

Engaging Parents to Prevent Adolescent Substance Use: A Randomized Controlled Trial

Peter Bergman, PhD, Rebecca N. Dudovitz, MD, MSHS, Kulwant K. Dosanjh, MA, and Mitchell D. Wong, MD, PhD

Objectives. To test whether providing information to parents about their child's academic performance and behavior in school will lead to lower rates of adolescent substance use.

Methods. We performed a randomized controlled trial in Los Angeles, California. We enrolled 318 seventh graders and their parents in 2014 and collected data through 2016. Half of the participants had parents with income less than \$15 000, and 81% were Latino. During this intervention, Linking Information and Families Together, we sent parents weekly text messages, telephone calls, or e-mails about missed assignments, grades, and behavior. Parents reported their monitoring and parenting self-efficacy; students reported their use and intentions to use alcohol, marijuana, and other drugs.

Results. By the end of eighth grade, lifetime use of alcohol or marijuana was 18.2% in the control group and 10.2% in the intervention group ($P = .02$). Parenting self-efficacy, parent-child relationship, and student's grades were similar between groups.

Conclusions. The intervention successfully reduced adolescent alcohol and marijuana initiation between grades 7 and 8. The intervention cost \$15 per student per year but could be automated, reducing the marginal cost toward zero. The intervention holds promise as a scalable and innovative approach to reducing substance use.

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The recent opioid epidemic highlights the urgency for more effective substance use prevention programs, particularly among adolescents.¹ Previous programs have largely focused on 2 strategies: (1) improving knowledge about the dangers of substance use and (2) helping adolescents cope with peer pressure.^{2–4} Although these programs are modestly effective, they require substantial training and resources, which limits dissemination and consistent implementation. In short, more effective, more reliable, and less expensive substance use prevention programs are greatly needed.

Parental monitoring is one of the most important protective factors contributing to childhood outcomes and has been linked to lower rates of substance use^{5,6} and better academic achievement.⁷ Similarly, the Centers for Disease Control and Prevention recognizes parental engagement in school as an essential strategy for improving childhood health outcomes.⁸ As children seek greater

independence during adolescence, however, they tend to share less about their lives with their parents, particularly if they are engaging in risky behaviors or performing poorly in school. This increasing fragmentation between school and home life for adolescents is a major barrier to greater parent engagement and monitoring.

Adolescent disclosure and parental monitoring can be described as a classic information asymmetry problem: parents cannot easily monitor and incentivize a child who is unwilling to disclose poor effort or behavior in school. Teachers, however, have important

information about children's academic performance and school behavior. If parents had better connection to teachers and access to this information, they could be more effective and engaged parents. In a previous study, a school-based intervention resolved this information asymmetry problem by informing parents about their child's effort in school and found that doing so improved grades and test scores.⁹ Because of this finding, we conducted a 2-year, randomized controlled trial to test whether the same intervention reduces substance use among middle school adolescents in low-income, minority families.

METHODS

We conducted a randomized trial in 4 public middle schools in Los Angeles, California. We selected participating schools on the basis of their enrollment of students from low-income families, the use of an online gradebook (also known as a school information management system), and their willingness to participate in the study. Three of the participating schools served more than 95% minority, low-income families, and the fourth school served approximately 40% minority, low-income families. In Los Angeles, like other large, urban districts, student achievement in public schools is poor, and many students are economically disadvantaged: 80% of public school students are low income and less than half of students ultimately obtain adequate grades to qualify for California's public colleges.¹⁰

ABOUT THE AUTHORS

Peter Bergman is with Teachers College, Columbia University, New York, NY. Rebecca N. Dudovitz, Kulwant K. Dosanjh, and Mitchell D. Wong are with the David Geffen School of Medicine, University of California, Los Angeles.

