Examining Barriers to Sustained Implementation of School-wide Prevention Practices

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Abstract

The purpose of this study was to determine if an experimental 5-item measure of barriers to implementing and sustaining school-wide prevention practices, the *Assessment of Barriers to Implementation and Sustainability in Schools* (ABISS), would relate to objective measures of school-wide positive behavioral interventions and supports (SWPBIS) implementation fidelity. The ABISS was administered to individuals in 704 U.S. schools implementing SWPBIS across 11 states, and scores were compared to school demographic variables and SWPBIS fidelity of implementation. Results showed acceptable model fit for the ABISS, partial measurement invariance, and statistically significant relations, after controlling for school demographic variables, with SWPBIS fidelity of implementation, except for schools implementing SWPBIS for 5 or more years. These patterns indicate substantial but decreasing relations of perceived barriers to implementation fidelity as schools continue to implement SWPBIS. Implications are discussed in terms of how assessment of perceived barriers can support implementation and sustainability of school-wide prevention practices.

Keywords: prevention, implementation science, barriers, fidelity of implementation, positive behavior support

Examining Barriers to Sustained Implementation of School-wide Prevention Practices

Because schools, districts, and states often adopt and implement effective educational practices that are later abandoned, identifying variables that support the sustainability of educational practices is a growing area of research (McIntosh, Horner, & Sugai, 2009). In research on sustainability of educational practices, the following terms should be differentiated: implementation fidelity, sustained implementation, and sustainability. We consider implementation fidelity to be the extent to which trained interventionists deliver the intervention consistently, and as intended (Sanetti & Kratochwill, 2009). As an educational practice continues to be implemented over a period of several years with adequate fidelity and positive student outcomes, sustained implementation is evident. In contrast, sustainability is the *potential* of sustained implementation, based on aspects of the practice, its implementation, its context, and the systems in place to support it (McIntosh & Turri, 2014). To meet the goal of sustained implementation, schools need to engage in an iterative process of responding to changes in context (McIntosh, Horner, et al., 2009). Barriers to the sustainability of school-based practices are inevitable, often arising from initial levels or changes to the structure and dynamics of implementing schools in areas such as resources, staff capacity, and district policy. When an intervention can be implemented with integrity despite these potential barriers, it can be called sustainable (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005).

In terms of potential for sustained implementation, the current level of fidelity is particularly important. When fidelity is high for an evidence-based practice, outcomes valued by school staff may be more likely to be achieved, and momentum and motivation of school staff to maintain a high level of implementation may be increased (McIntosh, Horner, et al., 2009). When the impact of the intervention is visible, i.e., positive changes are observed, staff members

may associate their efforts with the outcomes, which can help facilitate their continued effort (Andreou, McIntosh, Ross, & Kahn, 2015; Forman, Olin, Hoagwood, Crowe, & Saka, 2009; Han & Weiss, 2005). Correspondingly, sustained implementation may be threatened if staff perceive that the intervention is not leading to important outcomes or worth their effort (Lohrmann, Martin, & Patil, 2013). For these reasons, determining the extent to which perceived barriers to sustained implementation relates to implementation fidelity is an important first step toward identifying the effect of perceived barriers on sustained implementation. However, there is currently no known quantitative measure of barriers available.

 In the current study, we present a preliminary, brief measure of school personnel perceived barriers to sustained implementation, and examine the extent to which the measure relates to concurrent measures of School-wide Positive Behavioral Interventions and Supports (SWPBIS) implementation fidelity. SWPBIS is a systems-level approach to implementing effective behavior support practices focusing on instruction and environmental change to enhance prosocial behaviors and reduce problem behaviors across all school settings and for all students (Sugai et al., 2010). Identifying and addressing potential barriers to sustained implementation is particularly important for school-wide interventions such as SWPBIS, given its widespread dissemination across diverse school contexts and its well documented positive effects on multiple student outcomes (Horner et al., 2009; McIntosh, Bennett, & Price, 2011).

 In its current form the scale is not intended for use as a diagnostic tool, rather the measure is intended to be an efficient measure of overall levels of barriers to sustainability. SWPBIS was selected because of its wide implementation and sustainability (McIntosh, Filter, Bennett, Ryan, & Sugai, 2010), making it an opportune focus of systems change research. Although the present study focuses on SWPBIS, barriers to implementation are inevitable in any large-scale

implementation effort; therefore, the implications of this study could potentially inform other school-based practices, and implementation science more broadly.

