Journal of Health Science and Education
An open access journal
ISSN 2817-1780
eSciRes
ISSN 2817-1780
Research Article JHSE-1-109

# Implementing School wide PBIS in Middle Schools: Results of a Randomized Trial

**Sprague JR[1*], Biglan A[2], Rusby J[2], Gau J[2] and Vincent C[1]**
[1]*Department of Special Education and Clinical Sciences, The University of Oregon, USA*
[2]*Oregon Research Institute, Oregon, USA*

**Abstract**

This study aimed to experimentally evaluate the impact of school wide Positive Behavior Interventions and Supports (SWPBIS) on early adolescent development through a randomized control trial involving 35 middle schools in the Pacific Northwest. The impact of two levels of SWPBIS training and technical assistance on school discipline practices and student behavior was evaluated. Dependent measures included a student survey focused on healthy and harmful behaviors (antisocial behavior, alcohol, tobacco and other drug use), participation in decision-making, rule awareness, teacher praise received, rule compliance, treatment from peers, treatment of peers, protective behaviors, and positive teacher/staff relationships. Archival data regarding exclusionary discipline (in and out of school suspension, expulsion and truancy) and academic outcomes were analysed. The independent variable (implementation fidelity) was measured using direct observations, interviews and staff member surveys. The treatment schools achieved a significantly higher level of SWPBIS implementation. Students in the treatment schools reported significantly less growth in antisocial behavior and substance abuse. Other student self-report data presented trends in the expected direction but were not statistically significant. At the school level, no significant differences were found in the analysis of direct observation data or archival school records. Results are discussed in terms of the need to refine and add intervention elements to the basic SWPBIS protocol to further strengthen observed effects.

**Keywords:** School wide positive behavior supports; Middle school; Adolescence; Substance abuse; Intervention fidelity

## Introduction

In early adolescence, youth experience the rapid biological and social changes of puberty. They strive for more autonomy at the same time they encounter more opportunities to engage in risky behaviors. The transition to middle or junior high school typically involves a greater number of teachers and a reduction of supportive contacts with teachers [1], the break-up of the peer network [2] and an increase in academic competitiveness [3,4]. In addition, there is an increased emphasis on discipline and a reduction in student autonomy [1,5], despite the fact that as young people grow older, they want to take greater responsibility for their own behavior [6]. It is not surprising that in turn, many students in middle school feel less connected to school than do children in elementary school [7] and they experience less social support and increased daily stress in school [8].

The stressful context of this developmental phase helps elucidate why the transition to middle school has been shown to be associated with a) A decline in grades [9,10] and interest in school [1,11], b) Decreased beliefs in academic and social competence and self-esteem [12,13] and c) Increases in general psychological distress [9]. Taken together, the turmoil of this time increases opportunities for both positive and negative outcomes, making this an especially opportune time to provide the skills and support to succeed [14].

### School wide PBIS

There is growing evidence that a school wide, systems approach to behavior management can prevent many of the problems that middle school settings often exacerbate [15-17].

Commonly referred to as School Wide Positive Behavior Interventions and Support (SWPBIS; [15], SWPBIS is a multiple systems approach to addressing the problems posed by antisocial students and coping with challenging forms of student behavior. The key practices of SWPBIS include (a) Clear definitions of expected appropriate, positive behaviors provided for students and staff members; (b) Clear definitions of problem behaviors and their consequences for students and staff members; (c) Regularly scheduled instruction and assistance in desired positive social behaviors; (d) Incentives and motivational systems provided to encourage students to behave appropriately; (e) School staff committed to staying with the intervention over the long term to monitor, support, coach, debrief, and provide booster lessons for students as necessary to maintain the achieved gains; (f) Staff who receive training, feedback, and coaching about effective implementation of the intervention and (g) Established systems for measuring and monitoring the intervention's effectiveness that are carried out regularly [18].

Several studies, including two randomized controlled studies of school-wide PBIS in elementary schools, have shown that implementation of the model is associated with significant reductions in office discipline referrals and suspensions [19,20] and other problem behavior [21] such as teacher-ratings of classroom behavior problems, concentration problems, emotion regulation problems, and bullying [22].

Despite encouraging findings in elementary schools, however, the approach has not been evaluated in a randomized controlled trial in middle schools. Therefore, the present study experimentally evaluated the impacts of SWPBIS on reducing the level of in-school problem behavior, improving academic achievement, preventing the development of deviant peer

groups, and reducing the prevalence of substance use and anti-social behavior in non-school settings. Our hypothesis was that successful and sustained implementation of SWPBIS would alter the trajectory of at-risk children away from destructive outcomes such as substance use and antisocial behavior.

**Research questions**

- Can SWPBIS be implemented with fidelity in middle schools?
- Is SWPBIS associated with changes in healthy and harmful student behaviors?
- Do changes in student perceptions of key school climate constructs differ across condition, gender, and race/ethnicity?
- Is SWPBIS associated with changes in archival discipline and academic performance data?

## Methodology

The data were collected within the framework of a group randomized effectiveness study funded by the National Institute on Drug Abuse.

**Design**

A waitlist control design with random assignment to condition (Full SWPBIS *vs.* a one-day workshop on SWPBIS) was used across the 35 schools. One school dropped out from the study in year one. Figure 1 presents the logic and timeline of the study.

| | Baseline | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|---|
| Cohort 1 | Y1 Fidelity, Archival Data | Y2 Fidelity, Student Survey, Archival Data | Y3 Fidelity, Student Survey, Archival Data | Y4 Fidelity, Student Survey, Archival Data | |
| Cohort 2 | | Y1 Fidelity, Archival Data | Y2 Fidelity, Student Survey, Archival Data | Y3 Fidelity, Student Survey, Archival Data | Y4 Fidelity, Student Survey, Archival Data |

**Figure 1:** Research design.

**Participating schools and students**

Recruitment of participating schools was restricted to the state of Oregon, and a database of all Oregon middle schools was obtained from the Oregon Department of Education. Eligible schools were contacted by email or phone, excluding alternative and charter schools. Schools that indicated they had already received SWPBIS training or that were already implementing the major SWPBIS components were excluded. Schools were explained the project and the requirements for participation and that a stipend for participation in the student surveys would be provided to help offset the cost of substitute teachers for staff development activities. They were also informed that they would be assigned at random to either the treatment or control condition. From the pool of 36 schools that indicated interest a rank order list was created based on school size (enrollment) and randomly assigned schools to treatment or control using a computer-generated "coin flip." Schools were not informed of their condition assignment.

