contributes to the economic literature on peer effects by extending the empirical evidence regarding the impact of violent peers. Building on existing research that addresses the "reflection problem" (Manski, 1993), this study utilizes prior information about individual students to investigate the dynamics of violence among middle school classmates. Specifically, by leveraging self-reports from elementary school, students in middle school are categorized as violent if they reported involvement in violence during their elementary school years.

Additionally, it is plausible that some middle school classmates are former elementary school peers who share similar attributes and achievements. In the context of violence, these former violent peers may have encountered a comparable school climate, potentially influenced by their behavior. To address this, I adopt the methodology of Gibbons and Telhaj (2008) and Lavy et al. (2012b) by constructing separate measures of violence for new and old peers. For each student, I identify both their previous and current classmates and count how many of these peers exhibited violent behavior during their elementary school years. By doing so, the new violent peers serve as an exogenous source of exposure to violence, thereby minimizing biases related to endogenous sorting, student selection, and other omitted variable issues.

However, the proportion of new violent peers shows a high correlation with students' background characteristics in the sample of this study. To address this selection problem, the identification strategy of this paper relies on idiosyncratic variations in the proportion of new violent classmates between elementary and middle school for students who follow the same transition path. This approach facilitates the partialling out of unobserved factors that are correlated with the

proportion of new violent classmates and affect the academic achievements of students on the same transition path. The methodology accounts for confounding factors such as school resources, the composition of the student body (e.g., the proportion of pupils from disadvantaged backgrounds), and the quality of elementary schooling. To support the validity of this identification strategy, I conduct balancing tests that demonstrate the variation in the proportion of new violent peers within transition paths is unrelated to students' background characteristics. Furthermore, I demonstrate that this variation does not affect a student's likelihood of changing to a different class within the same school or transferring to another school.

Numerous empirical studies have examined the impact of disruptive peers, but this paper offers a more nuanced analysis by focusing specifically on peers with a history of violent behavior. This approach enables a more precise interpretation of their effects. The results show that a higher proportion of new violent peers significantly and negatively impacts the academic performance of other students. These effects are particularly pronounced in mathematics and English, compared to Hebrew and science. Additionally, the analysis reveals that these effects are consistent across students' socioeconomic backgrounds, but gender differences emerge. Specifically, girls are more adversely affected by the presence of new violent peers than boys. Furthermore, while boys' performance is negatively influenced only by the presence of violent male peers, girls are adversely affected by both violent male and female peers.

I provide evidence that these results are not driven by sample selection biases related to information on prior involvement in violence during elementary school, nor by tracking policies. Moreover, a placebo analysis confirms that the estimates accurately capture the effect of violent peers in the classroom, rather than reflecting unobserved factors shared by students within the same middle school or transition cohort.

An examination of the underlying mechanisms reveals potential reasons why girls are more

negatively affected than boys. The findings suggest that violence impacts girls' academic outcomes through changes in the classroom environment. Specifically, a higher proportion of violent peers increases girls' perceptions of violence and disruption in the classroom and leads to more negative reports of relationships between students, as well as between students and teachers. In addition, the study finds that the effects of violence are mediated by the productivity of teachers, as reflected in lower job satisfaction and higher workloads.

Another possible mechanism relates to changes in individual behavior. The analysis of study habits, measured by weekly homework time and private tutoring sessions, shows no consistent relationship with exposure to violence. However, I find that exposure to violence significantly increases the likelihood of girls engaging in physical fights during middle school, while boys do not appear to be similarly affected.

The paper is structured as follows. Section 2 reviews the literature on peer effects and the impact of violence on academic outcomes, followed by an overview of the Israeli school system. Section 3 outlines the empirical strategies employed to identify violent peer effects and their underlying mechanisms. Section 4 describes the data, the construction of the analysis samples, and the treatment variable. Section 5 evaluates the validity of the identification strategy, presents the main estimates of violent peer effects on academic achievement, and discusses robustness and heterogeneity analyses. Section 6 explores the potential mechanisms underlying the observed effects of violence. Finally, Section 7 concludes.

2 Background

2.1 Related Literature

Peer effects have long been a focal point for economists aiming to understand how group behavior and characteristics influence individual outcomes, both empirically (e.g., Coleman (1968); Sum-

mers and Wolfe (1977)) and theoretically (e.g., Becker (1974)). Despite the intuitive appeal of this concept, estimating peer effects presents significant challenges. As Manski (1993) identifies, the simultaneous observation of individual and group behavior makes it difficult to separate the effects of the group from those of the individual. To address this "reflection problem," Manski suggests using pre-group formation data on individuals to analyze their outcomes after they join the group.

Building on this approach, Hanushek et al. (2003), Duflo et al. (2011), Lavy et al. (2012b), and Sojourner (2013) utilize lagged performance to estimate ability peer effects in schools. In addition, Angrist and Lang (2004), Ammermueller and Pischke (2009), Gould et al. (2009), Bifulco et al. (2011), Lavy and Schlosser (2011), Lavy et al. (2012a), Anelli and Peri (2019), and Brenøe and Zölitz (2020) investigate peer effects based on preexisting personal traits.

Empirical evidence also highlights that peer groups are often self-selected and thus endogenous to students' achievements and backgrounds.² Specifically, middle school classes in my data are composed of students from the same elementary school, implying that former peers share similar educational experiences that may influence their achievements in middle school. These shared experiences include comparable teacher quality, teaching methods, social dynamics, and exposure to learning disruptions and violence.

In the context of violence, the reflection problem is particularly relevant, as prior violent behavior among peers may be influenced by interactions with their elementary school peers. To address this issue, I adopt the methodology of Gibbons and Telhaj (2008) and Lavy et al. (2012b), using conditional random variation in the proportion of new violent classmates to estimate the impact of exogenous exposure to violence on scholastic achievement.

²A substantial body of literature explores the connection between school quality and housing prices (e.g., Black (1999); Kane et al. (2006); Gibbons et al. (2008)), indicating that students are often grouped into different neighborhoods and schools based on socioeconomic status.

Research on violence and disruptive peer effects consistently confirms the negative externalities associated with disruptive peers. Carrell and Hoekstra (2010) and Carrell et al. (2018) explore both the immediate and long-term impacts of peers from troubled families on learning. Kristoffersen et al. (2015), examine peers who are potentially disruptive or emotionally sensitive, while Aizer (2008) focuses on peers diagnosed with attention deficit disorder (ADD). Figlio (2007), uniquely investigates peers with documented violent behavior, revealing significant negative externalities, though with limitations in the instrumental variable identification strategy. My study contributes to this literature by providing a more nuanced understanding of violent peer effects through the use of exogenous exposure to peers with a history of violent behavior.

2.2 The Israeli School System

In Israel, students generally attend their local elementary school and remain in the same class from grades 1 to 6. After completing elementary school, they move on to either a local middle school (grades 7-9) or a high school (grades 7-12). By law, elementary school graduates must attend grades 7-9 at a school that serves multiple neighborhoods within their residential zone. This policy aims to integrate students from different schools, ethnic groups, and socioeconomic backgrounds. As part of this strictly enforced regulation, schools are prohibited from assigning students to homeroom classes based on individual characteristics like family background or academic ability (Zussman et al., 2024).

Nevertheless, parents may have some discretion in assigning their children to different homeroom classes within the same grade. In Section 5, I address this potential issue by conducting balancing tests, which show that the background characteristics of students transitioning from elementary to middle school are uncorrelated with the proportion of new violent peers in their middle school classes. Additionally, I demonstrate that mobility patterns within the same transition path are not correlated with the levels of exposure to new violent classmates.

English and mathematics are key subjects in the Israeli education system, as high levels of proficiency in these subjects are essential for obtaining a reputable matriculation certificate (*Bagrut* in Hebrew) upon high school graduation. This certificate serves as a prerequisite for university admission, making exemplary performance in these disciplines during middle school a significant determinant of a student's future academic trajectory and economic prospects. Reflecting the importance of these subjects, since 1994 the Ministry of Education has allowed schools to group students from different homerooms based on their proficiency in mathematics and English. This ability-based grouping enables students to learn these subjects alongside peers from outside their assigned homerooms. While schools that implement ability-based tracking are required to provide opportunities for students to transition between class levels, the regulations do not specify the methodologies for such tracking, nor are schools required to disclose the composition of each ability group (Glickman and Lipshtat, 2013).

In the sample used to estimate the main results (described in Section 4), approximately 83 percent of schools implement English ability-based classes, and 85 percent group students according to their mathematics achievements. However, the implementation of these policies varies across schools. Some schools teach mathematics and English exclusively in ability groups, while others use a hybrid approach, offering primarily homeroom-based instruction but with additional hours in ability-based groups. Despite these figures, the available data is imprecise and does not allow for the identification of the specific tracking policy in each school, nor does it provide details on the composition of students within each ability group. To mitigate potential biases from these varying tracking practices, in Section 5, I estimate the effect of exposure to violence on students' average performance across multiple subjects, considering both homeroom and ability-based classes. I also provide evidence demonstrating that these tracking policies do not bias the results.

Moreover, the Israeli public education system is divided into two distinct sectors: the Jewish system and the Arab system, each with separate schools and curricula. In Jewish schools, instruc-

tion is conducted in Hebrew, while Arabic is used in Arab schools. There are also significant differences in violence levels between Jewish and Arab communities, with violence being notably higher in Arab communities.³ To focus on a homogeneous school curriculum and account for these differing levels of violence, my analysis is restricted to Jewish schools.

Within the Jewish system, there are secular and religious schools, with the latter offering an intensive curriculum in Jewish studies. Jewish secular schools feature mixed-sex classrooms, whereas most Jewish religious schools are single-sex. For this study, I focus on Jewish secular schools to analyze the impact of violence in classrooms that include both boys and girls.

3 Empirical Strategy

3.1 Identification of Violent Peer Effects

The effect of a classroom violent environment on students' outcomes is usually confounded by the effects of unobserved correlated factors. Such correlations may arise if self-selection and sorting of students across schools and classes are influenced by the violent climate or if the presence of (new) violent classmates is associated with other characteristics of the school that impact students' outcomes.

Recent research has employed various identification strategies to address these issues of self-selection and sorting. These strategies include exploiting random group assignments (Duflo et al., 2011; Gould et al., 2011), using instrumental variables (Goux and Maurin, 2007), and leveraging within-school or within-class random variation (Hoxby, 2000; Hanushek et al., 2003; Ammermueller and Pischke, 2009; Gould et al., 2009; Lavy and Schlosser, 2011; Bifulco et al., 2011;

³For instance, the number of murders per 100,000 capita among Arabs has been approximately two to three times higher than among Jews during the 1980s and 1990s. Since then, this gap has expanded, with the ratio peaking at approximately eleven times higher in the early 2020s (Elmo-Capital and HersHKovitz, 2023).

Lavy et al., 2012a; Anelli and Peri, 2019; Bren e and Z litz, 2020). Additionally, Lavy et al. (2012b) employ within-student variation to further refine the analysis of peer effects.

In this study, I rely on variations in the proportion of new violent classmates that result from student's transition from elementary to middle school. Based on this framework, I examine whether changes in students' achievement are systematically associated with the variation in the proportion of new violent middle school classmates, across elementary and middle schools within students who transitioned from the same elementary school to the same middle school.

On average, a class comprises students from approximately seven different elementary schools. This results in considerable within-class variation. Utilizing within-class variation is advantageous as it allows comparisons among students within the same class while controlling for all class-specific unobserved factors. However, since new violent students constitute only a small fraction of the class, within-class variation has limited statistical power for estimating the effects of violent peers. Conversely, the within-transition-path framework potentially offers more variation, as elementary school peers can be assigned to different classes across multiple middle schools.