Correspondence should be sent to Peter Bergman, 525 W. 120th St., Box 174, New York, NY 10027 (e-mail: bergman@tc.columbia.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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Figure 1 shows the flow of student and parent recruitment and participation in the study. In the spring of 2014, the 4 schools identified all 539 students who were enrolled in the sixth grade. We sent 539 students home with a description of the study and a consent form for their parents to read and complete; 328 parents returned a signed consent form, 144 did not respond, and 47 declined to participate. In the fall of 2014, at the beginning of seventh grade, 10 students whose parents had consented to the study were excluded because they had transferred to a different school over the summer (7) or subsequently refused participation (3). The study investigators assigned the remaining 318 student–parent dyads to the control (153) or intervention (165) arm by simple randomization in a 1 to 1 ratio using a computer-based random number generator.

Description of the Intervention

The intervention, Linking Information and Families Together (LIFT), consisted of weekly messages to parents detailing their child's missed assignments and behavior problems, which we obtained from the online gradebook. We sent messages any week that the student had any missed assignment or behavior problem. Our messages aimed to be neutral in tone to make it easier for teachers to respond to any subsequent communication from the parent as they saw fit. An example of what was sent follows:

Your child did not complete or got a low grade on the following assignments. If they turn them in soon, they may get partial or full credit. Your child can talk with their teacher if they have any questions. ORIGINAL DUE DATE: 02/08/2016, CLASS: Physical Science MS B, ASSIGNMENT: 04 EKS Chemical Reactions.

We sent messages to one of the child's parents, who we identified as the primary caregiver in the baseline parent survey. Research staff sent these messages in the preferred language and method of the parent (text message, telephone call, or e-mail). The intervention started in seventh grade and continued through the end of middle school (eighth grade). Both the intervention group and the control group received usual school communication, including access to an online gradebook, parent–teacher conferences, text messages, e-mails, telephone calls, and quarterly report cards. Teachers were blinded to the intervention assignment, and

other than providing access to the electronic gradebook, they were not involved in the delivery of the intervention.

Data Collection

We collected survey data from student and parent participants after receiving consent from both parents and students. In the fall of seventh grade, we conducted a baseline self-administered survey of students before random assignment, and we surveyed students again in the spring of seventh and eighth grade. Each round of student surveys asked about use and intentions to use alcohol and marijuana. Considering the sensitive nature of substance use questions, students were interviewed in a separate room with no other students or school staff. We recorded responses on an iPad, and we used audio computer-assisted self-interviews, which is designed to improve disclosure of highly sensitive information. We gave students \$5 for each survey they completed.

We conducted a baseline telephone survey of parents at the beginning or just after the intervention began in seventh grade. The parent or guardian who was the primary caregiver for the child was asked to complete the survey. We conducted follow-up surveys at the end of seventh and eighth grade. The parent survey obtained language spoken at home, parent education and income levels, race/ethnicity, and knowledge of their child's grade point average (GPA). We gave parents \$20 for each survey they completed.

We collected academic transcripts from the participating schools for each student, which recorded their marks for achievement by subject from sixth through eighth grade.

Study Retention

Over the 2-year follow-up, 5 (3%) of the control and 10 (6%) of the intervention student–parent dyads refused participation in the surveys after study enrollment and randomization. Seven students in each study arm transferred schools during the study period. The response rate for the eighth grade student survey was 92% (141/153) for the control group and 90% (148/165) for the intervention group ($P = .45$). The response rate for the eighth grade parent survey was 90% (138/153) for the control group and 88%

(146/165) for the intervention group ($P = .68$; Figure 1).

Primary and Secondary Endpoints

Before the study began, we intended to examine self-reported 30-day use of alcohol and marijuana as primary endpoints; however, rates of 30-day use was lower than anticipated (< 10 students [$< 3\%$ of the sample] at eighth grade). Thus, after we completed data collection, we changed the primary endpoints to self-reported lifetime use of alcohol and marijuana—any usage indicated on any survey by the end of the study. These measures followed those of the Youth Risk Behavior Surveillance Surveys.¹¹ We also examined intentions to use alcohol and marijuana because substance use begins to emerge during middle school,¹² intentions are known to predict actual later use,¹³ and these measures allow comparison with other primary prevention programs.¹⁴

Secondary endpoints came from parent and student surveys and students' academic transcripts. We asked parents whether they received communication about their child's academic performance and whether they checked their child's grades online. Parents reported about their parenting self-efficacy regarding their child's academic achievement using a 7-item scale (α range: 0.61–0.71).¹⁵ We also asked parents what “kinds of grades their child gets in school” (mostly As, mostly Bs, mostly Cs, mostly Ds). Our academic outcomes were student GPA, as recorded by schools, and the accuracy of parents' beliefs about their child's GPA.