Table 1 provides a comparison of treatment and control schools on enrollment, race, free and reduced lunch, percent minority, school size, and school locale. T-tests and Cohen's d-statistic with the convention small 0.20, medium, 0.50 and large 0.80, were used to compare mean percent of minority student enrollment (t [33]=0.51, p=0.615, d=0.17) and mean percent of students on free and/or reduced lunch (t [33]=0.45, p=0.658, d=0.15). Chi-square tests and Cohen's phi (Φ) with the convention small 0.10, medium 0.30, and large 0.50, were used to compare the proportions reported for size ($\chi^2$[2,35]=2.31, p=0.316, Φ=0.25) and locale ($\chi^2$[2.35]=0.72, p=0.699, Φ=0.14) by study condition.

| | **Treatment (n=18 Schools, 6,492 Students)** | | **Control (n=17 schools, 7,006 students)** | |
|---|---|---|---|---|
| | N | % | N | % |
| Enrollment by race | | | | |
| White | 4749 | 73.2 | 4724 | 67.4 |
| African-American | 136 | 2.1 | 163 | 2.3 |
| Hispanic | 1098 | 16.9 | 1553 | 22.2 |
| Asian | 256 | 3.9 | 171 | 2.4 |
| American Indian/Alaskan Native | 253 | 3.9 | 395 | 5.6 |
| Size | | | | |
| Small (<250) | 8 | 44.4 | 4 | 23.5 |
| Medium (251-500) | 7 | 38.9 | 7 | 41.2 |
| Large (>500) | 3 | 16.7 | 6 | 35.3 |
| Locale | | | | |
| Rural | 8 | 44.4 | 8 | 47.1 |
| Town | 6 | 33.3 | 7 | 41.2 |
| Suburban/city | 4 | 22.2 | 2 | 11.8 |
| | Mean | SD | Mean | SD |
| Free or Reduced Lunch (Mean, SD) | 61.17 | 18.1 | 63.89 | 18.0 |
| Minority (Mean, SD) | 23.94 | 17.4 | 27.51 | 27.5 |

**Table 1:** School-level summary of at study year 1.

No statistically significant differences were found and effect sizes were all small except for school size, which showed close to a medium effect size. Comparison of proportions shows control schools with a larger percentage of schools with more than 500 students. All students in the school were eligible to participate in the student surveys and

direct observation components, as well as their representation in the archival measures we collected. These are described next.

**Measures**

**Student survey data:** Several constructs were assessed as part of the annual student survey. Measures of internal consistency were obtained from the first annual assessment of the survey. Constructs included perpetrator of overt aggression (α=0.74), victim of overt aggression (α=0.32), perpetrator of relational aggression (α=0.83), victim of relational aggression (α=0.89), antisocial behavior (α=0.94), antisocial peer behavior (α=0.87), safety (α=0.87), substance use (α=0.92), participation in decision-making, rule awareness, teacher praise received, rule compliance, protective behaviors, and positive teacher/staff relationships. A complete list of survey questions is available from the first author.

**School archival data:** Academic and behavior data from the Oregon Department of Education were collected for all participating schools. These are described briefly here.

**School level achievement:** Data regarding the proportion of students who met or exceeded performance level for their grade from the standardized Oregon Assessment of Knowledge and Skills (OAKS) reading and math tests were collected (http://www.ode.state.or.us/search/results/?id=169). Discipline data. State wide discipline incident data were compared for Treatment and Control schools over the course of three study years. A rate was computed that took the total number of building level discipline incidents (obtained from the Oregon Department of Education) and divided it into the total school population for each year (obtained from the NCES database). This creates a rate per 100 students per day. This metric is commonly used in SWPBIS research [23,24].

The following types of disciplinary incidents were recorded in the dataset: in school suspension (ISS), out-of-school suspension (OSS), expulsion (EXP), and total days missed. ISS was defined as temporarily removing a student from the regular classroom while he or she remains under the supervision of school personnel; OSS was defined as a temporarily removing a student from the regular school to another setting; EXP was defined as removing a student from the regular school for the remainder of the school year or longer; ISS, OSS, and EXP were recorded as events as well as associated with durations measured in half day increments.

**Analyses of student survey data:** Random coefficients analysis was used to examine nested data; repeated measures nested within students, students nested within cohorts, and cohorts nested within schools [25,26]. Figure 2 shows participation by cohort, year, and grade for a hypothetical increasing dependent variable across students in a single school, for example change in problem behavior. Cohorts are depicted by the solid lines in Figure 1 and Cohort -1 represents the 7th and 8th graders at the beginning of the study; Cohort 0 represents the first and only cohort with data across all three years in middle school, 6th through 8th grade; Cohort 1 represents 6th and 7th grade students in study year 2; and Cohort 2 the 6th graders at the end of the study. For each cohort, the random coefficient model estimated an intercept and a slope (except Cohort 2, which has only one time point) and included effects of condition on school-level parameters. Tests of condition effects take place at this level because schools, not cohorts or students, were randomly assigned to condition.