Hence, I use cross-sectional data with test scores in multiple subjects and estimate the following model:

$$y_{ics} = \alpha_i + \beta^{ES} + \beta^{MS} + \beta_s^{ES-MS} + \gamma X_{ics} + \delta P_{ics} + \epsilon_{ics} \quad (1)$$

where i denotes students, c denotes class, and s denotes schools. y_{ics} is an achievement measure for an eighth-grade student i in class c and school s . β^{ES} denotes the elementary school cohort fixed effect, and β^{MS} denotes the middle school fixed effect. β_s^{ES-MS} is a fixed effect for all students who attended the same elementary and the same middle school (same transition path). X_{ics} is a vector of student's characteristics that includes mother's and father's years of education, number of siblings, immigration status, and ethnic origin. P_{ics} represents the proportion of new

violent classmates. Finally, ε_{ics} is an error term that accounts for any type of correlation within observations along the same transition path.

The coefficient of interest is δ , which measures the effect of having a higher proportion of new violent peers on student achievement. Since I estimate the impact of violence on eighth-grade scores one year after class formation, δ represents the "net" effect of exposure to violence, capturing students' adjustment to their new class structure, including interactions with new violent peers.

Moreover, recent research suggests that the effect of the proportion of new violent peers may be confounded by the overall proportion of new peers in the class, which could resemble the effect of exposure to new peers more generally⁴. For instance, Golsteyn et al. (2021) find that university students perform better in the presence of persistent peers. Additionally, Lavy and Sand (2019) report that the number of persistent friends when moving from elementary to middle school significantly affects academic outcomes and the class environment, depending on the quality of these friendships. Therefore, I also include the overall proportion of new violent classmates in my preferred model specification.

In addition, drawing on well-established empirical evidence on peer effects, I recognize that the impact of violent peers encompasses not only their violent behavior but also their background characteristics. To refine my identification strategy further, I examine the stability of the δ estimate by incorporating the average individual characteristics of each new group of violent peers.

3.2 Identification of Underlying Mechanisms

The parameter δ captures the effects of violent peers, which can operate through various channels. One set of channels involves mechanisms within the classroom, such as alterations in the

⁴In fact, the Pearson correlation coefficient between these two measures is 0.47 in the sample of secular schools.

classroom environment, changes in the quality of interactions among students, and the dynamics between students and teachers. Another set includes out-of-class factors, such as students' motivation, discipline, and study efforts. In line with Lavy and Schlosser (2011), I investigate these mechanisms by estimating models similar to Model 1, using dependent variables derived from students' responses to a school questionnaire. This questionnaire addresses aspects of the classroom environment, student behavior, and study efforts.

A thorough analysis should account for the possibility that these channels may operate concurrently. For instance, a higher proportion of new violent classmates might deteriorate the classroom climate through disruptive behavior, which in turn could damage social relationships within the class. Additionally, the presence of violent peers could lead teachers to increase homework to counteract disruptions, potentially affecting individual student behavior and investment in academic activities.

To differentiate between these mechanisms, I use two types of questions in the student questionnaire. One set assesses students' perceptions of general classroom conditions, such as the prevalence of violence and disruption. The effect of exposure to violence on these metrics captures the overall impact of violent peers, including both changes in classroom composition and alterations in student behavior. The other set focuses on students' conduct, including questions about their participation in violent interactions during the current year. An observed effect of violence on these self-reported behaviors would indicate changes in individual behavior. Further details about these questions are provided in the next section.

4 Data

4.1 Data Construction

This study utilizes data from the Growth and Effectiveness Measures for Schools (GEMS; *Meizav* in Hebrew) survey conducted from 2002 to 2005. GEMS, administered by the Division of Evaluation and Measurement of the Israeli Ministry of Education, is a biennial assessment of elementary and middle schools. It covers a representative 1-in-2 sample of schools, with student participation rates exceeding 90 percent for both tests and questionnaires.⁵

The GEMS dataset includes test scores for eighth-grade students in Hebrew, science, mathematics, and English, as well as questionnaire responses from fifth through ninth graders. All students, except those in special education classes, are tested and required to complete the questionnaire. To facilitate interpretation, I converted the original 1-to-100 test scores into z-scores and calculated the z-score of each student's average across the four subjects.⁶

The student questionnaire gathers information on school climate, personal behavior, and time allocated to homework in tested subjects. Students rate their agreement with various statements on a 6-point Likert scale, ranging from 1 (strongly disagree) to 6 (strongly agree). Of particular interest is the statement: "This year I was involved in many physical fights." To assess prior violent behavior, I linked eighth-grade students' scores and self-reports from 2004 and 2005 with their responses to this statement in elementary school (2002-2003, either fifth or sixth grade). Students who reported some level of agreement (from "somewhat agree" (4) to "strongly agree" (6)) in elementary school were classified as violent.

Nevertheless, a student involved in fights does not necessarily initiate them. In other words, a

⁵The GEMS is administered annually to elementary and middle schools in half of the localities. In the largest localities, the survey is conducted in half of the elementary and middle schools within each city.

⁶The scores were standardized to z-scores within each year and subject.

student can be involved in violence as an aggressor, a victim, or both. To address this distinction, in Section 5, I introduce an additional definition of violence based on the statement: "Sometimes I am scared to go to school because there are violent students." Agreement with this statement may indicate that the student is a victim of violence. Notably, 33 percent of students identified as violent in the sample of this study reported some level of agreement with this statement.

A comparable measure for these *violent-victim* students is found in the medical literature on bullying. Specifically, students are classified into three categories: pure bullies, victims, and bully-victims (individuals who engage in bullying but are also victimized by others). The rate of violent-victims in this study is comparable to the prevalence of bully-victims found in the medical literature (e.g., Forero et al. (1999), Nansel et al. (2001)). Furthermore, Juvonen et al. (2003) demonstrate that bully-victims tend to experience more significant behavioral and relational problems than bullies alone. Assuming that violent-victims in my sample are somewhat equivalent to bully-victims in the medical literature, I find contradictory evidence. My results indicate that the proportion of new exposure to violence (both *pure violent* and *violent-victim* peers) negatively affects academic scores, but these effects do not differ significantly.

Out of a total of 90,066 students, linking elementary school responses is not possible for about 21 percent of eighth graders, likely due to the biennial nature of GEMS or potential selective exclusion by some schools. This missing data may not be random if certain elementary schools selectively opted out or if some students were instructed to avoid school during survey administration. To address this, I focus the main analysis on classes where at least 85 percent of students have elementary school information. This subset includes 41 percent of eighth graders in Jewish secular schools who participated in GEMS in either 2004 or 2005. Due to constraints in measuring new exposure to violence within classes, I also limit the sample to schools with multiple eighth-grade classes, reducing the sample size by 12 percent. To account for the background characteristics of the new violent peers, I further restrict the sample to students with a positive proportion, resulting

in a decrease of about 14 percent in sample size.

To construct the proportion of new violent classmates, I first identified each student's new peers—middle school classmates who were not previously known from elementary school, regardless of whether they were classmates. I then identified which of these new peers were classified as violent based on their self-reports from elementary school. Note that I am able to compute this proportion for over 90 percent of the students with missing responses to the elementary school questions, as I can access their elementary school peers' data through the administrative records maintained by the Israeli Ministry of Education. To address the issue of incomplete classification of violent behavior, exposure to new violent classmates was calculated as the ratio of new violent classmates to the total number of classmates for whom elementary school information is available.

The GEMS data are also linked to student administrative records from the Israeli Ministry of Education, which provide demographic information used to construct the vector of students' background characteristics.⁷ The final sample includes 15,941 students from 524 classes in 172 schools, with responses to GEMS in elementary school, allowing for the measurement of their proportion of new violent classmates. These students come from 902 elementary schools and constitute 2,026 transition paths from elementary school to middle school. This sample includes 1,413 students who did not respond to the violence-related statement used for classification. While this missing data does not impact these students' treatment assignments, it affects their peers' assessment.

4.2 Descriptive Statistics

Table 1 reports the descriptive statistics for the sample used in this study. On average, within each class, 90 percent of students reported their level of involvement in violent behavior during elemen-

⁷For students with missing background characteristics, I imputed values using the mean of their classmates' data. These imputed values were then included as control variables in the regression analyses to account for potential bias.

Table 1: Descriptive Statistics of Exposure to New Classmates and Violence

	Mean	St. Dev.	Min	Max
Proportion of students reporting the level violent behavior in elementary school	0.90	0.03	0.85	1.00
Proportion of new peers in class	0.76	0.16	0.03	1.00
Exposure to Violence				
Proportion of violent peers in class	0.14	0.07	0.03	0.52
Proportion of new violent peers in class	0.11	0.06	0.03	0.52
Proportion of old violent peers in class	0.03	0.04	0.00	0.25
<i>New Exposure to Violence</i>				
<u>Levels of agreement:</u>				
Somewhat agree	0.05	0.04	0.00	0.28
Agree	0.03	0.03	0.00	0.24
Strongly agree	0.03	0.03	0.00	0.17
<u>Source of violence:</u>				
Proportion of pure violent	0.08	0.05	0.00	0.44
Proportion of violent-victim	0.02	0.03	0.00	0.20
<u>Gender:</u>				
Boys	0.08	0.05	0.00	0.33
Girls	0.02	0.03	0.00	0.24

Notes: The table provides means, standard deviations, and minimum and maximum values for various proportions related to classroom dynamics and violence. The proportion of students reporting the level of violent behavior during elementary school is calculated at the class level. All other proportions are calculated at the student level.

tary school. Integration rates between elementary and middle school are notably high, with 76 percent of a student's peers being new to them. The proportion of violent peers averages around 14 percent of a student's total classmates. More specifically, about 11 percent of a student's classmates are new individuals with a history of violent behavior. This indicates that around 15 percent of a student's new classmates have a prior history of violence.

When analyzing the levels of agreement regarding involvement in violent behavior during elementary school, it is noted that 5 percent of new classmates reported "somewhat agreeing" with having participated in physical fights, while 3 percent "agreed" and 2 percent "strongly agreed." The majority of these new violent peers are classified as pure violent, representing 8 percent of the total sample of classmates, while 2 percent are violent-victims. Furthermore, there is a pronounced gender disparity within this group, as males account for approximately 73 percent of new violent

peers. This notable difference in gender representation underscores the potential implications of gender dynamics, which will be explored in greater detail in the subsequent section.

Table 2 reports the mean student characteristics for violent and non-violent students. On average, the two groups differ statistically. Statistically, the two groups show significant differences. Violent students are more likely to be boys and typically come from lower socioeconomic backgrounds, as indicated by having parents with fewer years of schooling. Additionally, they are 16 percent more likely to have been involved in physical fights during middle school. These differences highlight the importance of accounting for the background characteristics of violent peers when assessing the impact of violence on academic achievement.

5 The Effect of the Proportion of New Violent Peers Academic Achievement

5.1 Evidence on the Validity of the Identification Strategy

To determine whether the sample of this study supports my identification strategy, I first perform a series of balancing tests to evaluate whether fluctuations in the proportion of new violent peers within the same transition path are associated with changes in student background characteristics. Table 3 presents the coefficients from regressions of each background characteristic on the proportion of new violent peers, using four different specifications: naïve OLS regressions without controls, with middle school fixed effects, with elementary school cohort fixed effects, and transition path fixed effects.