We asked students about their relationship with their parent.¹⁶ The overall parent–child relationship measure included 5 items and assessed whether children had a safe relationship with their parent. The Cronbachs α ranged from 0.83 to 0.86 from baseline and follow-up surveys in this study. Parent monitoring (9 items) assessed whether the parent knew where they were, what they were doing, and who they spent time with (α : 0.83–0.92). Parenting related to school behaviors (9 items) asked about whether parents rewarded or enforced doing homework and good grades and behavior in school ($\alpha = 0.81–0.87$). Youth disclosure (5 items) assessed whether they told their parents about school and activities outside school (α : 0.72–0.78).

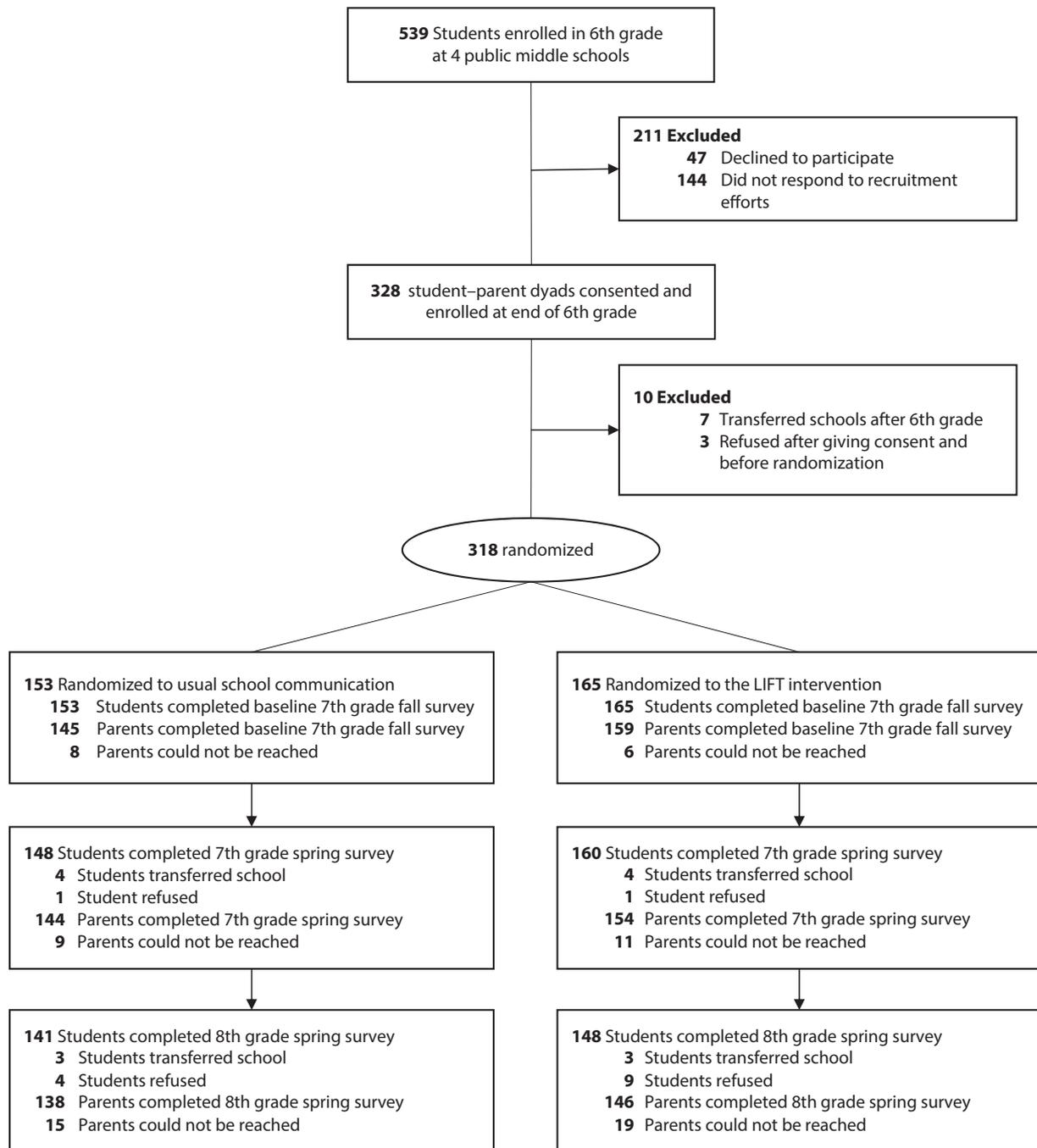


FIGURE 1—Flow of Student and Parent Participants Through the Study: 2014–2016, Los Angeles, CA

Data Analysis

We compared baseline student and parent characteristics by study arm using the χ^2 statistic. Using the mixed command in Stata version 14.0 (StataCorp LP, College Station, TX), we performed hierarchical longitudinal analyses to examine the impact of the

intervention on our primary and secondary outcomes as follows.¹⁷

$$(1) \quad y_{ij} = \beta_0 + \beta_1 treatment_i + X_i\beta_2 + u_j + \varepsilon_{ij}$$

We included random effects, u_j and ε_{ij} , for student and school to account for multiple

observations over time for each individual and nesting of students in schools. Because students were randomly assigned to the treatment, we did not need to control for additional covariates to get unbiased estimates; however, including covariates, X_i , improves power and may reduce bias in small

samples that are unbalanced because of random chance.¹⁸ We therefore used baseline indicators of usage and intentions as control variables, as well as demographic information on students' ethnicity and self-reported sex, primary caregiver's self-reported sex, education, income, and language. We also controlled for family structure (1- vs 2-parent household). All analyses are intent to treat.