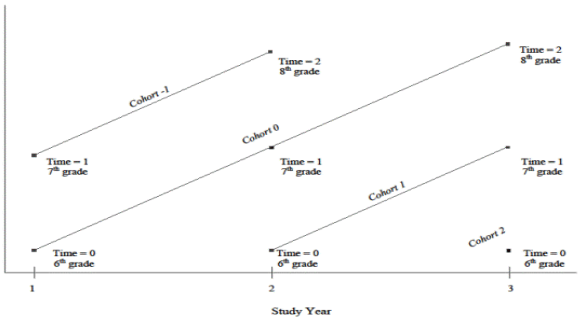


**Figure 2:** Random coefficients analysis model.

The random coefficient model can be represented by a set of equations. The equation below represents the level-1 model within students. Where, Yijkl represents the outcome for assessment on occasion i for individual j in cohort k within school l. Timeijkl was coded 0 at each student's entry into middle school, 6th grade, and increased by 1 for each successive year. The terms π0jkl and π1jkl represent the intercept and slope for students' trajectories over time within each cohort and school. Finally, the model includes a random term, rijkl.

$$Yijkl = \pi 0jkl + \pi 1jkl TIMEijkl + rijkl$$

The level-2 equations below model variation in the level-1 parameters. The fixed part of the model represents the average intercept, β00kl, and average slope, β10kl, within cohort and within school. The random part gives student-level variation around the mean intercept, u0jkl, and mean slope, u1jkl.

$$\pi 0jkl = \beta 00kl + u0jkl$$

$$\pi 1jkl = \beta 10kl + u1jkl$$

Next is the cohort-level portion of the model again predicting the variation in parameters from the lower-level equations, in this case the cohort-level intercepts and slopes. The following two equations estimate the change across years in these cohort-level parameters.

$$\beta 00kl = \gamma 000l + \gamma 001l YEARkl + v00kl$$

$$\beta 10kl = \gamma 100l + \gamma 101l YEARkl + v10kl$$

The γ000l and γ001l terms in the first equation model the trajectory of cohort-level intercepts across each school. The random variation around this trajectory is represented by v00kl. The second equation models the initial cohort-level slope, γ100l, and the change in cohort-level slopes across time, γ101l, that is, across cohorts within each school. The cohort-level variation in slopes is captured by v10kl. Cohorts are represented by the year variable, YEAR, which starts at zero for the first 6th grade cohort and progresses to 2 for the cohort that begins 6th grade in the last year of the study. As shown in Figure 2, the cohort labeled Cohort -1 begins the study in 7th grade. They will have a YEAR value of -1 since they were in 6th grade one year before the study.

In the final level of the model, school-level effects were assessed. Most importantly, we use condition, Cl, assigned at the school level, to predict school-level changes in cohort intercepts or slopes. For each of the cohort equations above, then, we have two more equations. The first pair specifies effects on average cohort intercepts:

$$\gamma 000l = \zeta 0000 + \zeta 0001Cl + w000l$$

$$\gamma 001l = \zeta 0010 + \zeta 0011Cl + w001l$$

With Cl coded 0 for control schools and 1 for intervention schools, the ζ0000 term represents the mean of cohort-level intercepts from control schools. The term ζ0001 estimates the difference in cohort intercepts between control and intervention schools. Random variation around those school parameters is captured by w000l. The second equation estimates the average change in cohort intercepts across years for control schools, ζ0010, and the difference in change associated with condition, ζ0011. Random variation among schools is captured with the term w001l.

The following two equations account for variance in average slopes of cohorts across time at the school level.

$$\gamma 100l = \zeta 1000 + \zeta 1001Cl + w100l$$

$$\gamma 101l = \zeta 1010 + \zeta 1011Cl + w101l$$

The first equation accounts for variance in the school-level averages of cohort slope at the first year in the study, cohort 1. The first term, ζ1000, provides a mean of the first cohort slopes among control schools. The second term, ζ1001, estimates the difference intervention and control schools.

School-level variation around the intercept of cohort slopes is captured with the random effect w100l. The ζ1010 term estimates the average change in cohort slopes across control schools. The ζ1011 term estimates the difference between intervention and control schools in cohort slopes. School-level random variation is given by w101l.

By substituting each set of equations into the previous set, and rearranging terms, the following model was obtained, with the fixed terms on the first two lines and random terms on the second two:

$$Yijkl = \zeta 0000 + \zeta 0001Cl + \zeta 0010YEARkl + \zeta 0011ClYEARkl + \zeta 1000TIMEijkl + \zeta 1001ClTIMEijkl$$

$$+ \zeta 1010YEARklTIMEijkl + \zeta 1011ClYEARklTIMEijkl$$

$$+ w000l + w001lYEARkl + w100lTIMEijkl + w101lYEARklTIMEijkl$$

$$+ v00kl + v10klTIMEijkl + u0jkl + u1jklTIMEijkl + rijkl$$

In the above model, two of the four terms containing condition, Cl, provide the most important tests for intervention effects and are the focus of this paper (terms are underlined). First, we will test the difference between conditions on slopes of the Cohort 0's across schools, a test of the ζ1001 term. This would test whether the cohort of students entering 6th grade at the outset of our study experience less growth in problem behavior, say, over their middle school lives when they are in SWPBIS schools compared to when they are in control schools.