The naïve OLS results in Column 1 indicate that exposure to new violent peers is associated with several student background characteristics: a negative association with parents' years of

Table 2: Comparison of Characteristics Between Violent and Non-Violent

	Violent	Non-Violent	Difference
	(1)	(2)	(3)
Boy	0.8 (0.4)	0.45 (0.5)	0.35*** (0.01)
Father's years of schooling	12.2 (2.71)	12.73 (2.87)	-0.54*** (0.07)
Mother's years of schooling	12.32 (2.6)	12.91 (2.69)	-0.59*** (0.07)
Number of siblings	2.24 (1.2)	2.15 (1.1)	0.1*** (0.03)
New immigrant	0.01 (0.12)	0.01 (0.09)	0.01*** (0)
<i>Ethnic origin</i>			
Israel	0.48 (0.5)	0.5 (0.5)	-0.03** (0.01)
Europe, the Americas or Oceania (excluding FSU)	0.11 (0.31)	0.15 (0.36)	-0.04*** (0.01)
Asia or Africa (excluding Ethiopia)	0.2 (0.4)	0.18 (0.39)	0.02* (0.01)
Ethiopia	0.03 (0.18)	0.02 (0.13)	0.01*** (0)
Former Soviet Union (FSU)	0.15 (0.36)	0.12 (0.32)	0.03*** (0.01)
Other	0.03 (0.16)	0.03 (0.17)	0 (0)
Violent student based on middle school reports	0.23 (0.42)	0.07 (0.26)	0.16*** (0.01)
Number of students	1,510	10,849	

Notes: The table compares the means and standard deviations (in parentheses) of background characteristics and middle school violent behavior between violent and non-violent students, presented in Columns 1 and 2, respectively. The differences between the means are shown in Column 3, with significance levels reported as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

schooling, a positive association with the number of siblings, migration status, and a strong association with ethnicity. Introducing middle school fixed effects in Column 2 slightly reduces these associations, though they remain statistically significant. Including elementary school cohort fixed effects in Column 3 diminishes most of these associations, making them statistically insignificant. Finally, introducing transition path fixed effects from elementary to middle school in Column 4 removes the significance of all these correlations.

To further ensure that these findings are not due to random chance, I test whether the joint

Table 3: Balancing Tests for the Proportion of New Violent Peers

	(1)	(2)	(3)	(4)
Boy	-0.039 (0.083)	-0.168 (0.104)	-0.148 (0.131)	-0.064 (0.125)
Father's years of schooling	-4.447*** (0.702)	-1.096** (0.552)	-0.101 (0.519)	-0.041 (0.558)
Mother's years of schooling	-4.519*** (0.594)	-0.812* (0.466)	-0.011 (0.494)	-0.260 (0.591)
Number of siblings	0.552** (0.221)	0.437** (0.190)	0.319 (0.211)	0.258 (0.222)
New immigrant	0.062*** (0.016)	0.041** (0.018)	0.015 (0.021)	0.019 (0.022)
<i>Ethnic origin</i>				
Israel	-0.485*** (0.096)	-0.219** (0.087)	-0.147 (0.100)	-0.075 (0.103)
Europe, the Americas or Oceania (excluding FSU)	-0.285*** (0.051)	-0.161*** (0.055)	-0.107 (0.068)	-0.086 (0.068)
Asia or Africa (excluding Ethiopia)	0.326*** (0.063)	0.150** (0.071)	0.068 (0.087)	0.085 (0.094)
Ethiopia	0.124*** (0.025)	0.086*** (0.026)	0.043* (0.025)	0.020 (0.029)
Former Soviet Union (FSU)	0.360*** (0.074)	0.144* (0.074)	0.158** (0.079)	0.078 (0.087)
Other	-0.041 (0.025)	0.000 (0.026)	-0.015 (0.033)	-0.022 (0.032)
Joint significance <i>p-value</i>	0.000	0.000	0.228	0.877
Middle school FE		✓	✓	✓
Elementary school cohort FE			✓	✓
Transition path FE				✓

Notes: The table presents estimates from separate regressions where the dependent variable is a relevant student characteristic, and the independent variable is the proportion of new violent classmates. In Column 1, the regressions do not include any controls. Column 2 includes fixed effects for middle school, while Column 3 adds fixed effects for the elementary school cohort (the interaction between cohort and elementary school). Column 4 incorporates fixed effects for both elementary and middle school, representing the transition path. The bottom row of the table reports the *p-value* for the null hypothesis that none of the characteristics are jointly associated with the proportion of new violent classmates. This is based on a single regression per column, where the dependent variable is the proportion of new violent classmates and all characteristics are included as explanatory variables. Robust standard errors, clustered at the transition path level, are reported in parentheses. Significance level of regressions are reported as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

effects of all background characteristics are statistically significant. Specifically, I regress the proportion of new violent peers on the eleven individual characteristics and report, in the bottom row of each column, the respective *p-value* for the hypothesis that all coefficients are jointly null. The results in the bottom row of Table 3 show that after controlling for elementary school cohort fixed effects and/or transition path fixed effects, the estimates become jointly insignificant. Thus, the results suggest no systematic relationship between student characteristics and the proportion of new violent peers. Nevertheless, I include student characteristics in my benchmark specification.

Table A1 presents the results from similar balancing tests, but instead of evaluating the associations between student background characteristics and exposure to new violent peers, it examines the relationship between variation in the proportion of all violent classmates within the same transition path and changes in student background characteristics. The patterns observed in this Table are consistent with those in Table 3 and suggest that overall exposure to violence is also unrelated to student characteristics within the framework of my empirical strategy.

Even if cohort-to-cohort variations in the proportion of new violent peers within a transition path are purely idiosyncratic, a concern remains that students might react to shocks in their exposure to violence. However, the lack of school choice at the middle school level and the limited availability of private schooling in Israel significantly mitigate this concern. Nonetheless, students and their parents could still request a transfer to a different class within the same school or move to a new school at the end of seventh grade after being exposed to a high proportion of new violent peers. To address this concern, I test whether such mobility is related to exposure to violent peers by estimating models similar to Model 1, where the dependent variables are dummy variables for any transition from seventh to eighth grade—whether to a new class or a new school. The explanatory variable of interest is the proportion of new violent classmates at the start of seventh grade. Including the background characteristics of new violent peers in this analysis is particularly relevant, as they may influence mobility decisions; for example, a student may request a transfer due to the low academic performance or disruptive behavior of their new violent classmates.

Table 4 reports the outcome means in Column 1 and the regression results in Column 2. Approximately 14 percent of students transition from the seventh grade at the start of middle school to a different grade in eighth grade. Specifically, 4 percent moved to a different school, while 10 percent changed classes within the same school. While these mobility rates are noticeable, they are relatively low compared to those in the United States.⁸

⁸For example, Rumberger (2003) finds that 21 percent of U.S. eighth graders have changed schools at least once.

Table 4: The Effect of the Proportion New Violent Peers on Student's School Mobility

	Mean outcome	Regression estimate
	(1)	(2)
Transition	0.14 (0.35)	-0.048 (0.159)
Different School	0.04 (0.2)	0.079 (0.079)
Different Class Same School	0.1 (0.29)	-0.127 (0.144)

Notes: The table reports means of the dependent variable (Column 1) and estimates (Column 2) for the effects of the proportion of new violent classmates in seventh grade on a student's transition likelihood in the following year (eighth grade). The first row presents summary statistics for any transition (to a different school or class), the second row for moving to a different school, and the third for moving to a different class within the same school. All regressions include middle school fixed effects, elementary school cohort fixed effects, transition path fixed effects, the proportion of students with previous reports of violence, individual student characteristics, the proportion of new peers in the class, and the average characteristics of new violent peers. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

This makes the identification strategy based on within-transition-path variation in the proportion of new violent peers particularly appealing in the Israeli context. All regression estimates are statistically insignificant, indicating that a student's likelihood of changing their enrollment is not related to the proportion of new violent peers they were exposed to at the start of middle school.

5.2 Effects on Achievement

Before proceeding with the estimation at the student level, I first present estimates based on class-level averages. Table 5 reports the effects of the proportion of violent students in a class on the average standardized score (across the four subjects) of non-violent students in each class. This analysis compares the average characteristics of classes within the same school and mitigates the challenge of accounting for unobservable class-specific factors using the within-transition-path variation framework. Additionally, class-level effects provide net measures of the impact of exposure to violence, capturing the dynamics through which these effects operate. Importantly, using

Table 5: Estimates of the Effects of the Proportion of Violent Students on Average Scores of Non-Violent Students, Sample of Class Means

	(1)	(2)	(3)	(4)	(5)
Proportion of violent students	-2.076*** (0.289)	-1.606*** (0.312)	-1.165*** (0.264)	-1.118*** (0.274)	-1.139*** (0.274)
Proportion of violence information	✓	✓	✓	✓	✓
Middle school FE		✓	✓	✓	✓
Non-violent mean controls			✓	✓	✓
Violent mean controls				✓	✓
Including classes with zero proportion					✓
Number of classes	546	546	546	535	546

Notes: The table reports estimates of the effect of the proportion of violent students in a class on the average standardized score of non-violent students. In Column 1, the model includes the proportion of students in the class who reported involvement in violence during elementary school. Column 2 adds middle school fixed effects, Column 3 adds class-level average characteristics of non-violent students, and Column 4 the average characteristics of violent students in the class. Column 5 includes an indicator for classes with a zero proportion of violent students. Robust standard errors, clustered at the middle school level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: ‘***’ = 1% level, ‘**’ = 5% level and ‘*’ = 10% level.

class-level averages helps reduce potential measurement error in the treatment variable.

Column 1 of the Table presents estimates obtained by controlling only for the proportion of students in the class who reported involvement in violence during elementary school. Column 2 adds middle school fixed effects. Columns 3 and 4 further include the average characteristics of non-violent students and violent students in the class, respectively.

Across all columns, the estimates remain statistically significant. However, a pattern of decreasing estimates is observed as additional controls are included. The estimate in Column 2 decreases (in absolute value) by approximately 23 percent compared to Column 1, suggesting that school characteristics may be important confounding factors. The estimate is further reduced by 27 percent in Column 3, indicating some selection based on student characteristics within the same school. Introducing the average characteristics of violent students in Column 4 leads to a relatively small change, with the estimate remaining at -1.118 (standard error = 0.274).

Since not all classes include violent students, the result in Column 4 is based on the subsample of classes with a positive proportion of violent students. In Column 5, I estimate the same regression, including classes with zero violent students. The estimate in Column 5 is similar to the one in Column 4, suggesting that the results in Column 4 are robust and not driven by the specific sample of classes with a positive proportion of violent students.

Table 6 presents the estimates for Model 1 at the student level, using a sample of students with a positive proportion of new violent classmates. Column 1 includes only the proportion of students with previous reports of violence. Columns 2 and 3 add middle school and elementary school cohort fixed effects, respectively. Column 4 transition path fixed effects. Column 5 introduces individual student characteristics. Column 6 adds the proportion of new peers in class. Finally, Column 7 includes the average characteristics of new violent peers.

As in the previous table, the results reveal a consistent pattern of reduction in the estimated effect. In Column 1, where only the proportion of violent classmates is included, the estimate closely resembles the one obtained at the class level. Introducing middle school fixed effects in Column 2 reduces the estimate by one-third, highlighting how middle school characteristics confound the effect of exposure to violence. Adding elementary school cohort fixed effects in Column 3 further reduces the estimate by about 28 percent, underscoring the importance of elementary school characteristics in shaping future outcomes. Despite these reductions, the estimate remains negative and statistically significant.