There are multiple primary outcomes of interest in 2 key domains: usage and intention to use alcohol and marijuana. Alcohol and marijuana were analyzed separately, but because their use may be correlated, we also examined them as a combined outcome (e.g., lifetime use of alcohol or marijuana). So that the effect sizes for continuous outcomes (parent-child relationship measures and parenting self-efficacy scales) could be more easily interpreted, we standardized the scale scores to place all measures on the same scale, but this standardization does not alter our findings. We included all participants at baseline in the analyses using an intent to treat assignment. We imputed missing baseline data using multiple imputations.¹⁹

RESULTS

Table 1 shows demographics and baseline substance use for the 2 study arms. Just over half of both groups were female. The majority were Latino, 86% and 72% for the intervention and control groups, respectively ($P = .003$). This imbalance does not affect the results, however. The sample was primarily from a disadvantaged background as determined from parental language, education, and income. For example, 45% of the sample reported an annual household income of less than \$15 000. At baseline before the intervention, equal proportions of intervention and control group students reported lifetime use of alcohol or marijuana and intentions to use alcohol or marijuana.

The intervention group received a median of 14 messages about poor academic effort or classroom behavior per year; 8% received zero messages, and 4% received 40 or more messages per year. The average duration of the study follow-up was 16 months and ranged from 12.5 to 21.0 months, which did not differ by study arm ($P = .86$).

TABLE 1—Baseline Student and Parent Characteristics for Control and Intervention Groups: 2014–2016, Los Angeles, CA

Variable	Intervention (n = 165), No. (%)	Control (n = 153) No. (%)	P
Student characteristics			
Girl	91 (55.2)	78 (51.0)	.46
Latino ethnicity	142 (86.1)	111 (72.5)	.003
Lifetime use			
Alcohol	10 (6.1)	6 (3.9)	.38
Marijuana	8 (4.8)	5 (3.3)	.39
Intention to use			
Alcohol	28 (17.0)	16 (10.5)	.09
Marijuana	17 (10.3)	7 (4.6)	.05
Parent characteristics			
Woman is primary caregiver	139 (87.4)	123 (85.4)	.61
2-parent household	112 (70.4)	102 (70.3)	.99
English primarily spoken at home	32 (20.3)	36 (24.8)	.34
≥ 1 parent with high school diploma	63 (40.1)	66 (45.8)	.32
Annual income, \$			
< 15 000	69 (44.8)	64 (45.7)	.86
15 000–29 999	46 (29.9)	38 (27.1)	
≥ 30 000	39 (25.3)	38 (27.1)	