Second, the ζ1011 term provides a test for change in cohort slopes across time. This effect is more difficult to picture. With a measure of problem behavior that includes antisocial behavior and drug use, cohorts of students are most likely report very low level of problem behavior initially. The average cohort, however, likely increases its levels of problem behavior through 8th grade. To the extent that the SWPBIS intervention reduces problem behavior, later cohorts in PBS schools should show a lower trajectory than earlier cohorts had in SWPBIS schools. The term for a change in slopes allows us to test for this effect within the context of the larger model. Random coefficient growth models also were used to examine differences in school-level achievement and discipline rates between PBIS intervention and control schools. However, because data are aggregated at the school level observations are considered independent and thus non-nested, except for repeated assessments. The equation below represents the level-1 model for schools. Where, Yij represents the outcome for assessment on occasion i for school j. TIME was coded 0 during study year 1, and increased by 1 for each successive year. The terms π0i and π1i represent the intercept and slope for a school's trajectories over time. Finally, the model includes a random term, rij.

$$Yij = \pi 0i + \pi 1iTIME + rij$$

The level-2 equations below model variation in the level-1 parameters. The fixed part of the model represents the average intercept, γ00, and average slope, γ10, across all schools. We will use condition, Ci, assigned to each school and coded 0 for control and 1 for PBIS to predict school-level changes in intercepts and slopes. The random part gives school-level variation around the mean intercept, u0i, and mean slope, u1i.

$$\pi 0i = \gamma 00 + \gamma 01Ci + u0i$$

$$\pi 1i = \gamma 10 + \gamma 11Ci + u1i$$

By substituting each set of equations into the previous set, and rearranging terms, the following model is obtained, with the fixed terms on the first line and random terms on the second:

$$Yij = \gamma 00 + \gamma 10Timeij + \gamma 01Ci + \gamma 11CiTIME +$$

$$u0i + u1iTIME + rij$$

In the above model, the γ11 term provides the condition by time interaction and is a test of whether school-level rates of achievement and discipline differed for PBIS intervention schools compared to control schools over the course of the three-year study period.

Hedge's g was computed as the effect size for the intervention effects estimated from the nested and non-nested growth models. Hedge's g, like Cohen's d-statistic, is a standardized mean difference with the effect size convention 0.20 small, 0.50 medium, and 0.80 large, but differ in computation of the pooled standard deviation [27]. The numerator was the estimated intervention effects (ζ1001 and ζ1011 from the nested models and γ11 from the non-nested models) and represents the group mean differences at the school level and the school-level standard deviation was used to compute the pooled standard deviation.

## Results

### Student surveys

Table 2 shows summary statistics for school-level study outcomes from the survey measures for Cohort 0 and Cohort 1; the cohorts that provide the test of whether the students entering 6th grade at the outset of the study (Cohort 0) experience differential growth over the middle school years for SWPBIS schools compared to control schools and differential rates of change for a later cohort (Cohort 1) in SWPBIS schools compared to control schools.

| **Cohorts** | **Intervention Schools (n=18)** | | | | | | **Control Schools (n=17)** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Time 0** | | **Time 1** | | **Time 2** | | **Time 0** | | **Time 1** | | **Time 2** | |
| | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** |
| Perpetrator overt aggression ↓ | | | | | | | | | | | | |
| Cohort 0 | 3.32 | 0.60 | 4.22 | 1.10 | 4.43 | 0.71 | 3.51 | 0.87 | 4.42 | 0.80 | 4.17 | 0.61 |
| Cohort 1 | 3.54 | 0.53 | 3.46 | 0.51 | -- | -- | 3.68 | 0.60 | 3.51 | 0.55 | -- | -- |
| Perpetrator relational aggression ↓ | | | | | | | | | | | | |
| Cohort 0 | 6.99 | 1.07 | 8.16 | 2.37 | 7.32 | 1.02 | 7.65 | 1.72 | 7.81 | 1.06 | 7.51 | 0.89 |
| Cohort 1 | 7.63 | 0.96 | 7.16 | 0.81 | -- | -- | 7.16 | 0.85 | 6.99 | 0.66 | -- | -- |
| Victim overt aggression ↓ | | | | | | | | | | | | |
| Cohort 0 | 4.57 | 0.73 | 5.17 | 1.19 | 4.75 | 0.60 | 4.79 | 1.15 | 5.26 | 0.93 | 4.61 | 0.72 |
| Cohort 1 | 5.09 | 0.85 | 4.61 | 0.52 | -- | -- | 4.74 | 0.79 | 4.65 | 0.77 | -- | -- |
| Victim relational aggression | | | | | | | | | | | | |
| Cohort 0 | 11.41 | 1.65 | 11.86 | 2.70 | 10.65 | 1.86 | 11.45 | 2.03 | 12.28 | 1.94 | 10.89 | 1.60 |
| Cohort 1 | 12.38 | 1.65 | 11.72 | 2.30 | -- | -- | 11.71 | 1.73 | 11.60 | 1.46 | -- | -- |
| Antisocial behavior ↓ | | | | | | | | | | | | |
| Cohort 0 | 12.67 | 1.16 | 13.96 | 2.10 | 14.21 | 1.62 | 12.73 | 0.62 | 13.87 | 1.31 | 14.42 | 1.74 |
| Cohort 1 | 12.58 | 0.40 | 12.54 | 0.55 | -- | -- | 12.97 | 0.73 | 12.88 | 0.71 | -- | -- |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antisocial peer behavior ↓ | | | | | | | | | | | | |
| Cohort 0 | 13.05 | 1.29 | 17.19 | 3.18 | 17.99 | 2.95 | 13.91 | 2.00 | 18.36 | 2.79 | 18.39 | 2.65 |
| Cohort 1 | 16.25 | 5.32 | 14.60 | 1.76 | -- | -- | 14.56 | 1.84 | 14.30 | 1.41 | -- | -- |
| Safety ↑ | | | | | | | | | | | | |
| Cohort 0 | 19.49 | 0.93 | 18.82 | 1.09 | 19.55 | 1.06 | 18.92 | 1.44 | 18.84 | 1.47 | 19.31 | 1.09 |
| Cohort 1 | 19.45 | 0.82 | 19.63 | 1.10 | -- | -- | 19.25 | 1.68 | 19.24 | 1.59 | -- | -- |
| Substance use ↓ | | | | | | | | | | | | |
| Cohort 0 | 12.40 | 0.67 | 12.79 | 0.63 | 13.48 | 1.06 | 12.41 | 0.28 | 13.14 | 1.39 | 13.73 | 1.06 |
| Cohort 1 | 12.34 | 0.47 | 12.30 | 0.36 | -- | -- | 12.58 | 0.50 | 12.46 | 0.45 | -- | -- |
| M=Mean; SD=Standard Deviation; ↓= A lower score is better; ↑=A higher score is better | | | | | | | | | | | | |