In Columns 4 and 5, introducing transition path fixed effects and individual characteristics slightly alters the estimated effect. The relative stability of the estimate in the face of individual controls suggests that the characteristics of new violent peers are balanced when accounting for middle and elementary school fixed effects as well as the transition path. Column 6 further incorporates controls for the proportion of new peers in the class, leading to a reduction of about

Table 6: Estimates of the Effects of the Proportion of New Violent Peers on Average Scores, Sample of Students

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Proportion of new violent peers	-2.098*** (0.197)	-1.400*** (0.179)	-1.089*** (0.218)	-1.124*** (0.241)	-1.089*** (0.223)	-0.978*** (0.226)	-0.953*** (0.224)
Proportion of violence information	✓	✓	✓	✓	✓	✓	✓
Middle school FE		✓	✓	✓	✓	✓	✓
Elementary school cohort FE			✓	✓	✓	✓	✓
Transition path FE				✓	✓	✓	✓
Individual controls					✓	✓	✓
Proportion of new peers						✓	✓
Violent mean controls							✓
Number of Students	15,941						

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on students' average standardized test scores. In Column 1, the model includes only the proportion of students with prior reports of involvement in violence. Column 2 adds fixed effects for middle schools. In Column 3, the model further incorporates fixed effects for elementary school cohorts. Column 4 introduces fixed effects for the transition path between elementary and middle school. Column 5 controls for individual student characteristics. Column 6 includes the proportion of new peers in the class. Finally, Column 7 adds the average characteristics of new violent peers in the class. Robust standard errors, clustered at the transition level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

10 percent in the estimated effect. This reduction is consistent with the well-documented negative impact of exposure to new peers. Finally, Column 7, which includes the average characteristics of students' new violent peers, represents my preferred specification. This refinement leads to a slight reduction in the magnitude of the estimated effect, which stands at -0.953 (standard error = 0.224).

The statistically significant result in Column 7 indicates that a higher proportion of new classmates with violent records negatively impacts academic performance. For instance, on average, a student in this sample has about three new violent peers out of approximately 32 classmates with records from elementary school. Reclassifying one non-violent new peer as violent (increasing the proportion of new violent peers by roughly 3 percentage points) leads to a decrease of about 0.03 standard deviations in the student's average score. Although this effect is moderate in absolute terms, it is significant when compared to similar findings in the literature.

For example, Kristoffersen et al. (2015) find that the presence of a potentially disruptive stu-

dent reduces peers' academic achievement by about 0.02 standard deviations. Additionally, the estimates from this study suggest that a one standard deviation increase (0.06) in the proportion of new violent classmates corresponds to a decrease of about 0.06 standard deviations in average scores. In contrast, Carrell and Hoekstra (2010) report that a one standard deviation increase in the proportion of students from troubled families results in a decrease of 0.025 standard deviations in test scores—a notably smaller effect.

In Table A2, I estimate similar models but use the proportion of all violent classmates as the explanatory variable. As shown in Table A1, the within-transition-path variation in this proportion is unrelated to students' background characteristics, although it may be endogenous, as it includes violent peers who were previously classmates. Nonetheless, this provides an alternative measure of the effect of violence on scholastic achievement. The estimates in Table A2 show similar patterns to those in Table 6, but are slightly smaller in magnitude.

5.3 Robustness of Main Findings

In this subsection, I present additional analyses to support the robustness of the results in Table 6. First, as mentioned above, the class-level estimation addresses the challenge of accounting for unobservable class-specific factors and provides a net measure of the effect of violence. The fact that the estimates in Table 6, particularly under my preferred specification in Column 7, closely align with those in Table 5 for the class averages provides suggestive evidence of the robustness of these results..

Additionally, A3 replicates the analysis from Table 6, but estimates the effects based on a sample of students with a non-negative proportion of new violent peers, including those with a zero proportion. The estimates in Table A3 are slightly higher than those in Table 6 but follow similar trends as the analysis progresses through the sets of controls. This suggests that the results in Table 6 are robust to selection based on students' new exposure to violence.

Table 7: Robustness Checks, Sample of Students

	Excluding non-respondents	Information in class			Placebo regressions	
		$\geq 70\%$	$\geq 80\%$	$\geq 90\%$	Within middle school	Within transition path
	(1)	(2)	(3)	(4)	(5)	(6)
Proportion of new violent peers	-0.872*** (0.227)	-0.972*** (0.130)	-0.852*** (0.154)	-1.009** (0.431)	0.118 (0.144)	-0.004 (0.166)

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on students' average standardized test scores, under several robustness checks. Column 1 presents the estimated effect for a sample where students who did not respond to the violence-related question used for classification are excluded. Columns 2-4 show the estimated effect for a sample of students in classes where at least 70/80/90 percent of students have information on their violent involvement in elementary school. Columns 5 and 6 report the estimated coefficients from falsification tests that randomize the proportion of new violent peers and the overall proportion of new peers. In Column 3, the randomization is done within the same middle school, while in Column 4, it is done within students who followed the same transition path from elementary school to middle school. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Furthermore, Table 7 reports results from additional robustness checks under the preferred specification. Column 1 presents the estimate based on a sample of students with a positive proportion of new violent peers, but only those who responded to the violence-related statement used for classification. The estimate obtained is similar to the benchmark estimate of -0.953 . Columns 2-4 show that my results are robust to the selection of students based on the completeness of the class information. Specifically, the results for samples with at least 70, 80, and 90 percent of class information remain similar to the benchmark estimate.

Columns 5-6 present the results of falsification tests designed to further validate the causal interpretation of the results in Table 5. These placebo tests involve randomizing the proportion of new violent peers and the overall proportion of new peers. In Column 5, the randomization occurs across all students within the same middle school, while in Column 6, it is within the same transition path. If the results in Table 6 were due to unobserved factors correlated with the actual proportion of new violent peers, we would expect that exposure to new violent peers in different classes within the same middle school or transition path would also affect student achievement.

Both estimates from the placebo tests are insignificant and notably different from those obtained with the true treatment, with the estimate from the within-middle-school randomization even being positive. These results provide compelling evidence that the main findings are not driven by spurious correlations between the proportion of new violent peers and other factors that vary across elementary and middle schools, or within students on the same transition path.

5.4 Heterogeneous Treatment Effects

To gain further insights into the extent of peer effects due to violence, I explore how the impact of the proportion of new violent peers varies across different dimensions. One possible source of heterogeneity is the varying levels of violence among new violent peers. Table 8 presents the results of this analysis, focusing on two key dimensions: *(a)* the levels of involvement in violence among new violent peers and *(b)* the source of their violence, specifically whether they are "pure violent" peers or "violent-victim" peers. The results for these two dimensions are reported in two separate panels.

Panel A explores the variation in the effect of violence based on the levels of involvement in violence among new violent peers. One might expect that the negative effect of violence increases with the level of involvement in violent acts; in other words, the impact of violent peers should rise monotonically with the degree of agreement with the violence-related statement used for classification. To examine this, I use two approaches: *(i)* estimating the proportion of new violent peers in each response category separately, and *(ii)* grouping the "somewhat agree" and "agree" categories together while estimating the proportion of "strongly agree" peers separately.

Under approach *(i)*, all three estimates are negative, but only the estimates for "somewhat agree" and "strongly agree" are statistically significant, and both are notably larger in magnitude than the estimate for the "agree" category. However, as indicated by the *p-value* reported at the

Table 8: Estimates of the Effects of the New Exposure to Different Levels of Violence on Average Scores, Sample of Students

	(1)
A. Proportions of new violent peers by the level of agreement	
I. Three levels	
Somewhat agree	-1.348*** (0.306)
Agree	-0.383 (0.365)
Strongly agree	-1.060*** (0.377)
Joint significance <i>p-value</i> of the coefficients	0.112
II. Grouped levels	
Somewhat agree/agree	-1.007*** (0.374)
Strongly agree	-0.935*** (0.241)
Joint significance <i>p-value</i> of the coefficients	0.852
B. Proportion of new violent peers by source of violence	
Pure violent	-0.874*** (0.234)
Violent-victim	-1.233** (0.488)
Joint significance <i>p-value</i> of the coefficients	0.48

Notes: The table presents estimates of the effects of new exposure to violence on students' standardized scores, categorized by the proportion of new violent peers in the class. Panel A shows results based on students' agreement with the statement, "This year, I was involved in many physical fights." Section I in this panel reports results for the three levels of agreement with this statement, while Section II groups "Somewhat agree" and "Agree" together. Panel B reports estimates based on the source of violence: pure violence (violent peers) and victimized violence (violent students who also reported some agreement with the statement, "Sometimes I am scared to go to school because there are violent students"). In each section, the results are derived from a single regression where all treatment variables in the panel are included. The bottom row of each panel reports the p-value for the joint test of the null hypothesis that the effects of all proportions within the panel are equal. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

bottom of Panel A, I cannot reject the null hypothesis that all three levels have the same effect. Additionally, the results from approach (ii) also fail to support a monotonic effect, as the estimated effect for the "somewhat agree/agree" category is similar to that of the "strongly agree" category.

Panel B compares the effects of new pure violent peers to the effects of violent-victim peers (students who were involved in violence but also experienced bullying or intimidation by other violent students). It is important to note that the levels of involvement in fights during elementary school are similar across the two groups, so the estimates in this panel capture the sole effect of

the source of violence.⁹ Consistent with findings in the medical literature, as discussed in Section 4, the estimated effect of violent-victim peers is more pronounced than that of pure violent peers. However, the joint significance test of these two coefficients does not provide sufficient evidence to conclude that the effects of the two types of violent peers differ significantly.

Another source of possible heterogeneity is across subjects, by student's socioeconomic status and gender. The results of this analysis are reported in Table 9, where each row corresponds to the estimated effect on the average standardized score, as well as the scores in Hebrew, Science, mathematics, and English.

Column 1 shows the results for the full sample, all the estimates are negative and statistically significant. However, there is variation in the effect across subjects: The effects in Hebrew and science (-0.604 and -0.657 respectively) are 40-50 percent lower than in mathematics and English (-1.078 and -1.150 respectively). Since Hebrew and Science are taught in homeroom classes, where I can more precisely measure the proportion of new violent peers, the statistically significant estimates in these subjects provide further supportive evidence that the effect of new violent peers exists.

In contrast, Mathematics and English are taught in a combination of homeroom and ability-based classes. The larger effects observed in these subjects likely include influences from beyond the homeroom setting. Nonetheless, these patterns provide suggestive evidence that ability-based tracking is not driving my results. Specifically, if tracking were a significant factor, we would expect the effect of the proportion of new violent peers in the homeroom class to be insignificant for mathematics and English scores. Moreover, the larger effects observed in English and mathematics highlight that exposure to violent peers adversely impacts achievement in these key subjects,

⁹The distributions of responses are as follows: among the pure violent students, 47 percent responded with "somewhat agree," 29 percent with "agree," and 23 percent with "strongly agree." For the violent-victim students, 35 percent responded with "somewhat agree," 29 percent with "agree," and 36 percent with "strongly agree."

Table 9: Estimates of the Effects of New Violent Peers on Students' Scores by Subject, Parental Education, and Gender, Sample of Students

	Parental Education			Gender	
	All	Lower (avg. ≤ 12)	Higher	Boys	Girls
	(1)	(2)	(3)	(4)	(5)
Average	-0.953*** (0.224)	-0.957*** (0.300)	-0.856*** (0.269)	-0.827** (0.323)	-1.202*** (0.315)
Hebrew	-0.604** (0.243)	-0.583* (0.324)	-0.522 (0.336)	-0.145 (0.388)	-0.885*** (0.336)
Science	-0.657*** (0.216)	-0.744*** (0.284)	-0.397 (0.278)	-0.526 (0.348)	-0.856*** (0.317)
Mathematics	-1.078*** (0.239)	-1.157*** (0.326)	-0.886*** (0.297)	-1.030*** (0.351)	-1.350*** (0.344)
English	-1.150*** (0.231)	-1.083*** (0.328)	-1.135*** (0.282)	-0.818** (0.336)	-1.479*** (0.330)

Notes: The table reports estimates of the heterogeneous effects of the proportion of new violent peers in a class on students' standardized scores. The estimates are presented for the overall average score as well as for Hebrew, Science, Mathematics, and English (the rows in the table). Column 1 shows the estimates for the entire sample of students. Column 2 presents estimates for students with lower parental education (defined as an average parental education level of 12 years or less). Column 3 shows estimates for students with higher parental education. Columns 4 and 5 report estimates separately for boys and girls. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

which are critical for obtaining a high-quality matriculation certificate—a prerequisite for university admission and most post-secondary education.