Failure to Sustain Educational Practices: What We Know About Barriers

Several broad factors have been discussed as potential barriers to sustained implementation of school-based practices, including academic, behavioral, and mental health initiatives. These identified barriers informed the development of the brief measure of perceived barriers to implementation. The majority of studies in this area are case studies of failures to sustain and analyses of school personnel and stakeholder's perceptions of barriers through qualitative interviews and surveys (e.g., Bambara, Goh, Kern, & Caskie, 2012; Forman et al., 2009; Lohrmann, Forman, Martin, & Palmieri, 2008; Sindelar, Shearer, Yendol-Hoppey, & Liebert, 2006). As such, the majority of the knowledge base regarding contextual barriers to sustained implementation of educational practices is based on descriptive, retrospective accounts. The lack of quantitative analysis of contextual barriers to sustainability may erroneously implicate educator motivation as the primary reason for failures to sustain. Specific barriers that have been identified, predominately based on studies of school personnel and stakeholder perceptions, are described below. Because these studies have poorly differentiated between the concepts of implementation and sustainability, we discuss the concepts together, given their logical relation.

Administrator Support

As the head of the school, administrators are instrumental in setting the priority for new interventions (Handler et al., 2007). As such, lack of administrator support is frequently reported as a perceived barrier to successful implementation of school-wide and individual positive behavior support practices (Andreou et al., 2015; Bambara, Nonnemacher, & Kern, 2009;

Kincaid, Childs, Blase, & Wallace, 2007; Lohrmann et al., 2008). Lohrmann et al. (2013)

reported that implementers of SWPBIS perceived that lack of active administrator support might

negatively impact staff buy-in by sending a mixed message to staff regarding their need to

participate. Developers of evidence-based mental health and prevention practices in schools

have indicated that in their experience, even passive administrator resistance, such as generally

acknowledging support but failing to participate, may be detrimental to the success of a practice

(Forman et al., 2009).

Staff Buy-in

Obtaining staff buy-in for a practice is an essential component of successful

implementation. Aside from the logistical challenge of recruiting staff with relevant skills, lack

of staff buy-in due to negative beliefs regarding the practice is a perceived barrier commonly

reported in research. For example, staff may resist changing their personal practices based on

either a desire to maintain the status quo or lack of interest in the intervention itself (Forman et

al., 2009). Qualitative interview and survey studies consistently indicate the perceived difficulty

of obtaining staff buy-in when the philosophical principles of a practice are in opposition to

existing staff beliefs (Andreou et al., 2015; Bambara et al., 2012; Bambara et al., 2009; Kincaid

et al., 2007; Lohrmann et al., 2008; Pinkelman, McIntosh, Rasplica, Berg, & Strickland-Cohen,

2015). For example, in SWPBIS, staff may resist the principle of acknowledging students for

appropriate behavior if they believe punishment to be more effective in reducing problem

behavior (Lohrmann et al., 2013).

Staff Capacity to Implement

Because school staff are ultimately the individuals who deliver a practice, barriers to staff

capacity to implement are important to address. Previous interview and survey research on

school-based behavior practices indicate that staff capacity is diminished by inadequate training, lack of ongoing technical assistance, and too few staff members trained (Bambara et al., 2012; Bambara et al., 2009; Kincaid et al., 2007). Inadequate training may threaten program success from the outset; Kratochwill, Volpiansky, Clements, and Ball (2007) suggest that strong training and ongoing professional development are essential components for ensuring that school personnel implement with fidelity. Qualitative interview and survey studies indicate that the provision of adequate time to complete intervention activities during the school day is also perceived as important (Forman et al., 2009; Pinkelman et al., 2015), as is the perception that the intervention can efficiently align with regular routines and not be perceived as an additional burden (Andreou et al., 2015; Bambara et al., 2009; Coffey & Horner, 2012).

Turnover

Staff turnover can affect both administrator support and staff capacity to implement. Given that administrator support has been noted as essential to successful implementation, administrator turnover may be particularly challenging. For example, in a case study analysis of failure to sustain a school inclusion practice that had been successfully implemented, Sindelar et al. (2006) found that administrator turnover was reported as a key contributor to the failure, noting that the new administrator had different priorities and showed less support for the practice. In terms of staff turnover, departing champions of the practice (i.e., key staff members invested in the practice), and incoming untrained staff may all contribute to diminished implementation. Sindelar and colleagues suggested that both types of staff turnover diluted program acceptance and capacity to implement. One specific challenge with staff turnover is the need to train new staff. When staff turnover is high, schools may use substantial resources to establish buy-in and provide training for new staff, contributing to a sense of being "stuck" in a

perpetual state of initial implementation (Hatch, 2000).