The results of the intervention effects on our primary substance use outcomes are shown in Table 2. On the basis of student surveys conducted at the end of seventh and eighth grade, self-reported lifetime use of marijuana was 10.5% in the control group and 5.6% in the intervention group ($P = .05$). Lifetime alcohol use was higher in the control group but was not statistically significant (12.1% vs 7.6%, respectively; $P = .19$). Combined, lifetime use of alcohol or marijuana was higher in the control group (18.2%) than in the intervention group (10.2%; $P = .02$). Intentions to use alcohol, marijuana, and either alcohol or marijuana were higher among the control group than the intervention group, but the differences did not reach statistical significance. In a sensitivity analysis limiting the analysis to the subset of students who had not previously used marijuana or alcohol at baseline, the results remained similar (Table A [available as a supplement to the online version of this article at <http://www.ajph.org>]).

Table 3 shows the impact of the intervention on various secondary parenting outcomes. In the top panel, we show school-to-parent communication—whether from schools as part of usual business or via the LIFT intervention—as measured by a parent

receiving 3 or more messages from the school about their child's academic progress. Because teachers continued usual messages to parents, both parents reported receiving text messages and other forms of communication, but as expected a greater proportion of parents in the intervention group than in the control group (49.3% vs 36.2%; $P = .002$) reported receiving 3 or more messages about their child's school performance by the end of eighth grade, which shows LIFT increased school to parent communication beyond business as usual.

Intervention group parents were slightly more likely than were control parents to check their child's online gradebook, but this difference did not reach statistical significance (59.2% vs 51.8%; $P = .10$). We also examined how accurate parents' knowledge was about their child's GPA, measured by the difference between parents' perceived GPA and the students' actual GPA obtained from school transcripts. Intervention group parents had more accurate knowledge of their child's GPA. The difference between perceived and actual GPA was 0.05 for the intervention group and 0.23 for the control group ($P = .001$). Parenting self-efficacy regarding their child's academic achievement was similar for the 2 groups.

TABLE 2—Self-Reported Intentions to Use and Lifetime Use of Alcohol and Drugs for Control and Intervention Adolescents: 2014–2016, Los Angeles, CA

	Intervention, No. (%)	Control, No. (%)	Difference: Intervention – Control (95% CI)
Intent to use			
Alcohol	14 (9.5)	23 (16.3)	-6.8 (-14.1, 0.6)
Marijuana	10 (6.7)	10 (7.1)	-0.4 (-6.0, 5.3)
Alcohol or marijuana	17 (11.6)	25 (17.7)	-6.1 (-13.7, 1.4)
Lifetime use			
Alcohol	11 (7.6)	17 (12.1)	-4.5 (-11.3, 2.2)
Marijuana	8 (5.6)	15 (10.5)	-4.9 (-9.8, 0)
Alcohol or marijuana	15 (10.2)	26 (18.2)	-8.0 (-14.9, -1.0)

Note. CI = confidence interval. Results from estimating a linear mixed effects model to account for the random effects for the school. Estimates are adjusted for student sex, ethnicity, baseline use and intention to use, parental sex, language, education, and household income and structure.

Although parents had more accurate knowledge of their child's GPA, there were no effects of the LIFT intervention on students' actual GPAs. In seventh grade, the GPA means for the intervention and control groups were 2.80 and 2.75, respectively (difference 0.05; $P = .29$). In eighth grade, the GPA means were 2.81 and 2.83, respectively (difference = -0.01; $P = .84$).

In the bottom panel of Table 3, we show the parent-child relationship outcomes on the basis of student self-report for the control and intervention groups. We observed no differences in overall parent-child relationship, parental monitoring, parenting related to school behaviors, and youth disclosure. Although we had hypothesized that our intervention would affect parental monitoring or self-efficacy, it did not. Therefore, we did not implement a mediation analysis.