In Columns 2 and 3, I compare the results for students from low and high socioeconomic status groups. Specifically, the analysis is based on two subsamples stratified by the average years of schooling of both parents: below the median (12 years) and above the median. The effects on average scores are similar across both groups. However, there are distinct patterns when examining the results by subject. The effects on Hebrew scores are similar for both groups, but statistically significant only for students with lower parental education. The effect on science scores is statistically significant for students with lower parental education and is approximately twice as large as the effect for students with higher parental education.

In contrast, the results for mathematics and English deviate from expectations. Since proficiency in these subjects is typically associated with higher parental education, one might expect that parents with higher levels of schooling would be better able to mitigate the negative effects of violence on classroom learning and the school environment. Contrary to this expectation, the effects in mathematics and English are statistically significant, negative, and similar across both subsamples, rejecting the hypothesis that higher parental education buffers the impact of violence. Further details on the mechanisms through which the effects of violence influence academic performance will be discussed in the next section.

In Columns 4 and 5, I report stratified results by gender. The estimated effect on the average score for girls is approximately 45 percent larger than for boys (-1.202 vs. -0.827). While the effects are higher for both genders in mathematics and English, the impact is consistently larger and statistically significant for girls. For instance, the estimate for Hebrew is -0.885 (standard error = 0.336) for girls, compared to -0.145 (standard error = 0.388) for boys. These gender differences are particularly noteworthy, given that students are placed in mixed-sex classes. This suggests that the negative impact of violent peers is more pronounced for girls, implying that peer violence affects girls differently than boys and that the observed effects are not solely driven by the shared classroom environment.

One factor that is not uniform across all students in the classroom is the gender dynamics within peer relationships. During early to mid-adolescence, peer networks tend to be predominantly same-sex (Sippola, 1999). Table 10 presents the estimated effects of new violent boy and girl peers for the entire sample and for subsamples of boys and girls. For the full sample, both estimates are negative, but only the effect of violent boys is statistically significant. Boys are negatively affected by the presence of other violent boys (-1.024 , standard error = 0.445), but not by violent girls (-0.140 , standard error = 0.919). In contrast, while girls are similarly affected by violent boys (-0.981 , standard error = 0.392), they are more than twice as negatively impacted by

Table 10: Estimates of the Gender-Specific Effects of New Violent Peers on Students' Scores by Gender, Sample of Students

	All	Boys	Girls
	(1)	(2)	(3)
Proportion of new violent boys	-0.957*** (0.291)	-1.024** (0.445)	-0.981** (0.392)
Proportion of new violent girls	-0.938 (0.677)	-0.140 (0.919)	-2.018* (1.132)
Joint significance <i>p-value</i> of the coefficients	0.981	0.45	0.435
Number of Students	15,941	7,934	8,007

Notes: The table reports estimates of the effects of the proportion of new violent boys and girls in a class on students' standardized scores. Column 1 shows the estimates for the entire sample of students, while Columns 2 and 3 report estimates separately for boys and girls. The third row of the table reports the *p-value* for the null hypothesis that the gender-specific effects are equal. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

the presence of other violent girls (-2.108 , standard error = 1.132), despite boys constituting the majority of the violent peers. However, the *p-values* reported at the bottom of the table indicate that I cannot conclude that the effects of violence differ significantly based on the gender of the violent peers.

6 Identifying the Mechanisms of Violence Peer Effects

The results presented above indicate that students exhibit worse academic achievement when they are exposed to a higher proportion of new violent classmates. In this Section, I leverage the GEMS middle school questionnaires to gain further insights into the nature of these violent peer effects. Specifically, I explore potential mechanisms through which these peer effects may operate, including changes in the pedagogical methods used by teachers, the classroom climate, and the quality of interactions within students and between students and teachers. To provide a comprehensive

understanding, I also examine whether exposure to violence influences student behavior. For this purpose, I analyze students' self-reports from the middle school questionnaires regarding their involvement in violence, discipline issues, and study efforts.

6.1 Classroom and School Environment

To investigate how exposure to new violent classmates might influence academic achievement through changes in the classroom and school environment, I categorized the individual items from the student questionnaire into eight distinct categories. The first five describe teachers' pedagogical practices in the classroom: (i) instilling of knowledge and enhancement of comprehension; (ii) instilling of analytical and critical skills; (iii) transparency, fairness, and feedback; (iv) individual treatment of students and (v) instilling of capacity for individual study. These categories reflect widely accepted concepts in educational psychology (Bloom, 1956). The remaining three categories focus on classroom environment: (vi) classroom disruption and violence; (vii) student-teacher relationships and (viii) inter-student relationships.

To quantify the effects within each category, I follow the methodology outlined by Kling et al. (2007). This involves calculating the average effect for each category by averaging the standardized effects of the individual outcomes that fall under it. I then estimate a system of regressions for seemingly unrelated categories.¹⁰ Given the absence of prior information to justify differential weighting, I assign equal weight to each outcome within a category. Since the dependent variables in these regressions are standardized, the coefficients represent the effect of a one-unit change in the variable of interest on the dependent variable, measured in standard deviation units.

Table A4 shows that the indicators of teachers' pedagogical practices and classroom environ-

¹⁰Specifically, I define the average effect τ_c of the proportion of new violent peers for category c as: $\tau_c = \frac{1}{K_c} \sum_{k=1}^{K_c} \frac{\pi_{kc}}{\sigma_{kc}}$, where K_c is the number of outcomes in category c , π_{kc} represents the effect on outcome k in category c , and σ_{kc} is the standard deviation of the outcome. I treat σ_{kc} as known, following the methodologies of Lavy and Schlosser (2011) and Lavy et al. (2012a), due to the large sample size available.

ment are highly associated with students' academic performance, even after controlling for elementary and middle school fixed effects, transition path fixed effects, and students' background characteristics. Specifically, higher levels of teachers' pedagogical practices, such as instilling knowledge and enhancing comprehension, as well as greater transparency, fairness, and feedback, are positively associated with students' average test scores. Similarly, improvements in classroom environment, characterized by greater discipline and reduced violence, better student-teacher relationships, and more positive inter-student relationships, also correlate with better academic performance.

However, these correlations do not allow for a causal interpretation, as other factors may influence both the observed mechanisms and test scores, or there may be reverse causation. For instance, the negative association between students' test scores and aspects of teachers' practices such as individual treatment and instilling capacity for individual study may indicate reverse causation. Students with lower academic achievement might require more individual attention and support for self-study.

Nevertheless, as noted by Lavy and Schlosser (2011) and Lavy et al. (2012a), who conducted similar analyses using these student questionnaires, the results presented in Table A4 suggest that students' assessments of their classroom environment contain valuable information. These assessments highlight mechanisms that may significantly impact academic achievement, as identified in the educational literature. While the analysis cannot capture all relevant mechanisms and cannot rule out the presence of other factors, it provides important insights into potential mediators of the negative impact of violence on students' academic performance.

Table 11 presents the regression estimates of the average outcomes for each of the eight categories, using the preferred specification. The results are reported separately for girls and boys, and the detailed results for the effect of each individual item are provided in Table A5.

Table 11: Estimates of the Effects of the Proportion of New Violent Peers on the Pedagogical Practices, Classroom Environment and Student Behavior by Gender, Sample of Students

	Boys	Girls
	(1)	(2)
<i>Pedagogy</i>		
Instilling of knowledge and enhancement of comprehension	0.012 (0.246)	-0.340 (0.256)
Instilling of analytical and critical skills	0.115 (0.221)	-0.233 (0.217)
Transparency, fairness and feedback	-0.024 (0.275)	-0.317 (0.283)
Individual treatment of students	0.431* (0.257)	-0.243 (0.237)
Instilling of capacity for individual study	0.041 (0.299)	-0.487* (0.292)
<i>Classroom environment</i>		
Violence and discipline	-0.250 (0.246)	-0.409* (0.246)
Student–teacher relationships	-0.116 (0.269)	-0.446* (0.258)
Inter-student relationships	-0.137 (0.332)	-0.869*** (0.292)
<i>Self-behavior</i>		
Self-discipline	-0.168 (0.278)	-0.275 (0.179)
Violent behavior in middle school	0.099 (0.144)	0.187** (0.073)

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on teachers' pedagogical practices, the classroom environment, and student behavior. Columns 1 and 2 show the estimates for the samples of boys and girls, respectively. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Focusing on the effects of violence on teachers' pedagogical methods, most estimates are statistically insignificant. However, there is little evidence suggesting that pedagogy is influenced by violence. Teachers provide more personalized attention to boys in response to a higher proportion of violent peers; specifically, the estimate for individual treatment is positive for boys and negative (though insignificant) for girls. Additionally, the estimation reveals a significant negative effect on girls' ability to develop independent study skills, while the effect on boys is nearly zero.

In contrast, the analysis of the classroom environment reveals distinct patterns for boys and girls, with the negative effects being more pronounced for girls. All estimates for girls are negative and statistically significant across all categories, while the estimates for boys are generally smaller and statistically insignificant. Specifically, girls report worse classroom discipline and higher levels of peer violence as the proportion of new violent peers increases. Additionally, girls report poorer student-teacher relationships. For example, as shown in Table A5, girls are significantly less likely to agree with the statement, "There are good relationships between the teachers and the students," while this effect is statistically insignificant for boys. Furthermore, girls report deteriorating relationships between students as the proportion of violent classmates rises. As shown in Table A5, girls are significantly less likely to agree with the statement, "Students in my class help each other," whereas the corresponding effect for boys is statistically insignificant.

These findings are consistent with established psychological literature suggesting that girls demonstrate greater social awareness and sensitivity from an early age, a trait that persists throughout development (Brody, 1985; McClure, 2000; Zahn-Waxler et al., 2015). This increased sensitivity may be reflected in girls' more pronounced perceptions of the classroom environment, particularly in contrast to the relative non-responsiveness of boys. Such heightened awareness of classroom misbehavior and the dynamics of peer and teacher relationships likely accounts for the more severe negative effects girls report as the proportion of violent peers increases.

6.2 Teachers' Fatigue and Work Satisfaction

To complement the analysis of the classroom environment, I also investigate the impact of the proportion of violent students on teachers' motivation and productivity. Specifically, I utilize data from the GEMS teacher questionnaire, which includes three relevant items: "I feel burned out as a teacher," "I feel that I have too much workload," and "I am satisfied with my work at school." The sample comprises 894 teachers from 165 schools.