Competing Initiatives

Implementing a new practice in a school is inherently difficult given that schools are faced with concurrent implementation of multiple, possibly competing, initiatives to satisfy needs and policies at multiple levels (e.g., school initiatives vs. state initiatives). Sanford DeRousie and Bierman (2012) found that teachers most frequently reported competing initiatives as a barrier to the sustainability of an evidence-based literacy and social emotional preschool curriculum. As a result, they warned against implementing a new initiative without also addressing strategies to reduce competing priorities. Langley, Nadeem, Kataoka, Stein, and Jaycox (2010) also reported that competing initiatives was the most frequently endorsed barrier among clinicians who were unsuccessful in implementing a school-based mental health initiative. In schools, one major barrier is the focus on standardized academic testing stemming from federal and state initiatives, which may be perceived as superseding non-academic goals, threatening non-academic interventions in particular (Forman et al., 2009).

Barriers to Sustainability of School-wide Positive Behavioral Interventions and Supports

Two recent studies have examined perceptions of school staff regarding facilitators and barriers to sustained implementation of SWPBIS. McIntosh et al. (2014) analyzed respondents' perceived importance of contextual features for implementation and sustainability of SWPBIS using a mixed-methods approach. Qualitative analyses revealed that limited resources (including time and funding) were identified as the most significant barrier to sustaining SWPBIS; other frequently endorsed barriers included high rates of staff turnover, low fidelity of implementation, and insufficient staff buy-in. Pinkelman et al. (2015) aimed to replicate and expand the results of McIntosh et al., using a larger and more diverse sample. Also based on qualitative analyses, the

most frequently reported barriers were limited staff buy-in, followed by insufficient resources, both temporal (i.e., time to do SWPBIS activities) and monetary (i.e., funding).

Although the results of these studies shed light on the perspectives of school team members regarding barriers to sustained implementation, both studies, together with the majority of the studies previously reviewed, relied largely on descriptive interviews or surveys to identify barriers to sustainability. Across these studies, there is tremendous consistency among the perceptions of school personnel; however, there have been limited efforts to identify barriers to implementation using objective measures of fidelity or sustained implementation. For example, McIntosh et al. (2014) reported that raters' perceived lack of implementation fidelity to be a significant barrier to sustainability, which warrants empirical corroboration with fidelity of implementation data.

Additionally, it is important to consider the schools' stage of SWPBIS implementation. Similar to other school-based interventions, SWPBIS is a systems-level approach, requiring several years to achieve full implementation (Sugai, Horner, & McIntosh, 2008). Across each stage of implementation, there may be different barriers to continued implementation. In the current study, three stages were conceptualized, representing schools implementing for 0 to 1 years (initial implementation), 2 to 4 years (full operation), and 5 or more years (sustainability; Adelman & Taylor, 1997; Mercer, McIntosh, Strickland-Cohen, & Horner, 2014). Both McIntosh et al. (2014) and Pinkelman et al. (2015) included schools across all stages of implementation in their samples; however, it is important to systematically examine differences in reported barriers, and the extent to which relations between reported barriers and fidelity differ by stage of implementation.

Purpose of the Study

Studying perceived barriers to sustained implementation across all stages of SWPBIS implementation will provide critical information to the emerging literature on the sustainability of school-based practices, which has to date been largely anecdotal. The purpose of this study is to evaluate the factor structure of a brief measure of SWPBIS school team members' perceived barriers to sustained implementation, and the extent to which the measure relates to fidelity of implementation data at each stage of implementation.

The following research questions were examined:

1. What is the factor structure of the barriers measure, and is it invariant across stages of implementation?

We expected the barriers scale, as a brief measure, to be unidimensional. Testing measurement invariance (i.e., similarity of scale psychometrics across stages) permitted investigation of substantive research questions regarding differences in barriers across stages of implementation. Without establishing measurement invariance, observed mean differences in perceptions of barriers could be an artifact of psychometric differences in the barriers measure across SWPBIS stages of implementation.

2. Are there mean differences in perceptions of barriers across schools at different SWPBIS stages of implementation?

Because sustained implementation, in part, requires that schools overcome barriers to implementation, we expected there to be fewer perceived barriers in latter stages of implementation.

3. Controlling for school demographic variables, to what extent do perceptions of barriers relate to fidelity of SWPBIS implementation at each implementation stage?

We considered it important to account for school demographic control variables, such as school level (i.e., elementary vs. middle or high schools) and the percentage of students in the school eligible for free or reduced price meals, because prior research has indicated that these variables relate to sustainability (McIntosh, Kim, Mercer, Strickland-Cohen, & Horner, 2015) or sustained implementation (McIntosh, Mercer, Nese, Strickland-Cohen, & Hoselton, 2015).

Method

Participants and Settings

A total of 704 U.S. K-12 public schools (within 11 states and spanning all four regions of the US Census Bureau) participated in the study. These schools were part of a larger sample of schools participating in a longitudinal study examining implementation and sustainability of SWPBIS. This subsample included all schools with complete demographic data available from the National Center for Educational Statistics (NCES). Demographic data for the schools are summarized in Table 1. All schools were currently implementing or preparing to implement SWPBIS in the next school year. Of these schools, 180 (25%) were in the initial implementation stage (0 to 1 years), 329 (47%) were in the full operation stage (2 to 5 years), and 195 (28%) were in the sustainability stage (5 or more years).