**Table 2:** Descriptive statistics for student survey outcomes by cohort and study condition.

Table 3 shows the fixed and random component estimates for the nested random coefficient growth models examining change in the outcomes from the survey measures. Condition effects testing differences in growth from 6th grade to 8th grade for Cohort 0 (ζ1001) indicate differences in slopes between intervention and control schools favoured control schools; a positive estimate indicates the rates are increasing at a steeper trajectory for the SWPBIS schools. However, none of the effects were significant and the average effect size was g=0.11, a small effect. The largest effect, g=0.21 for perpetrator of overt aggression, was also a small effect. Condition effects associated with change in the later cohort (ζ1011) shows that for six of the seven negative outcomes the later cohort PBIS schools trajectories are flatter over time compared to the later cohort control schools. For two of the negative outcomes, antisocial behavior and substance use, the rate of increase was significantly less steep in PBIS schools compared to control schools and the difference in rates were in the range of medium effect sizes (g=0.45 and g=0.40 for antisocial behavior and substance use, respectively). Control schools in the later cohort showed a non-significant slower rate of increase for perpetrator of relational aggression (g=0.14, small effect) compared to SWPBIS schools. SWPBIS schools in the later cohort showed a non-significant greater increase in school safety (g=0.16, small effect) compared to their control school counterparts.

| | **POA** | **PRA** | **VOA** | **VRA** | **ANTI** | **ANTIP** | **SAFE** | **USE** |
|---|---|---|---|---|---|---|---|---|
| Fixed effects | | | | | | | | |
| Intercept, ζ0000 | 3.623 | 7.281 | 4.944 | 11.841 | 12.952 | 14.177 | 18.72 | 12.43 |
| | -0.122 | -0.181 | -0.149 | -0.339 | -0.183 | -0.443 | -0.241 | -0.115 |
| Time, ζ1000 | 0.405 | 0.21 | -0.067 | -0.235 | 0.788 | 2.49 | 0.163 | 0.558 |
| | -0.084 | -0.137 | -0.096 | -0.223 | -0.151 | -0.321 | -0.119 | -0.097 |
| Cohort, ζ0010 | -0.016 | 0.042 | -0.142 | 0.158 | -0.01 | 0.492 | 0.052 | 0.063 |
| | -0.079 | -0.128 | -0.105 | -0.207 | -0.15 | -0.272 | -0.137 | -0.1 |
| Condition, ζ0001 | -0.097 | 0.095 | -0.039 | -0.193 | -0.335 | -0.607 | 0.419 | -0.233 |
| | -0.169 | -0.252 | -0.207 | -0.473 | -0.254 | -0.617 | -0.336 | -0.16 |
| Time by cohort, ζ1010 | -0.009 | -0.212 | -0.016 | -0.162 | 0.191 | -0.434 | -0.183 | 0.003 |
| | -0.079 | -0.126 | -0.103 | -0.196 | -0.179 | -0.272 | -0.115 | -0.109 |
| Cohort by condition, ζ0011 | 0.081 | 0.007 | 0.138 | 0.096 | 0.24 | 0.698 | -0.118 | 0.205 |
| | -0.111 | -0.179 | -0.146 | -0.291 | -0.209 | -0.38 | -0.191 | -0.14 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time by condition, ζ1001 | 0.137 | 0.027 | 0.105 | 0.057 | 0.122 | 0.317 | -0.15 | 0.1 |
| | -0.118 | -0.193 | -0.103 | -0.312 | -0.213 | -0.449 | -0.168 | -0.137 |
| | p=0.246 | p=0.889 | p=0.434 | p=0.856 | p=0.566 | p=0.481 | p=0.372 | p=0.467 |
| | g=0.21 | g=0.03 | g=0.16 | g=0.03 | g=0.07 | g=0.12 | g=0.14 | g=0.09 |
| Time by cohort by condition, ζ1011 | -0.076 | 0.123 | -0.112 | -0.195 | -0.571 | -0.666 | 0.221 | -0.329 |
| | -0.111 | -0.177 | -0.142 | -0.273 | -0.25 | -0.38 | -0.161 | -0.153 |
| | p=0.4931 | p=0.4861 | p=0.4309 | p=0.4769 | p=0.0223 | p=0.0796 | p=0.1708 | p=0.0318 |
| | g=0.12 | g=0.14 | g=0.16 | g=0.12 | g=0.45 | g=0.33 | g=0.16 | g=0.40 |
| Variance components intercepts | | | | | | | | |
| School-level, w100l | 0.138 | 0.267 | 0.19 | 1.186 | 0.163 | 2.022 | 0.665 | 0.049 |
| | -0.052 | -0.118 | -0.089 | -0.427 | -0.094 | -0.791 | -0.224 | -0.04 |
| Cohort-level, v00kl | 0.08 | 0.2 | 0.278 | 0.471 | 0.17 | 1.166 | 0.335 | 0.1 |
| | -0.035 | -0.08 | -0.085 | -0.204 | -0.1 | -0.44 | -0.106 | -0.049 |
| Student-level, u0jkl | 2.317 | 3.227 | 2.927 | 25.206 | 0.923 | 21.592 | 8.084 | 0 |
| | -0.123 | -0.316 | -0.114 | -0.798 | -0.564 | -1.331 | -0.291 | (NA) |
| Slopes | | | | | | | | |
| School-level, w101l | 0.053 | 0.15 | 0.053 | 0.442 | 0.036 | 0.935 | 0.114 | 0.031 |
| | -0.027 | -0.074 | -0.04 | -0.197 | -0.083 | -0.406 | -0.589 | -0.032 |
| Cohort-level, v10kl | 0.04 | 0.086 | 0.139 | 0.22 | 0.232 | 0.464 | 0.049 | 0.054 |
| | -0.021 | -0.046 | -0.045 | -0.107 | -0.104 | -0.271 | -0.04 | -0.036 |
| Student-level, u1jkl | 0.91 | 1.923 | 0.251 | 0 | 13.751 | 21.667 | 0.793 | 5.414 |
| | -0.063 | -0.153 | -0.05 | (NA) | -0.442 | -0.87 | -0.131 | -0.164 |
| Residual | 5.412 | 16.187 | 4.921 | 35.667 | 28.092 | 52.325 | 12.065 | 11.869 |
| | -0.106 | -0.311 | -0.094 | -0.641 | -0.585 | -1.079 | -0.233 | -0.183 |
| Table entries show fixed effects and variance estimates with standard errors in parenthesis; Estimates underlined are significant at p<0.05, bolded at p<0.01, bolded and underlined at p<0.001. Additionally, exact p-values and measure of effect size, Hedges' G, is reported for the parameter estimates of interest for the current study; POA=Perpetrator of Over Aggression; PRA=Perpetrator of Relational Aggression; VOA=Victim of Overt Aggression; VRA=Victim of Relational Aggression; ANTI=Antisocial Behavior; ANTIP=Antisocial Peer Behavior, SAFE=Safety; USE=Substance use | | | | | | | | | |