Table 12: Estimates of the Effects of the Proportion of New Violent Peers on the Teachers' Fatigue, Job Satisfaction and Homework Requirements

	Number of teachers	Number of schools	I feel burned-out	I feel that I have too much workload	I am satisfied with my work at school	Required homework time
	(1)	(2)	(3)	(4)	(5)	(6)
Means	894	165	2.709 (1.486)	4.399 (1.38)	5.273 (0.871)	24.574 (16.368)
<i>Samples of teachers</i>						
Home classroom teachers	411	163	0.786 (2.131)	0.825 (1.809)	-1.731* (1.001)	-25.977 (24.759)
Specialist teachers	562	78	0.766 (1.499)	2.289* (1.265)	-1.164 (1.225)	-19.235 (16.351)

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on teachers' fatigue and job satisfaction. The first row shows the means and standard deviations (in parentheses) for the full sample. The subsequent rows present the results for the sample of homeroom teachers and specialist teachers, respectively. Columns 1 and 2 show the number of teachers and schools, respectively. Columns 3 to 5 report the regression estimates for three responses of teachers to different aspects of their work in school. Column 6 presents the estimates for the effect on the time (in minutes) that teachers require students to spend on homework for each 45-minute class period. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

I successfully matched 411 homeroom teachers to their students, although the contact time between homeroom teachers and their students is limited—typically only a few hours per week. Additionally, the GEMS 2005 dataset allows for matching 562 specialist teachers (in Hebrew, science, mathematics, and English) to the homeroom classes they teach.¹¹ Table 12 presents estimates of the effect of the proportion of violent students in a class on teachers' responses to these three items, based on my preferred specification.

The mean responses of the full sample of teachers (whether matched to a homeroom class or not) to the statement "I feel burned out" is 2.7 on a Likert scale ranging from 1 to 6. About 25 percent of teachers report agreeing to some extent with this statement, suggesting that a considerable proportion of teachers experience burnout. For the statement "I feel that I have too much workload," the mean response is 4.4, with approximately three-quarters of teachers agreeing with

¹¹Note that 99 percent of the specialist teachers report teaching only one subject.

this statement. In contrast, the mean response to “I am satisfied with my work at school” is 5.3, with a low standard deviation of 0.87, reflecting that 96 percent of the teachers express satisfaction with their work.

Turning to the regression results presented in the bottom two rows of Table 12, I find that the proportion of violent students is positively associated with teachers’ sense of burnout in both the homeroom and specialist teacher samples, although the estimates are statistically insignificant. Regarding teachers’ sense of workload, I observe a positive and statistically significant effect only among specialist teachers. This finding is unsurprising, as specialist teachers’ workloads are more directly affected by disruptions and violence in the classes they teach throughout the week. However, I find no significant effect of violence on teachers’ job satisfaction. Interestingly, I observe a significant negative effect on the job satisfaction of homeroom teachers, despite the low variation in this item across the sample. One potential explanation is that although homeroom teachers may spend less classroom time with their students, they still have to manage the broader consequences of violence in the learning and social environment of the class.

The correlations presented in Table 12 align with the effects of violence on the classroom environment, which may act as channels through which violence impacts teachers’ well-being. However, it is important to note that the estimates in Table 12 cannot be interpreted as causal due to the potential for confounding factors or reverse causality. Furthermore, the interpretation of these results is limited by the patterns reported in Table A6. This table presents within-middle-school regressions, where various measures of the classroom environment (as reported by students) replace the treatment variable of the proportion of violent students in the grade. Of the 15 estimates presented, only three show a significant correlation between the quality of the classroom environment and teachers’ fatigue and satisfaction.

6.3 Change in Behavior and Study Efforts

The findings discussed above suggest that the increased vulnerability of girls' academic outcomes to exposure to violence may stem from the deterioration of the classroom environment they experience. However, it is also possible that higher exposure to violence may lead to behavioral changes that negatively impact academic performance. For instance, exposure to violence could undermine a student's motivation, self-confidence, or engagement in learning, thereby influencing academic achievement. To investigate this hypothesis further, I analyze additional items from the student questionnaire, focusing on self-reports related to self-discipline and involvement in violent behaviors, specifically physical altercations in middle school.

The "Self-behavior" section of Table 11 presents the results for the effect of exposure to violent peers on the average outcome in this category, as well as on the dummy variable indicating involvement in violence. The results for boys show no significant effect, as both estimates are statistically insignificant. Combined with earlier evidence that boys' reports on the classroom environment are relatively insensitive to the proportion of violent peers, this implies that boys' academic outcomes may be more negatively affected by distractions caused by violence, rather than by changes in their social environment or self-behavior.

In contrast, the analysis reveals a more pronounced effect for girls. While the effect on the average outcome of self-behavior is statistically insignificant, the effect on the dummy variable for involvement in violence is positive and statistically significant (0.187, standard error = 0.073). To put this into perspective, a 10-percentage point increase in the proportion of new violent peers (roughly doubling the average proportion) results in an increase of approximately 2 percentage points in the likelihood of a girl engaging in violent behavior. This effect is particularly notable, given that only about 3 percent of girls in the sample report engaging in violent behavior, compared to 15 percent of boys. Assuming a linear relationship, this increase in the proportion of violent peers corresponds to a 67 percent increase in the probability that a girl will engage in vio-

lent behavior. These findings suggest that, for girls, exposure to violent peers not only deteriorates the classroom environment but also may contribute to behavioral changes that further exacerbate the negative impact on academic outcomes.

Another potential behavioral change resulting from exposure to violence is a decrease in motivation, which may be reflected in students' study efforts. One measure of study effort is the amount of time students invest in homework. To examine the impact of violence on study efforts, I analyze additional items from the student questionnaire, where students report the weekly time they dedicate to homework in four subjects: Hebrew, science, mathematics, and English. Specifically, students were asked to indicate whether they spend no time, about one hour, two hours, three hours, four hours, or five or more hours on homework each week. The distributions of the reported homework hours are presented in Figure A1, showing that students invest more time on homework in mathematics and English, which are perceived as more difficult and important compared to Hebrew and science.

The upper section of Table 13 presents the effects of the proportion of new violent peers on the weekly hours spent on homework. These estimates can be considered a lower bound for the true effect, as the reported homework hours are truncated at five hours. Column 1 reports the results for the full sample. Of the four subjects, only the estimate for mathematics is statistically significant, indicating that exposure to violence leads to reduced homework time in mathematics.

Table 13: Estimates of the Effects of the Proportion of New Violent Peers on Study Efforts

	Parental Education			Gender	
	All	Lower (avg. ≤ 12)	Higher	Boys	Girls
	(1)	(2)	(3)	(4)	(5)
<i>Homework</i>					
Weekly hours spent on homework in Hebrew	0.201 (0.317) <i>1.852</i>	-0.296 (0.414) <i>1.973</i>	0.731 (0.519) <i>1.701</i>	0.753 (0.515) <i>1.797</i>	-0.407 (0.490) <i>1.904</i>
Weekly hours spent on homework in science	-0.277 (0.320) <i>1.872</i>	-0.634 (0.434) <i>1.931</i>	0.194 (0.568) <i>1.798</i>	0.477 (0.521) <i>1.875</i>	-0.725 (0.499) <i>1.869</i>
Weekly hours spent on homework in mathematics	-0.989*** (0.344) <i>3.064</i>	-1.538*** (0.439) <i>3.073</i>	-0.371 (0.624) <i>3.053</i>	-0.316 (0.581) <i>2.91</i>	-1.702*** (0.540) <i>3.214</i>
Weekly hours spent on homework in English	0.074 (0.388) <i>2.799</i>	-0.696 (0.505) <i>2.887</i>	1.199* (0.633) <i>2.691</i>	0.532 (0.639) <i>2.661</i>	-0.379 (0.560) <i>2.934</i>
Total Weekly hours spent on homework	-0.818 (1.083) <i>9.59</i>	-2.904** (1.419) <i>9.866</i>	1.870 (1.925) <i>9.246</i>	1.461 (1.917) <i>9.248</i>	-2.939* (1.630) <i>9.923</i>
<i>Tutoring</i>					
A tutoring session	-0.112 (0.121) <i>0.386</i>	-0.099 (0.160) <i>0.372</i>	-0.190 (0.205) <i>0.404</i>	-0.069 (0.215) <i>0.363</i>	-0.254 (0.185) <i>0.409</i>
Hebrew tutoring session	-0.022 (0.050) <i>0.043</i>	-0.028 (0.074) <i>0.048</i>	-0.105 (0.076) <i>0.037</i>	-0.106 (0.087) <i>0.051</i>	0.091 (0.068) <i>0.035</i>
Science tutoring session	0.001 (0.037) <i>0.023</i>	-0.001 (0.057) <i>0.026</i>	-0.015 (0.052) <i>0.019</i>	-0.044 (0.074) <i>0.028</i>	0.041 (0.041) <i>0.017</i>
Mathematics tutoring session	-0.078 (0.101) <i>0.234</i>	-0.125 (0.134) <i>0.24</i>	-0.054 (0.179) <i>0.226</i>	-0.009 (0.185) <i>0.217</i>	-0.172 (0.159) <i>0.25</i>
English tutoring session	-0.080 (0.114) <i>0.294</i>	-0.052 (0.149) <i>0.287</i>	-0.147 (0.188) <i>0.303</i>	0.003 (0.193) <i>0.271</i>	-0.248 (0.185) <i>0.316</i>
Total number of tutoring sessions	-0.305 (0.258) <i>0.638</i>	-0.308 (0.363) <i>0.65</i>	-0.487 (0.408) <i>0.622</i>	-0.266 (0.492) <i>0.619</i>	-0.477 (0.371) <i>0.655</i>

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on students' study efforts, measured by weekly hours spent on homework and private lessons. Column 1 presents results for the full sample, while Columns 2 and 3 show estimates for students with lower (average parental education ≤ 12 years) and higher parental education. Columns 4 and 5 present results separately for boys and girls. The means of the dependent variables are reported in italics. Regression estimates are from models that include the control variables specified in Table 6. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Columns 2 and 3 compare the results for students from families with lower and higher levels of parental education. On average, students from lower socioeconomic backgrounds report spending 0.4 more hours per week on homework than those from higher socioeconomic backgrounds across all subjects. This may reflect the need for these students to invest more time and effort in order to achieve better scholastic outcomes. Interestingly, all estimates for students from lower socioeconomic backgrounds are negative, while most estimates for students from higher socioeconomic backgrounds are positive. The negative effects observed among students from lower socioeconomic backgrounds may indicate that they are more adversely affected by exposure to violence. This effect could stem not only from their background but also from a decrease in study effort, which prevents them from catching up with their peers from higher socioeconomic backgrounds. Specifically, students from lower socioeconomic backgrounds experience a statistically significant reduction in motivation in mathematics.

In Section 5, I presented evidence suggesting that higher parental education does not necessarily mitigate the effects of violence on academic outcomes, as parents do not sufficiently support their children's academic progress beyond the school environment. However, the positive estimates among students from higher socioeconomic backgrounds may indicate that their parents' academic background contributes to higher study efforts. This could be because these students inherit a greater intrinsic motivation to invest in their studies compared to those from lower socioeconomic backgrounds. It is important to note, however, that only the estimate for English is statistically significant.

Columns 4 and 5 report the results for boys and girls. Overall, girls spend approximately 0.7 more hours per week on homework than boys. Nevertheless, none of the estimates for boys are statistically significant, while the estimates for girls indicate that exposure to violent peers significantly reduces both mathematics homework time and total weekly homework time. These findings suggest that the higher sensitivity of girls to classroom conditions, including discipline, peer vi-

olence, student-teacher relationships, and inter-student relationships, may manifest in decreased study efforts. Although these effects are statistically significant, they are of small magnitude. For instance, a one standard deviation increase in the proportion of new violent peers (equivalent to a 0.06 increase) corresponds to a reduction of about 6 minutes in mathematics homework and 11 minutes in total homework for girls.