Measures

Barriers to Sustainability. The *Assessment of Barriers to Implementation and Sustainability in Schools* (ABISS) is an experimental 5-item scale with 4 response options (1 = *Not True*; 4 = *Very True*) assessing potential barriers to implementation or sustainability of school-wide interventions. The items in the ABISS (see Table 2) were initially developed as part of the *School-wide Universal Behavior Sustainability Index- School Teams* (SUBSIST; McIntosh, Doolittle, Vincent, Horner, & Ervin, 2009). The SUBSIST is a research-validated

measure used to assess the critical features that facilitate or hinder the sustainability of school-based universal behavior support practices. Internal consistency of the ABISS in the current sample is reported in the results section; based on data reported in McIntosh, MacKay, et al. (2011), inter-rater reliability (weighted kappa = .83) and 3-week test-retest reliability (weighted kappa = .86) for ABISS items was high. Evidence for content validity, based on data reported in McIntosh, MacKay, et al. (2011), included an expert panel review of the measure, the response format, and the extent to which the specific items assessed a potential barrier to sustainability. Results showed a content validity index score of .95, indicating strong content validity (Rubio, Berg-Wagner, Tebb, Lee, & Rauch, 2003). Percentages of missing data on individual ABISS items ranged from 2.2 to 6.7%.

SWPBIS Fidelity of Implementation. Fidelity of implementation of SWPBIS at each school was assessed using the following research-validated measures: the School-wide Evaluation Tool (SET; Sugai, Lewis-Palmer, Todd, & Horner, 2001), the School-wide Benchmarks of Quality (BOQ; Kincaid, Childs, & George, 2005), the PBIS Self Assessment Survey (SAS; Sugai, Horner, & Todd, 2000), and the Team Implementation Checklist (TIC; Sugai, Todd, & Horner, 2001).

School-wide Evaluation Tool. The SET is completed during a site visit from a trained external evaluator. Psychometric analyses revealed strong internal consistency (α = .96), test-retest reliability (mean = 97%) and inter-rater agreement (mean agreement = .99; Horner et al., 2004). SET implementation average scores were available for 409 schools (58% of sample).

School-wide Benchmarks of Quality. The BOQ is also an external evaluation that is based on observation and permanent product review. Analyses of the measure's psychometric properties indicated strong internal consistency (α = .96), test-retest reliability (mean = 97%),

inter-rater reliability (mean agreement = 89%), and concurrent validity (correlation with the SET, r = .51; Cohen, Kincaid, & Childs, 2007). BOQ total ratio scores were available for 348 schools (50% of sample).

PBIS Self Assessment Survey. The SAS is a self-assessment fidelity of implementation measure. Its correlation with the SET has been documented as .75 (Horner et al., 2004). Psychometric analysis showed strong internal consistency for the school-wide subscale and total scores of the measure (α range = .75 to .94; Hagan-Burke et al., 2005; Safran, 2006). SAS implementation average scores were available for 461 schools (65% of sample).

Team Implementation Checklist. The TIC is another self-report fidelity measure. The TIC has demonstrated strong internal consistency (ordinal α = .94; McIntosh, Mercer, et al., 2015). TIC implementation average scores were available for 284 schools (40% of sample).

Procedure

Schools implementing or preparing to implement SWPBIS were recruited through the schools' state SWPBIS networks through email and sharing contact information at state or district conferences. The invitation requested that any one member of each school's SWPBIS team could complete the ABISS online for their respective school, between fall 2012 and spring 2013. In the case of multiple responses per school, the survey with the least missing data was selected as the response for the school. Of the respondents, 63% were school PBIS team leaders, facilitators, or internal coaches; 23% were school administrators; 8% were other school faculty or staff members; and 5% were external to the school (e.g., a district PBIS team facilitator). ABISS data were then electronically linked to the schools' PBIS fidelity data (i.e., the most recent SET, BOQ, SAS, and/or TIC scores for the school year the ABISS was completed), reported to the National TA Center on PBIS through a secure website (www.pbisapps.org).