DISCUSSION

We found evidence that providing actionable information to parents about their child's academic performance can reduce adolescents' engagement in substance use. Specifically, we found reductions in the likelihood of students' initiation and intentions to use alcohol and marijuana. Lifetime use of alcohol or marijuana was cut by 44% (10.2% vs 18.2%) over an average 16-month follow-up period from the beginning of seventh through the end of eighth grade. By comparison, 1 of the most effective school-based substance use prevention programs is Project ALERT, which was initially

tested in seventh graders and involved an 8-lesson curriculum that focused on helping adolescents resist peer pressure.¹⁴ Project ALERT reduced lifetime use of alcohol from 22.8% among controls to 16.3% among intervention middle school students at 3 months, but these effects disappeared by 12 months. It had a more sustained effect on marijuana use and at 15 months found 12.1% of control students and 8.3% of intervention students had ever used marijuana. LIFT also has effects comparable with that of the Strengthening Families Program, which is a video-based intervention targeting youths and their parents and has been found to reduce substance use among adolescents over several years.²⁰

Probably the largest barrier to scaling up the delivery of state-of-the-art substance use prevention programs like Project ALERT and the Strengthening Families Program is the time, effort, training, and other resources that are required for implementation. Today, public schools have dwindling resources and teachers who are straining to meet the growing demands and increasing benchmarks for improving academic achievement.²¹ Thus, what is most remarkable about the LIFT intervention is its simplicity and minimal cost. A part-time research assistant was responsible for obtaining gradebook information and communicating with parents. LIFT capitalizes on the growing use of the online gradebook by public and private schools nationwide, which is occurring in the setting of a growing trend to use data and information systems to improve education.²² As there were no other components to LIFT,

we estimated that the marginal cost of the intervention was about \$15 per student per year. Furthermore, this process could easily be automated with current school management software, reducing the cost of the intervention to close to zero.

To better understand the mechanism by which LIFT works, we examined several potential mediating factors (secondary outcomes), including parent monitoring, parenting related to academic achievement, parent-child relationship and support, and parenting self-efficacy. We had hypothesized that when parents are informed that their child is showing poor effort or misbehaving in school, their response would be greater involvement and supervision of their child, leading to overall improvements in behaviors school-related and otherwise. However, we did not see any effect of LIFT on the parent-child relationship. Intervention parents reported receiving more messages, supporting the fidelity of the intervention, and they had more accurate knowledge of their child's grades.

These findings suggest that the intervention had an impact on some parental monitoring and awareness of their child's academic performance. However, exactly how LIFT reduces adolescent substance use remains unclear. One explanation for why we did not see differences in the parent-child relationship is that the measures we used were not sensitive enough to capture differences between groups or over time. Another possibility is that LIFT affects substance use through other unmeasured mechanisms. For example, the "crowd-out" hypothesis suggests that students who have more stringent academic requirements and expectations have less free time to engage in substance use and other risky behaviors. There is some evidence to suggest this may be true,²³ but we did not measure free time or time spent doing homework.

It is also worth noting that we did not observe any improvement in grades as a result of the intervention. This observation is consistent with other studies of the LIFT intervention, which has been found to substantially improve grades and standardized test scores among high school students but not among middle school students.^{9,24,25} One possible reason for the heterogeneous effect of LIFT among middle and high school students

TABLE 3—Parenting Outcomes for Control and Intervention Groups: 2014–2016, Los Angeles, CA