**Table 3:** Fixed effects and variance components estimates from random coefficient growth models.

| **Factors** | **Intervention Schools (n=18)** | | | | | | **Control Schools (n=17)** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Year 1** | | **Year 2** | | **Year 3** | | **Year 1** | | **Year 2** | | **Year 3** | |
| | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** | **M** | **SD** |
| School-level achievement | | | | | | | | | | | | |
| Math | 65.7 | 9.9 | 66.8 | 9.2 | 64.0 | 11.8 | 65.4 | 11.1 | 70.3 | 10.4 | 61.1 | 16.4 |
| Reading | 66.7 | 9.3 | 66.8 | 9.0 | 71.0 | 8.4 | 66.8 | 11.5 | 69.8 | 12.3 | 69.9 | 11.2 |
| Discipline | | | | | | | | | | | | |
| Expulsion rate | 0.002 | 0.004 | 0.002 | 0.003 | 0.003 | 0.006 | 0.003 | 0.004 | 0.003 | 0.005 | 0.003 | 0.004 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In-school suspension rate | 0.071 | 0.094 | 0.064 | 0.087 | 0.058 | 0.060 | 0.135 | 0.189 | 0.097 | 0.133 | 0.095 | 0.145 |
| Out-of-school suspension rate | 0.082 | 0.063 | 0.076 | 0.077 | 0.073 | 0.064 | 0.078 | 0.065 | 0.061 | 0.042 | 0.075 | 0.051 |
| Total days missed | 0.425 | 0.405 | 0.355 | 0.355 | 0.408 | 0.412 | 0.459 | 0.450 | 0.333 | 0.265 | 0.425 | 0.355 |

**Table 4:** Descriptive statistics for school-level achievement and discipline data.

**School archival data**

Table 4 shows the summary statistics for the academic and discipline data. Examination of the means and standard deviations show little change for any of the measures across the 3 year study period. Table 5 shows fixed and random component estimates from the random coefficient growth models for the academic and discipline data aggregated at the school level. Supporting the small change in observed means none of the trajectories significantly increased over time ($\gamma 10$) and the effect of intervention schools over time was non-significant for each of the outcomes ($\gamma 11$).

| | **Math** | **Reading** | **EXP** | **ISS** | **OSS** | **DAYS** |
|---|---|---|---|---|---|---|
| Fixed effects | | | | | | |
| Intercept, $\gamma_{00}$ | **69.18** | **68.31** | **0.003** | **0.129** | **0.073** | **0.422** |
| | -5.53 | -5.42 | -0.001 | -0.03 | -0.014 | -0.087 |
| Time, $\gamma_{10}$ | -3.46 | 0.88 | <0.001 | -0.02 | -0.001 | -0.017 |
| | -3.41 | -1.92 | -0.001 | -0.011 | -0.006 | -0.048 |
| Condition, $\gamma_{01}$ | -1.41 | -1.14 | -0.001 | -0.058 | 0.008 | -0.018 |
| | -3.47 | -3.4 | -0.001 | -0.042 | -0.02 | -0.122 |
| Time by condition, $\gamma_{11}$ | 1.3 | 1.2 | 0.001 | 0.017 | -0.003 | 0.008 |
| | -2.14 | -0.53 | -0.001 | -0.016 | -0.009 | -0.067 |
| | *p=0.544* | *p=0.599* | *p=0.511* | *p=0.403* | *p=0.730* | *p=0.904* |
| | *g=0.09* | *g=0.06* | *g=0.19* | *g=0.13* | *g=0.05* | *g=0.02* |
| Variance components | | | | | | |
| Intercept, $\mathbf{u}_{0i}$ | 68.83 | **87.3** | <0.001 | **0.012** | **0.003** | **0.095** |
| | -23.35 | -23.7 | (<0.001) | -0.003 | -0.001 | -0.033 |
| Time, $\mathbf{u}_{1i}$ | 18.21 | 4.33 | <0.001 | 0.001 | <0.001 | 0.018 |
| | -9.32 | -3.52 | -0.001 | -0.001 | -0.001 | -0.011 |
| Residual, rij | **43.55** | **16.64** | **<0.001** | **0.003** | **0.001** | **0.041** |
| | -9.64 | -4.07 | (<0.001) | -0.001 | (<0.001) | -0.012 |