Data Analyses

Prior to testing mean differences on the ABISS by stages of implementation, the factor

structure and measurement invariance of the ABISS was first investigated (Research Question

#1). Because items on the ABISS have a four-option response format and responses to items

were positively skewed (range: 0.82 to 2.47), ABISS item responses were specified as ordered

categorical, and the mean- and variance-adjusted weighted least squares (WLSMV) estimator

with the theta parameterization was used. First, the unidimensionality of the ABISS within each

implementation group was investigated by comparing the magnitude of the first relative to the

second eigenvalues in ordinal exploratory factor analyses (EFA). After establishing

unidimensionality within each implementation group, the internal consistency of the ABISS was

assessed using ordinal alpha (Zumbo, Gadermann, & Zeisser, 2007). To test measurement

invariance across implementation groups, a configural invariance model with factor loadings and

item thresholds free to vary across groups was tested against a scalar invariance model with

factor loadings and item thresholds constrained to equality across groups. In the configural

invariance model, item residuals were constrained to equal one and ABISS factor means were

constrained to equal zero for model identification. In the scalar invariance model, for the initial

implementation group the factor mean was constrained to equal zero and item residual variances

were constrained to equal one for model identification, but factor means and item residual

variances were freely estimated in the institutionalization and sustainability groups. Change in

model fit was tested using the DIFFTEST option in M*plus* (Muthén & Muthén, 2012), with a

statistically significant chi-square value indicating that scalar invariance did not hold. Following

a statistically significant chi-square difference test, potential sources of non-invariance were

investigated by examining model modification indices and freeing loadings and thresholds one

item at a time until a partially invariant model that did not statistically differ from the configural

invariance model was found. Following the tests of measurement invariance of the ABISS, mean

differences by implementation group on the ABISS were examined in the final partial invariance

model (Research Question #2).

To enable testing of the relation between ABISS scores and fidelity (Research Question

#3), we first tested the appropriateness of fitting a latent fidelity construct with SET, BOQ, SAS,

and TIC scores as indicators. Scores on each of the fidelity measures were proportions with

negative skew (range: -.80 to -2.42). To better meet model assumptions, angular transformations

(i.e., arcsine root; see Maindonald & Braun, 2010, p. 279) were used on the scores from each

fidelity measure, resulting in much less negative skew (range: -.12 to -.72). Following

transformation, the reliability of the fidelity factor was examined by calculating a composite

reliability estimate (Raykov, 1997). Then, the measurement invariance of the factor was

examined across implementation groups. Unlike the ordered categorical ABISS responses, scores

on the fidelity measures were continuous; consequently, the robust maximum likelihood

estimator (MLR) was used, and configural (free factor loadings and intercepts), metric (equal

loadings), and scalar (equal loadings and intercepts) models were tested. Differences in model fit

across the invariance models were examined using likelihood ratio tests, with statistically

significant chi-square values indicating that metric or scalar invariance did not hold across

groups. Mean differences in fidelity by implementation group were examined in the scalar

invariance model.

To determine the extent to which the relations between ABISS scores and fidelity varied

by stage of implementation (Research Question #3), a multiple-group structural equation model

was fit using the WLSMV estimator, with the measurement models for the ABISS and fidelity

factor specified according to the final invariance models in the prior analyses. Equality of the

regression paths from the ABISS factor to the fidelity factor was investigated using a Wald test,

and the magnitude and statistical significance of the paths were explored by implementation

group.

In all analyses, model fit was evaluated based on conventional criteria (Mueller &

Hancock, 2010): Comparative Fit Index (CFI) $\geq$ .95 and Root Mean Square Error of

Approximation (RMSEA) and its 90% confidence interval < .05. Standard errors were adjusted

in all models for nesting of schools in districts using the COMPLEX option in M*plus*, and

missing data were handled under the assumption that data were missing at random with the

WLSMV or MLR estimator. Also, for tests of differences in ABISS and fidelity by

implementation group, standardized mean differences (*d*) were reported as an effect size measure

using the following formula (Hancock, 2001):

$$d = \frac{\left|\bar{Y}_1 - \bar{Y}_2\right|}{\sqrt{\dfrac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2}}} \tag{1}$$

where $\bar{Y}_1$ and $\bar{Y}_2$ are latent means in two groups, n_1 and n_2 are sample sizes in the groups, and

s_1^2 and s_2^2 are variances of the latent factors.

Results

Results related to Research Question #1 (What is the ABISS factor structure and is it

invariant across stage of implementation?) are presented first, followed by results related to

Research Question #2 (Are there mean differences on the ABISS across schools at different

stages of implementation?), and then results related to Research Question #3 (Do the relations

between ABISS scores and fidelity differ by stage of implementation?) are presented. Means and

standard deviations for the ABISS items by implementation group are presented in Table 2.

Factor Structure of the ABISS

The magnitude of the first compared to the second eigenvalues in EFAs in each implementation group [initial implementation: 2.57 to 1.15; full operation: 2.71 to 1.08; sustainability: 2.84 to 0.97] supported unidimensionality of the ABISS. The internal consistency of the ABISS, based on calculation of ordinal alpha (Zumbo et al., 2007), was .75 in the initial implementation group, .76 in the full operation group, and .81 in the sustainability group.