It is important to note that these results have limited causal interpretation, as the time a student spends on homework is not only a function of the student's motivation but also of the homework time required by the teacher. To more accurately estimate the effect of violence on students' homework investment, the model should ideally control for the amount of homework assigned by teachers. However, teacher assignments could also be a response to classroom violence, complicating this estimation. Column 6 in Table 12 provides supporting evidence for including teacher requirements as a control variable in the models presented in Table 13. On average, teachers require students to spend about 25 minutes on homework for each 45-minute class session. However, the regression estimates are statistically insignificant, specifically for specialist teachers.

The results from the more comprehensive model, presented in Table A7, show that controlling for the weekly hours required by teachers affects the magnitude, statistical significance, and even the sign of some estimates. For example, the estimate for the effect on mathematics homework time among students from higher socioeconomic backgrounds changes from -0.371 (standard error = 0.624) to 6.282 (standard error = 2.519). This suggests that a one standard deviation increase in exposure to violent peers is associated with an increase of 26 minutes in mathematics homework, a 14-percent increase relative to the average homework time for this group.

However, given the small magnitudes of the estimated effects and the contrasting patterns across models, I am unable to draw definitive conclusions about the effect of violence on students' motivation, as reflected in their homework time. Another potential mechanism related to

study efforts is the likelihood of students seeking private tutoring. This mechanism is influenced not only by students' study habits but also by parents' motivation to invest in their children's education. For example, one would expect that parents from higher socioeconomic backgrounds may be more likely to provide private tutoring to mitigate the effects of violence on their children's academic performance.

The bottom section of Table 13 presents results for the potential mediator of private tutoring, based on students' reports of receiving tutoring in Hebrew, science, mathematics, and English. Approximately 40 percent of students in the sample report participating in at least one tutoring session. Notably, students whose parents have higher levels of education are only 3 percent more likely to receive private tutoring compared to their peers from lower socioeconomic backgrounds. Most of the estimates for private tutoring are negative, and all are statistically insignificant, including those for students from higher socioeconomic backgrounds.

These findings suggest that parents do not appear to mitigate the effects of violence on their children's academic outcomes by providing additional private tutoring. Taken together with the results for homework time, these findings indicate that changes in study effort—whether through time spent on homework or private tutoring—play a limited role in explaining the observed effects of violence on academic achievement.

7 Conclusion

In this paper, I examine the peer effects of violent students on academic achievement using a rich dataset from Israeli schools. The study explores the mechanisms through which a violent classroom climate influences student performance, distinguishing between two primary channels: the direct effect on classroom dynamics and the indirect effect through changes in individual student behavior.

The findings provide robust evidence that exposure to violent peers in middle school significantly impairs academic outcomes. Specifically, the presence of new violent classmates—those who were not previous elementary school peers but have a history of violent behavior—negatively influences performance in core subjects such as Hebrew, mathematics, English, and science. By employing a rigorous empirical strategy that leverages variations across elementary and middle schools within the same student transition path, the study mitigates confounding factors such as socioeconomic background and innate ability, and controls for potential biases from unobserved variables.

The analysis reveals that the impact of violent peers is not uniform across subjects. Students suffer greater declines in achievement in mathematics and English compared to Hebrew and science. Furthermore, the negative effects of exposure to violence are more pronounced for girls than for boys. Specifically, boys' academic performance is significantly affected only by the presence of violent male peers, while girls experience negative outcomes from both violent male and female classmates. This finding is consistent with existing literature on gender-based peer effects, which underscores the importance of classroom composition in shaping academic achievement (e.g., Lavy and Schlosser (2011); Anelli and Peri (2019)).

The results suggest that the more severe effects on girls' academic outcomes are primarily driven by a deteriorating classroom environment, characterized by heightened perceptions of violence and disruption, as well as weakened relationships between students and between students and teachers. Additionally, the study finds that the impact of exposure to violent peers among girls is also mediated by changes in their behavior, including an increased likelihood of engaging in violent conduct themselves.

In contrast, the analysis provides limited evidence that exposure to violence mediates academic

performance through changes in motivation or study efforts. Furthermore, the study presents some evidence suggesting that the drawbacks of exposure to violence may be attributed to higher teacher workloads and lower job satisfaction, which likely affect teacher productivity and, in turn, students' academic achievement.

From a policy perspective, these findings highlight the importance of interventions aimed at reducing school violence to improve academic outcomes, particularly for girls, who appear more vulnerable to the negative consequences of peer violence. The results also underscore the need for gender-sensitive approaches in addressing school violence, given the differing effects and mechanisms at play between boys and girls, especially in co-educational settings.

Future research should explore the long-term impacts of exposure to violent peers, particularly with regard to outcomes in subsequent educational stages, as well as on mental health and labor market outcomes. Additionally, investigating the effectiveness of specific interventions designed to mitigate the negative effects of school violence would provide valuable insights for both educators and policymakers. The findings also stress the need for more comprehensive survey instruments that can distinguish between peer effects driven by individual behavioral changes and those arising from broader classroom environmental factors. Gaining a deeper understanding of these distinct channels will have important implications for student placement strategies and the design of educational policies aimed at fostering more supportive learning environments.

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Appendix

Table A1: Balancing Tests for the Proportion of All Violent Peers

	(1)	(2)	(3)	(4)
Boy	0.012 (0.076)	-0.093 (0.105)	-0.032 (0.120)	0.016 (0.092)
Father's years of schooling	-3.530*** (0.585)	-0.803* (0.415)	-0.538 (0.433)	-0.443 (0.466)
Mother's years of schooling	-3.451*** (0.533)	-0.284 (0.404)	-0.192 (0.420)	-0.255 (0.476)
Number of siblings	0.186 (0.202)	0.052 (0.166)	0.083 (0.179)	0.048 (0.179)
New immigrant	0.026** (0.013)	0.012 (0.016)	0.011 (0.017)	0.011 (0.018)
<i>Ethnic origin</i>				
Israel	-0.197** (0.087)	-0.085 (0.082)	-0.074 (0.089)	-0.027 (0.088)
Europe, the Americas or Oceania (excluding FSU)	-0.260*** (0.045)	-0.109** (0.053)	-0.055 (0.060)	-0.052 (0.056)
Asia or Africa (excluding Ethiopia)	0.250*** (0.058)	0.096 (0.065)	0.034 (0.073)	0.027 (0.074)
Ethiopia	0.046** (0.020)	0.023 (0.024)	0.030 (0.021)	0.015 (0.025)
Former Soviet Union (FSU)	0.203*** (0.066)	0.092 (0.065)	0.086 (0.066)	0.056 (0.075)
Other	-0.043** (0.021)	-0.016 (0.024)	-0.021 (0.029)	-0.020 (0.028)
Joint significance <i>p-value</i>	0.000	0.000	0.758	0.983
Middle school FE		✓	✓	✓
Elementary school cohort FE			✓	✓
Transition path FE				✓

Notes: The table presents estimates from separate regressions where the dependent variable is a relevant student characteristic, and the independent variable is the proportion of all violent classmates. In Column 1, the regressions do not include any controls. Column 2 includes fixed effects for middle school, while Column 3 adds fixed effects for the elementary school cohort (the interaction between cohort and elementary school). Column 4 incorporates fixed effects for both elementary and middle school, representing the transition path. The bottom row of the table reports the *p-value* for the null hypothesis that none of the characteristics are jointly associated with the proportion of new violent classmates. This is based on a single regression per column, where the dependent variable is the proportion of new violent classmates and all characteristics are included as explanatory variables. Robust standard errors, clustered at the transition path level, are reported in parentheses. Significance level of regressions are reported as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Table A2: Estimates of the Effects of the Proportion of All Violent Peers on Average Scores, Sample of Students

	(1)	(2)	(3)	(4)	(5)	(6)
Proportion of violent peers	-1.763*** (0.179)	-1.039*** (0.187)	-0.907*** (0.210)	-0.925*** (0.225)	-0.869*** (0.209)	-0.863*** (0.208)
Proportion of violence information	✓	✓	✓	✓	✓	✓
Middle school FE		✓	✓	✓	✓	✓
Elementary school cohort FE			✓	✓	✓	✓
Transition path FE				✓	✓	✓
Individual Controls					✓	✓
Proportion of new peers						✓
Number of Students	18,530					

Notes: The table reports estimates of the effects of the proportion of all (old and new) violent peers in a class on students' average standardized test scores, using a sample that includes students with a zero proportion of new violent peers. In Column 1, the model includes only the proportion of students with prior reports of involvement in violence. Column 2 adds fixed effects for middle schools. In Column 3, the model further incorporates fixed effects for elementary school cohorts. Column 4 introduces fixed effects for the transition path between elementary and middle school. Column 5 controls for individual student characteristics. Finally, Column 6 includes the proportion of new peers in the class. Robust standard errors, clustered at the transition level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Table A3: Estimates of the Effects of the Proportion of New Violent Peers on Average Scores, Sample of Students, Including Zero Proportions

	(1)	(2)	(3)	(4)	(5)	(6)
Proportion of new violent peers	-2.074*** (0.183)	-1.508*** (0.163)	-1.277*** (0.200)	-1.306*** (0.219)	-1.231*** (0.197)	-1.138*** (0.202)
Proportion of violence information	✓	✓	✓	✓	✓	✓
Middle school FE		✓	✓	✓	✓	✓
Elementary school cohort FE			✓	✓	✓	✓
Transition path FE				✓	✓	✓
Individual Controls					✓	✓
Proportion of new peers						✓
Number of Students	18,530					

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on students' average standardized test scores, using a sample that includes students with a zero proportion of new violent peers. In Column 1, the model includes only the proportion of students with prior reports of involvement in violence. Column 2 adds fixed effects for middle schools. In Column 3, the model further incorporates fixed effects for elementary school cohorts. Column 4 introduces fixed effects for the transition path between elementary and middle school. Column 5 controls for individual student characteristics. Finally, Column 6 includes the proportion of new peers in the class. Robust standard errors, clustered at the transition level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Table A4: Associations Between Average Scores and Teacher's Pedagogical Practices and Classroom Environment, Sample of Students

	Indicators included separately	Indicators included jointly
	(1)	(2)
Instilling of knowledge and enhancement of comprehension	0.127*** (0.012)	0.243*** (0.016)
Instilling of analytical and critical skills	-0.096*** (0.014)	-0.131*** (0.016)
Transparency, fairness and feedback	0.016 (0.011)	0.030** (0.013)
Individual treatment of students	-0.076*** (0.013)	-0.208*** (0.019)
Instilling of capacity for individual study	-0.047*** (0.011)	-0.018 (0.014)
Violence and discipline	0.007 (0.013)	-0.033** (0.014)
Student-teacher relationships	0.051*** (0.012)	0.052*** (0.016)
Inter-student relationships	0.042*** (0.011)	0.029** (0.013)

Notes: The table reports within-transition-path associations between each of the aggregate categories of mechanisms and students' average scores in Hebrew, science, mathematics, and English. All regressions include middle school fixed effects, elementary school cohort fixed effects, transition path fixed effects, and individual student characteristics. Robust standard errors, clustered at the transition level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

Table A5: Estimates of the Effects of the Proportion of New Violent Peers on the Pedagogical Practices and Classroom Environment by Gender, Individual Items, Sample of Students

	Boys	Girls
	(1)	(2)
<i>Instilling of knowledge and enhancement of comprehension</i>		
The teachers give exercises and assignments that help memorize the material	-0.185 (0.429) 4.429	-0.446 (0.441) 4.59
The teachers ask many questions in class that check whether we know the material well	0.135 (0.493) 4.189	-0.002 (0.460) 4.26
The teachers commend students who know the material well	0.100 (0.555) 3.767	-0.802 (0.543) 3.842
The teachers provide many examples that help understand the material	0.013 (0.442) 4.21	-0.069 (0.479) 4.288
The teachers hold discussions in class that help understand the material	0.125 (0.540) 3.813	-0.681 (0.509) 4.001
During lessons, the teachers ask many questions that check whether we understand the material well	-0.254 (0.462) 4.145	-0.307 (0.438) 4.223
I understand the teachers' scholastic requirements well	0.114 (0.474) 4.715	-0.748 (0.461) 4.766
<i>Instilling of analytical and critical skills</i>		
The teachers give exercises and assignments whose answers have not been studied in class and are not in the textbooks	0.265 (0.650) 2.75	-0.158 (0.536) 2.534
The teachers require that we use what we have studied to explain various phenomena	0.470 (0.531)	-0.354 (0.515)