Table entries show fixed effects and variance estimates with standard errors in parenthesis; Estimates underlined are significant at p<0.05, bolded at p<0.01, bolded and underlined at p<0.001; Additionally, exact p-values and measure of effect size, Hedges' G, is reported for the parameter estimates of interest for the current study; EXP=Expulsion; ISS=In School Suspension; OSS=Out-of-School Suspension; DAYS=Total Days Missed

**Table 5:** Fixed effects and variance components estimates from random coefficient growth models.

## Discussion

This study aimed to experimentally evaluate the impact of school wide Positive Behavior Interventions and Supports (SWPBIS) [18,28] on early adolescent development through a randomized control trial involving middle schools in the Pacific Northwest. The impact of two levels of SWPBIS training and technical assistance on school discipline practices and student behavior was evaluated. The study demonstrated

that a fully implemented SWPBIS staff development program resulted in higher levels of intervention fidelity compared to schools that only received a one day workshop on SWPBIS.

Students in the treatment schools reported significantly less growth in antisocial behavior and substance abuse. Other student self-report data presented trends in the expected direction but were not statistically significant. SWPBIS does appear to be associated with differences in students' perceptions of school climate. There were more steady declines in rule awareness across grade levels and an increase in rule compliance across grade levels. These findings appear to contradict each other, suggesting a revision of survey items aiming to assess these constructs. SWPBIS students reported a greater sense of safety in all grade levels, and a greater decline in positive teacher relationships from 6$^{th}$ to 7$^{th}$ grade. In treatment schools, there were discernible differences between racial/ethnic groups. AI/AN students tended to have the most negative perceptions. SWPBIS does not appear to be associated with differences in students' perceptions of, teacher praise received, treatment from peers (victim of relational aggression), treatment of peers (perpetrator of relational aggression), and participation in decision-making. At the school level, no significant differences were found in the analysis of direct observation data or archival school records [29].

## Recommendations

The results strongly suggest the need to refine and add intervention elements to the basic SWPBIS protocol to further strengthen observed effects. While significant differences were found in self-reported substance use and antisocial behavior, all other outcomes showed no significant differences. These findings suggest that specific protocols need to be added to the SWPBIS approach to address these weaker findings. These include protocols specific to peer to peer and teacher to student relationships. In addition, a focus on classroom management for teachers may be essential to improve student perceptions of rule awareness and may also likely to improve directly observed teacher behavior.

## Limitations

This study involved 35 middle schools, and analysis was conducted at the school level. It is possible that the overall study was underpowered to detect effects across the measurement protocol. A replication of this study should involve a larger number of schools in both conditions. It may also be feasible to choose a better defined counterfactual. It is likely that some of the control schools benefitted from the one-day workshop. In fact, the lowest performing treatment schools had lower fidelity scores than the highest performing control schools. This finding suggests that there are other, non-measured variables affecting fidelity of implementation in complex organizations such as Middle schools. Replications of this study should include measures of organizational health [30].

## Conclusion

There has been a movement in research and practice toward more comprehensive, multi-level programs that address multiple behaviors, and these generally appear to be more effective [31-40]. The best prevention programs use direct instruction and interactive approaches that are holistic, developmentally appropriate and culturally sensitive to teach students the skills and to be motivated to learn effectively in school and life, make responsible decisions, solve problems effectively, recognize and manage their emotions and other personal resources, appreciate the perspectives of others (e.g., empathy), handle interpersonal situations effectively (problem solving), and establish positive goals. SWPBIS is currently the most widely implemented school discipline program in the United States [15]. We need to move to the next horizon and improve outcomes in middle schools.

## Funding

This research report was supported by grant R01-DA019037 from the National Institute on Drug Abuse, National Institutes of Health. The opinions expressed herein are those of the authors and do not necessarily reflect the views or policies of the funding agency.

## References

1. Feldlaufer H, Midgley C, Eccles JS (1988) Student, teacher, and observer perceptions of the classroom environment before and after the transition to junior high school. J Early Adoles 8: 133-156.
2. Hardy CL, Bukowski WM, Sippola LK (2002) Stability and change in peer relationships during the transition to middle-level school. J Early Adoles 22(2): 117-142.
3. Anderman EM, Midgley C (1997) Changes in achievement goal orientations, perceived academic competence, and grades across the transition to middle-level schools. Contemp Educ Psychol 22(3): 269-298.
4. Harter S, Whitesell NR, Kowalski P (1992) Individual differences in the effects of educational transition on young adolescent's perceptions of competence and motivational orientation. Am Educ Research J 29(4): 777-807.
5. Eccles JS, Lord SE, Roeser RW, et al. (1997) The association of school transitions in early adolescence with developmental trajectories through high school. Cambridge University Press, New York, pp: 283-321.
6. Eccles JS, Midgley C (1989) Stage/environment fit: Developmentally appropriate classrooms for early adolescents. Research on motivation in education, Academic Press, New York.
7. Wentzel KR, Wigfield A (1998) Academic and social motivational influences on students' academic performance. Educational Psychology Review 10(2): 155-175.
8. Seidman E, Allen L, Aber JL, et al. (1994) The impact of school transitions in early adolescence on the self-system and perceived social context of poor urban youth. Child Dev 65(2): 507-522.
9. Chung H, Elias M, Schneider K (1998) Patterns of individual adjustment changes during middle school transition. J School Psychology 36(1): 83-101.
10. Gutman LM, Midgley C (2000) The role of protective factors in supporting the academic achievement of poor African American