Comparison of the configural and scalar invariance models indicated that scalar invariance did not hold, χ^2 (26) = 52.03, p = .001. Inspection of model modification indices suggested that item 2 (Competing Initiatives) on the ABISS was most problematic, and subsequent model tests indicated that a partially-invariant model with factor loadings and thresholds for all items other than item 2 constrained to equality across groups fit as well as the configural model, χ^2 (20) = 27.09, p = .133. Inspection of the factor loadings for item 2 indicated smaller factor loadings for the initial implementation and full operation groups relative to the sustainability group. Fit for the partially-invariant model was acceptable on the CFI and near the criterion for acceptability on the RMSEA, χ^2 (35) = 74.48, $p < .001$, CFI = .965, RMSEA = .068, 90% CI [.047, .090]. These results indicated that the partially-invariant model for the ABISS was most appropriate to use in subsequent tests of substantive research questions.

Differences in Perceived Barriers across Implementation Stages

To address Research Question #2, mean differences on the ABISS were tested in the final partially-invariant model. Based on inspection of the ABISS factor means, the sustainability group (M = -.20, p = .043, d = .39) had fewer perceived barriers than the initial implementation group. There was no statistically significant difference in perceptions of barriers between the full operation (M = -.12, p = .130, d = .23) and initial implementation groups.

Relations of ABISS with Fidelity

As a pre-condition to assessing the relations of the ABISS with implementation fidelity across implementation groups, measurement invariance of the fidelity factor was first tested.

Measurement invariance of the fidelity factor. Comparisons with the configural invariance model indicated that metric, χ^2 (6) = 7.67, p = .263, and scalar, χ^2 (12) = 10.72, p = .553, invariance held for the fidelity factor across implementation groups. The scalar invariance model fit well on all criteria other than the 90% CI for the RMSEA, χ^2 (18) = 23.28, p = .180, CFI = .977, RMSEA = .035, 90% CI [.000, .071]. Internal consistency of the fidelity factor was good, with a composite reliability (Raykov, 1997) of .84. Fidelity was statistically significantly higher in the full operation group (M = .14, p < .001, d = .97) and sustainability group (M = .20, p < .001, d = 1.38) compared to the initial implementation group.

Model with only school demographic controls. Prior to estimating the full model assessing the relations between the ABISS and fidelity, a baseline multiple-group model was fit with only the school demographic control variables (i.e., middle vs. elementary school, high vs. elementary school, enrollment, percentage minority students, percentage of students eligible for free or reduced lunch, school location) as predictors of fidelity, using the scalar invariance model previously described. Model fit was good on all indicators, χ^2 (72) = 86.99, p = .110, CFI = .954, RMSEA = .030, 90% CI [.000, .050]. The school demographic variables explained 10.7% of the variance in fidelity in the initial implementation group, with high vs. elementary school (β = -.263, p = .001) as the only statistically significant predictor. In the full operation group, the demographic variables explained 22.0% of the variance in fidelity, with high vs. elementary school (β = -.260, p = .001) and larger enrollments (β = -.260, p = .001) both predicting lower levels of fidelity. In the sustainability group, the demographic variables explained 22.6% of the

variance in fidelity, with middle vs. elementary (β = -.177, p = .028) and locations in a more

urban area (β = -.417, p < .001) both predicting lower levels of fidelity.

Model with ABISS and school demographic controls. To address Research Question

#3, a final model was fit to determine the extent to which the ABISS was related to

implementation fidelity after controlling for school demographic variables. The full model with

school demographic control variables and the partially-invariant ABISS factor as predictors of

latent fidelity also fit the data well on all indicators other than chi square, χ^2 (236) = 280.22, p =

.026, CFI = .957, RMSEA = .028, 90% CI [.011, .040]. As presented in Table 3, the following

school demographic variables predicted lower levels of fidelity by implementation group: initial

implementation, high vs. elementary (β = -.237, p = .045); full operation, high vs. elementary (β

= -.237, p < .001), enrollment (β = -.202, p = .003), percentage minority students (β = -.204, p =

.015); and sustainability, middle vs. elementary (β = -.193, p = .013), school location (β = -.428,

p = .002). In addition, the following school demographic variables predicted greater perceptions

of barriers on the ABISS by implementation group: initial implementation, percentage of

students eligible for free/reduced lunches (β = .291, p = .039); full operation, percentage of

students eligible for free/reduced lunches (β = .277, p = .011); and sustainability, middle vs.

elementary (β = .261, p = .013), high vs. elementary (β = .334, p = .008). The school

demographic variables explained 20.8% of the variance in ABISS scores in the initial

implementation group, 19.9% of the variance in ABISS scores in the full operation group, and

10.8% of the variance in ABISS scores in the sustainability group.