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Table A5 (Continued)

	Boys	Girls
	(1)	(2)
	3.723	3.896
The teachers ask that we find new examples by ourselves for the material we have studied	-0.182 (0.617) 2.959	-0.508 (0.566) 2.954
The teachers ask that we try to find several ways to solve a certain problem	0.120 (0.562) 3.498	-0.321 (0.514) 3.605
The teachers teach us to find a single common explanation for different phenomena	0.094 (0.513) 3.423	-0.708 (0.469) 3.476
The teachers give assignments where it is required to analyze material and to relate it to other things we have studied	0.207 (0.587) 3.523	-0.387 (0.579) 3.533
When there are several ways to solve a problem, the teachers require that we check them all and find the best one	0.045 (0.644) 3.833	-0.730 (0.566) 3.89
The teachers expect us to ask ourselves whether what we have learned is correct	0.271 (0.648) 2.943	-0.091 (0.597) 2.673
The teachers teach us how to know whether information we have found is important, relevant and can be used	0.311 (0.613) 3.464	0.095 (0.572) 3.467
<i>Transparency, fairness and feedback</i>		
The teachers explain to me exactly what I have to do to improve my studies	-0.146 (0.637) 3.859	-0.466 (0.595) 3.878

Continue on next page

Table A5 (Continued)

	Boys	Girls
	(1)	(2)
The teachers explain how they determine the grades/assessments	-0.103 (0.604) 4.657	-0.743 (0.540) 4.962
The teachers often tell me what my situation is regarding schoolwork	0.147 (0.601) 3.569	-0.199 (0.623) 3.471
<i>Individual treatment of students</i>		
The teachers know what the educational difficulties of each student are	0.045 (0.629) 4.028	-0.781 (0.529) 4.253
When a student has difficulty with a certain topic, the teachers give him more time to study it	0.785 (0.598) 3.019	-0.173 (0.585) 2.895
The teachers give every student homework according to his place in the material	0.973** (0.481) 1.634	0.094 (0.357) 1.401
The teachers help every student to learn topics that interest him	1.091** (0.450) 1.832	-0.420 (0.384) 1.541
The teachers give me a feeling that if I make an effort I will succeed more at studies	0.535 (0.706) 3.826	-0.663 (0.657) 3.911
When a student fails, the teachers encourage him to try again and again	1.009 (0.702) 3.051	-0.330 (0.625) 3.198
The teachers always assist me when I need help with studies	0.645	-0.447

Continue on next page

Table A5 (Continued)

	Boys	Girls
	(1)	(2)
	(0.632)	(0.592)
	3.666	3.758
<i>Instilling of capacity for individual study</i>		
The teachers teach us how to learn new topics by ourselves	0.150	-0.721
	(0.601)	(0.550)
	2.757	2.668
The teachers require students to utilize many and varied sources of information (newspapers, books, databases, etc.)	-0.211	-0.782
	(0.602)	(0.549)
	3.785	3.997
The teachers teach us to observe our environment and to follow phenomena that occur in it	0.265	-0.742
	(0.567)	(0.597)
	2.669	2.753
<i>Violence and discipline</i>		
Student discipline is strictly maintained at school	0.515	-0.270
	(0.480)	(0.485)
	4.651	4.836
The classroom is frequently noisy and non-conducive to learning	0.688	0.142
	(0.445)	(0.464)
	4.928	5.057
Students are frequently late or truant	0.595	0.394
	(0.573)	(0.482)
	4.438	4.426
There are many fights among students in my class	0.979*	1.177**
	(0.594)	(0.591)
	3.218	3.158
<i>Student-teacher relationships</i>		
Students are frequently rude to the teachers	1.224**	0.571
	(0.511)	(0.493)
	4.46	4.615

Continue on next page

Table A5 (Continued)

	Boys	Girls
	(1)	(2)
Sometimes the teachers treat me in an insulting or hurtful way	-0.869 (0.740) 3.33	0.380 (0.622) 3.138
There are good relationships between the teachers and the students	-0.813 (0.535) 3.5	-0.998** (0.498) 3.644
There is mutual respect between the teachers and the students	-0.392 (0.534) 3.478	-0.563 (0.502) 3.637
When I have a problem, I know whom to turn to at school (teachers, advisor)	0.786 (0.661) 4.156	-0.004 (0.575) 4.521
<i>Inter-student relationships</i>		
I feel well adjusted socially in my class	0.123 (0.507) 5.078	-0.684 (0.497) 5.141
Students in my class help each other	-0.806 (0.663) 3.765	-2.229*** (0.571) 4.046
I am generally well off at school	0.025 (0.556) 4.606	-0.756 (0.482) 4.947
<i>Self-Behavior</i>		
I know what behavior is allowed or forbidden in school	-0.323 (0.385) 5.432	-0.132 (0.285) 5.618
I know what behavior is allowed or forbidden in school	-0.024 (0.555) 2.052	0.867** (0.365) 1.333
Sometimes I am scared to go to school because there are violent students	0.225 (0.511) 1.676	-0.132 (0.285) 1.527

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on students' reports

about pedagogical practices and the classroom environment in their school. Column 1 presents the results for boys, while Column 2 presents the results for girls. All regressions include middle school fixed effects, elementary school cohort fixed effects, transition path fixed effects, and individual student characteristics. Robust standard errors, clustered at the transition level, are reported in parentheses. Means of the dependent variables are reported in Columns 1 and 2 in italics. The significance levels of the regression estimates are indicated as follows: ‘***’ = 1% level, ‘**’ = 5% level and ‘*’ = 10% level.

Table A6: Associations Between Teachers' Fatigue and Job Satisfaction and Classroom Environment

	I feel burned-out	I feel that I have too much workload	I am satisfied with my work at school
	(1)	(2)	(3)
Frequently the classroom is noisy and not conducive to learning	0.258** (0.111)	0.040 (0.101)	-0.087 (0.076)
There are many fights among students in my classroom	0.085 (0.101)	-0.010 (0.074)	-0.046 (0.056)
Students frequently talk back to teachers	0.144 (0.115)	0.012 (0.098)	-0.095 (0.065)
There are good relationships between teachers and students	-0.226** (0.102)	0.010 (0.116)	0.070 (0.067)
There is mutual respect between teachers and students	-0.122 (0.130)	0.137 (0.120)	0.140** (0.063)

Notes: The table reports within-middle-school associations between teacher's fatigue and job satisfaction and classroom environment (as reported by the students). Robust standard errors, clustered at the middle school level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.

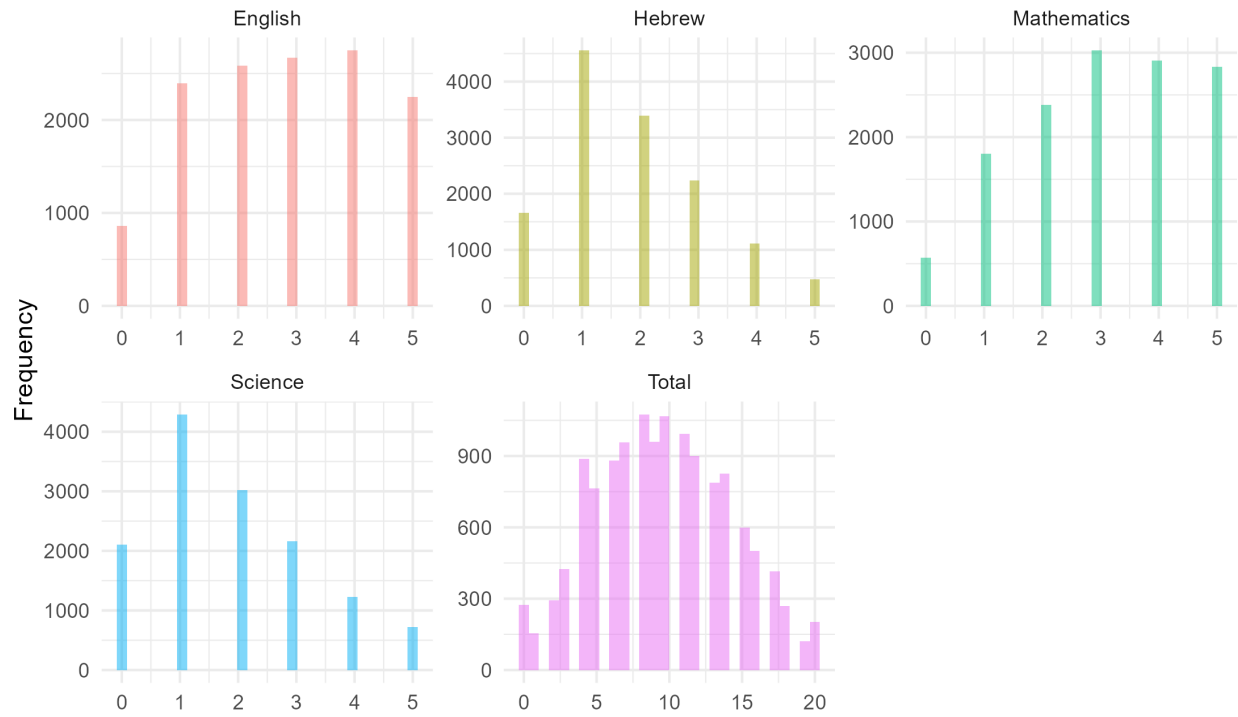


Figure A1: Distribution of Weekly Homework Hours by Subject

Note: The figure shows the distribution of hours students report spending on homework per week in English, Hebrew, Mathematics, Science, and total hours. The last category, "5 hours," refers to students reporting spending 5 or more hours per week.

Table A7: Estimates of the Effects of the Proportion of New Violent Peers on Study Efforts

	Parental Education			Gender	
	All	Lower (avg. ≤ 12)	Higher	Boys	Girls
	(1)	(2)	(3)	(4)	(5)
Weekly hours spent on homework in Hebrew	1.263 (0.887)	1.230 (1.070)	1.479 (1.404)	2.714* (1.492)	0.004 (1.336)
Weekly hours spent on homework in science	-0.047 (0.921)	-1.810 (1.345)	1.780 (1.237)	0.877 (1.593)	-0.481 (1.278)
Weekly hours spent on homework in mathematics	1.436 (1.747)	-0.844 (2.436)	6.282** (2.519)	1.238 (5.103)	-2.584 (2.785)
Weekly hours spent on homework in English	0.388 (2.573)	2.589 (3.198)	-3.225 (3.204)	1.992 (4.112)	-0.739 (3.646)

Notes: The table reports estimates of the effects of the proportion of new violent peers in a class on weekly hours spent on homework. Column 1 presents results for the full sample, while Columns 2 and 3 show estimates for students with lower (average parental education ≤ 12 years) and higher parental education, respectively. Columns 4 and 5 present results separately for boys and girls. Regression estimates are from models that include the control variables specified in Table 6, in addition to including the weekly homework time (in hours) required by the teacher. Robust standard errors, clustered at the transition path level, are reported in parentheses. The significance levels of the regression estimates are indicated as follows: '***' = 1% level, '**' = 5% level and '*' = 10% level.