	Intervention No. (%) or Mean \pm SD	Control No. (%) or Mean \pm SD	Difference: Intervention – Control (95% CI)
Parent reported			
Received 3 or more messages about child's school performance	72 (49.3)	50 (36.2)	13.2 (4.70, 21.7)
Checked child's online gradebook	86 (59.2)	71 (51.8)	7.4 (–1.50, 16.2)
Knowledge of child's GPA (difference between perceived GPA and actual GPA)	0.05 \pm 0.08	0.23 \pm 0.08	–0.18 (–0.30, –0.07)
Parenting self-efficacy score	9.04 \pm 0.39	9.01 \pm 0.40	0.02 (–0.17, 0.21)
Student reported			
Parent-child relationship quality score	1.82 \pm 0.18	1.95 \pm 0.19	–0.13 (–0.33, 0.06)
Parental monitoring score	4.97 \pm 0.31	4.86 \pm 0.34	0.11 (–0.08, 0.3)
Parenting on school behaviors score	4.30 \pm 0.16	4.32 \pm 0.17	–0.02 (–0.21, 0.17)
Youth disclosure score	4.34 \pm 0.22	4.28 \pm 0.25	0.05 (–0.15, 0.26)

Note. CI = confidence interval; GPA = grade point average. GPA ranges in integers from 0 to 4, where 0 is failing, 1 = D, 2 = C, 3 = B, and 4 = A. Actual GPA was obtained from school transcripts. Scores for the parenting self-efficacy, relationship quality, monitoring, school behaviors, and youth disclosure measures were standardized. A higher score indicates a more positive relationship between parent and child. Results are from estimating a linear mixed effects model to account for the random effects for the school. Estimates are adjusted for student sex, ethnicity, parental sex, language, education, and household income and structure.

is that high school grades are critical for college acceptance, whereas middle school grades are not part of the college selection process. Thus, parents and students may be more invested in high school performance, especially in response to the LIFT intervention. Another possibility is that information asymmetry occurs when there is a greater separation or divide between the child and parent.

For many students, independence and growing separation may not occur until high school. Consequently, LIFT might be more effective during late adolescence, which is concurrent with high school. Finally, high school teachers and grading policies may be more sensitive to changes in students' classroom behavior and homework practices. Regardless of the mechanism, considering that LIFT has a bigger effect on high school academic achievement, determining whether LIFT might also be more effective at reducing substance use among high school students is an important area for future study, particularly because substance use increases greatly during late adolescence.^{26,27}

Limitations

There are several study limitations. First, our sample is small and comes from 4 public middle schools in the Los Angeles Unified School District, which may not generalize to other populations or school settings.

However, LIFT-type interventions have now been tested and shown to effectively improve academic outcomes in many schools across different countries and populations.^{9,24,25,28–31} Second, we do not have detailed information on parental monitoring outside school performance. We suspect that increased parental monitoring of academic performance might lead to increased monitoring of other behaviors, such as substance use. However, consenting families may have had higher than average parental engagement at the outset.

Future studies are needed to clarify these potential mechanisms. We also relied on students' self-reported behaviors, recorded in school settings, and it is possible that intervention students provided more socially acceptable responses. This potential confounding may be mitigated by the fact that the intervention did not directly target substance use behaviors; the levels of responses are more likely to be biased than are differential responses between intervention and control students. Lastly, we did not observe longer-run outcomes after middle school to discern whether the effects found in our study persisted after the intervention had concluded.

Conclusions

In recent years, online classroom management systems have become increasingly useful and affordable, and they have been

increasingly adopted by public and private schools nationwide. In some schools, particularly those that are low performing, the rate of parental use of these online gradebook systems is low and indicates a potentially enormous missed opportunity.³² The LIFT intervention takes advantage of the growing adoption of “ed-tech” and is an innovative approach to reducing marijuana and alcohol use. Our results suggest that LIFT is promising and worth further investigation, especially considering the current epidemic of substance abuse and the potential for rapid dissemination of this low-cost, highly scalable, and potentially effective intervention. **AJPH**

CONTRIBUTORS

P. Bergman collected the data. P. Bergman, R. N. Dudovitz, and M. D. Wong contributed to study design and data analysis. P. Bergman, K. K. Dosanjh, and M. D. Wong edited the article. P. Bergman and M. D. Wong drafted the article. R. N. Dudovitz contributed to data interpretation and reviewing and revising the article. K. K. Dosanjh and M. D. Wong contributed to study implementation, school and participant recruitment, and data collection.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

This study was approved by the University of California, Los Angeles institutional review board, and written consent was obtained from all participants. It is registered at clinicaltrials.gov (identifier NCT02129153).

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