A Wald test indicated that the regression paths from the ABISS to fidelity differed by

implementation group, χ^2 (2) = 6.22, p = .045. In the initial implementation (β = -.279, p = .007)

and full operation (β = -.426, p = .007) groups, greater perceptions of barriers to sustainability on

the ABISS were independently associated with lower levels of fidelity. In contrast, perceptions of barriers on the ABISS were unrelated to fidelity in the sustainability group (β = -.034, p = .769). The ABISS explained an additional 9.0% of the variance in fidelity beyond the school demographic variables in the initial implementation group, an additional 20.8% of variance in fidelity in the full operation group, and only 2.8% additional variance in fidelity in the sustainability group.

Discussion

This study evaluated the factor structure of a brief measure of barriers to sustained implementation and assessed the extent to which scores on the measure relate to SWPBIS fidelity of implementation data across each stage of SWPBIS implementation. With respect to the proposed research questions, we first analyzed the factor structure of the ABISS and the extent to which measurement invariance held across phases of SWPBIS implementation. Results indicated that partial measurement invariance held for the unidimensional ABISS across phases of implementation and that the ABISS exhibited adequate internal consistency. Second, we examined whether there were mean differences in perceptions of barriers, as measured by the ABISS, across schools at different SWPBIS stages of implementation. Results indicated that the sustainability group had fewer perceived barriers than the initial implementation group; no statistically significant difference was observed in perceptions of barriers between the full operation and initial implementation group. Last, we examined the extent to which perceptions of barriers relate to SWPBIS fidelity of implementation, controlling for school demographic variables. Results indicated that the relations between perceptions of barriers (ABISS) and fidelity differed across SWPBIS implementation stages. For the initial implementation and full operation groups, greater perceptions of barriers were associated with lower fidelity of

implementation; in the sustainability group, perceptions of barriers were unrelated to fidelity.

The results support the utility of the ABISS as a preliminary measure to identify overall levels of perceived barriers to SWPBIS sustained implementation. Although further development is necessary before the widespread use of the ABISS as a diagnostic tool, the current results are a good first step towards empirically linking barriers and implementation fidelity to sustained implementation. The vast majority of studies on barriers to sustainability are retrospective accounts of failures to sustain; to our knowledge, the present study is among the first empirical studies to examine barriers in relation to objective measures of fidelity of implementation. This and future studies can begin to form an empirical basis for decision-making regarding the identification and remediation of factors hindering implementation and sustainability for evidence-based practices.

The present results highlight the importance of assessing barriers during the beginning stages of implementation, but also through full implementation. It is not surprising that reported barriers were lowest in the sustainability group, and also unrelated to fidelity of implementation in that stage. It is logical to assume that in order to have maintained the practice and reached sustainability, schools would have needed to overcome barriers. Successful schools may address many potential barriers prior to full implementation. To promote durable change from the outset, it is desirable to implement in "fertile ground," that is, in school environments with fewer barriers to implementation and sustainability, or ensure that barriers are addressed prior to (or as a condition of) implementation (Rogers, 2003). However, the present results also indicate that several less malleable school demographic variables, such as grade level and enrolment, accounted for a sizable proportion of fidelity variance. This finding suggests that despite efforts to implement in fertile ground, schools may face barriers that are difficult to prevent or

eliminate. Understanding how these less malleable factors affect fidelity can assist schools in proactively offsetting or minimizing their effects; for example, schools with larger enrollments may form smaller committees within the larger SWPBIS staff team to distribute responsibility and increase accountability.

In the Fixsen et al. (2005) stages of implementation model, the program installation phase addresses pre-implementation activities to ensure readiness, which can minimize potential barriers. Activities such as securing staff time and resources prior to implementation are essential for building the infrastructure of a successful practice (Bertram, Blase, & Fixsen, in press). However, although barriers may be most pressing to assess and address pre-implementation, on-going monitoring remains essential. Changes to resources, context, or priority can occur at any point in implementation. According to Fixsen et al., maintaining high fidelity while responding to these changes characterizes the sustainability stage.

Although the present results indicate that perceived barriers are related to implementation fidelity, it is necessary to understand the importance of barriers relative to other contextual features of implementation, such as facilitators. For example, McIntosh et al. (2014) found that school team members rated barriers as relatively less important compared to facilitators for both initial implementation and sustainability. Barriers and facilitators are inextricably linked, with some features often described as representing both a barrier and facilitator. For example, the lack of administrator support, staff buy-in, adequate training, and resources are commonly reported barriers, with the presence of these features reported as facilitators (Andreou et al., 2015; Coffey & Horner, 2012; Kincaid et al., 2007; Pinkelman et al., 2015). Even so, previous studies have identified uniquely reported facilitators to sustainability; for example, although features such as administrator support and staff buy-in were reported as both facilitators and

barriers, Kincaid et al. (2007) noted ongoing external support and the integration of the practice into the school among the uniquely reported facilitators, and misperceptions or poor knowledge about the practice as unique barriers. Future research should further differentiate facilitators from barriers and also determine their relative importance for sustained implementation.