students during the middle school transition. J Youth Adolescence 29(2): 223-249.
11. Wigfield A, Eccles JS, Yoon KS, et al. (1997) Changes in children's competence beliefs and subjective task values across the elementary school years: A three-year study. J Educ Psychol 89(3): 451-469.
12. Anderman EM, Maehr ML (1994) Motivation and schooling in the middle grades. Review Educ Research 64(2): 287-309.
13. Wigfield A (1994) Expectancy-value theory of achievement motivation: A developmental perspective. Educational Psychology Review 6(1): 49-78.
14. Roeser RW, Eccles JS, Samcroff AJ (1998) Academic and emotional functioning in early adolescence: Longitudinal relations, patterns, and prediction by experience in middle school. Dev Psychopathol 10(2): 321-352.
15. Horner R, Sugai G, Anderson C (2010) Examining the evidence base for school-wide positive behavior support. Focus on Exceptional Children 42(8): 1-14.
16. Metzler CW, Biglan A, Rusby JC, et al. (2001) Evaluation of a comprehensive behavior management program to improve school wide positive behavior support. Educ Treatment Children 24(4): 448-479.
17. Sprague J, Walker H, Golly A, et al. (2001) Translating research into effective practice: The effects of a universal staff and student intervention on key indicators of school safety and discipline. Educ Treatment Children 24(4): 495-511.
18. Sprague JR, Horner RH (2012) School wide positive behavior interventions and supports: Proven practices and future directions. Int Res Pract, New York, pp: 447-462.
19. Bradshaw CP, Mitchell MM, Leaf PJ (2010) Examining the effects of schoolwide positive behavioral interventions and supports on student outcomes. J Positive Behavior Interventions 12(3): 133-148.
20. Horner R, Sugai G, Smolkowski K, et al. (2009) A randomized control trial of school-wide positive behavior support in elementary schools. J Positive Behavioral Interventions 11(3): 133-144.
21. McIntosh K, Bennett JL, Price K (2011) Evaluation of social and academic effects of school-wide positive behaviour support in a Canadian school district. Exceptionality Educ Int 21(1): 46-60.
22. Waasdorp TE, Bradshaw CP, Leaf PJ (2012) The impact of schoolwide positive behavioral interventions and supports on bullying and peer rejection: A randomized controlled effectiveness trial. Arch Pediatr Adolesc Med 166(2): 149-156.
23. Irvin LK, Horner RH, Ingram LK, et al. (2006) Using office discipline referral data for decision-making about student behavior in elementary and middle schools: An Empirical investigation of validity. J Positive Behavior Interventions 8(1): 10-23.
24. Irvin LK, Tobin T, Sprague J, et al. (2004) Validity of office discipline referral measures as indices of school-wide behavioral status and effects of school-wide behavioral Interventions. J Positive Behavioral Interventions 6(3): 131-147.
25. Murray DM (1998) Design and analysis of group-randomized trials. Monographs in Epidemiology B 29.
26. Singer JD, Willett JB (2003) Applied longitudinal data analysis: Modelling change and event occurrence. Oxford University Press, USA.
27. Rosnow RL, Rosenthal R, Rubin DB (2000) Contrasts and correlations in effect-size estimation. Psychol Sci 11(6):446-453.
28. Sprague JR, Golly A (2013) Best Behavior: Building positive behavior supports in schools. (2nd Edtn), Cambium Learning Group, Longmont, USA.
29. Rusby JC, Crowley R, Sprague JR, et al. (2011) Observations of the middle school environment: The context for student behavior beyond the classroom. Psychology in the Schools 48(4): 400-415.
30. Bradshaw CP (2008) Impact of School-Wide Positive Behavioral Interventions and Supports (PBIS) on the organizational health of elementary schools. School Psychology Quarterly 23(4): 462-473.
31. Battistich V, Schaps E, Watson M, et al. (2000) Effects of the child development project on students' drug use and other problem behaviors. J Primary Prevention 21(1): 75-99.
32. Catalano RF, Berglund ML, Ryan JAM, et al. (2004) Positive youth development in the United States: Research findings on evaluations of positive youth development programs. The ANNALS Am Acad Political Social Science 591(1): 98-124.
33. Derzon JH, Wilson SJ, Cunningham CA (1999) The effectiveness of school-based interventions for preventing and reducing violence: Center for evaluation research and methodology. Vanderbilt University, USA.
34. Elias MJ, Gara MA, Schuyler TF, et al. (1991) The promotion of social competence: Longitudinal study of preventive school-based program. Am J Orthopsychiatry 61(3): 409-417.
35. Flay BR (2000) Approaches to substance use prevention utilizing school curriculum plus social environment change. Addict Behav 25(6): 861-885.
36. Flay BR, Graumlich S, Segawa E, et al. (2004) Effects of 2 prevention programs on high-risk behaviors among African American youth: A randomized trial. Arch Pediatr Adolesc Med 158(4): 377-384.
37. Hawkins JD, Catalano RF, Kosterman R., et al. (1999) Preventing adolescent health-risk behaviors by strengthening protection during childhood. Arch Pediatr Adolesc Med 153(3): 226-234.
38. Hawkins JD, Catalano RF, Miller JY (1992) Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychol Bull 112(1): 64-105.
39. Kellam SG, Anthony JC (1998) Targeting early antecedents to prevent tobacco smoking: Findings from an epidemiologically based randomized field trial. Am J Public Health 88(10): 1490-1494.
40. Lerner RM (2001) Developing individuals within changing contexts: Implications of developmental contextualism for human development research, policy and programs development of person-context relation. pp: 13-37.

***Corresponding author:** Jeffrey R Sprague, Ph.D, Department of Special Education and Clinical Sciences, The University of Oregon, USA, Tel: 541-346-3592; Email: jeffreysprague@gmail.com

**Received date:** June 27, 2017; **Accepted date:** July 19, 2017; **Published date:** July 21, 2017

**Citation:** Sprague JR, Biglan A, Rusby J, Gau J, Vincent C (2017) Implementing School wide PBIS in Middle Schools: Results of a Randomized Trial. *J Health Sci Educ* 1(2): 109.