Limitations

A number of key limitations of the current study are worth noting. First, these findings are most applicable to schools implementing SWPBIS. Previous research has shown that findings regarding variables related to implementation may be practice-specific, and particular aspects of practices may make them more or less robust to barriers (Fixsen et al., 2005). For example, schools implementing SWPBIS must often demonstrate readiness before initial training begins, and therefore some barriers (e.g., philosophical opposition) may have been addressed before a decision to adopt SWPBIS. Second, schools were only included in the study if they had completed SWPBIS fidelity assessments and volunteered to complete the ABISS, and thus findings may not generalize to schools not conducting external or internal SWPBIS assessments of fidelity. Finally, because of the relatively few studies examining barriers empirically, the results need replication, especially for approaches other than SWPBIS.

Potential Implications for Practice and Future Research

Results from this study suggest that the ABISS adequately serves as a preliminary brief measure for assessing barriers to implementation of SWPBIS, though further development and expansion are needed prior to its widespread use. Given that overall scale scores were related to fidelity of implementation, the specific barriers included may be important for schools to consider during initial adoption as well as ongoing implementation of SWPBIS. Barriers such as the philosophical opposition of staff members to SWPBIS, competing initiatives already

occurring within the school, and staff turnover frequently present great challenges to the

sustainability of practices within schools. However, utilizing a brief measure to identify the

existence of such barriers may provide school teams the opportunity to be proactive in their

response to the existence of barriers by developing plans for how to best address them. For

example, if a school team finds that they have too many competing initiatives taking place in

their school, they may work to identify which practices lack evidence, which are not feasible to

maintain, and which may be braided with other initiatives that address the same common goal.

Therefore, knowledge of the existence of this barrier may provide the team with a just reason for

eliminating programs that are ineffective or require a great deal of resources. For barriers that

are not directly malleable, such as staff turnover, team members may develop a training plan for

new staff members on core features of their school-wide system that may be delivered at

different times of the school year.

The current findings do not identify which specific barriers most strongly predict initial

or sustained implementation of evidence-based practices. More studies that analyze the

individual relations of specific barriers to fidelity of implementation across a broader range of

barriers than are included in the ABISS are needed. For example, the ABISS is strongly

weighted towards assessing personnel turnover; although this is a common and important barrier,

the scale is limited in its content of other barriers identified in research such as lack of

administrator support, staff buy-in, and resources. Future development of the ABISS will focus

on expansion to more adequately sample the content area in order to serve as a more

comprehensive assessment of potential barriers.

The present study provided empirical evidence to support the hypothesis that the overall

presence of barriers is related to fidelity, but future research may identify methods of

determining specific barriers that impact implementation and their relative importance for sustainability. Doing so will assist schools in identifying specific areas for prevention and remediation of barriers. Finally, our finding that the differential relation of barriers to fidelity by the stage of implementation in which schools were at suggests that future research may consider the possibility that coaching strategies may need to vary by implementation stage. The supports provided by coaches to help schools minimize the impact of barriers on implementation may be quite different for schools in the initial stages of adoption of a practice versus school that have been implementing for several years. We encourage future research on the examination of how effective coaching strategies may be differentiated for schools at these different stages.

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Table 1

School Demographics by Implementation Group

	Implementation Group		
Variable	Initial	Full Operation	Sustainability
% Elementary Schools	62	75	69
% Middle Schools	26	16	23
% High Schools	12	9	8
Mean Enrollment (*SD*)	532 (370)	532 (305)	573 (279)
Mean % Minority Students (*SD*)	34 (33)	39 (31)	41 (25)
Mean % Students Eligible for	52 (24)	48 (23)	48 (22)
Free/Reduced Lunches (*SD*)			
% Schools in Rural Area	38	22	21
% Schools in Town	18	13	12
% Schools in Suburb	17	36	45
% Schools in City	27	30	23
Sample Size (*n*)	180	329	195

Table 2

Means and Standard Deviations of ABISS Items by Implementation Group

	Initial Implementation		Full Operation		Sustainability	
Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
1. School personnel are opposed to SWPBIS because it goes against their personal values (e.g., "rewarding" students, teaching "compliance").	1.49	.62	1.47	.68	1.43	.68
2. Other school/district initiatives (e.g., academic, behavior, etc.) are present that compete (for time, resources or content) with SWPBIS.	2.02	.91	1.94	1.00	1.96	1.06
3. There are high levels of turnover of school administrators (i.e., yearly).	1.40	.71	1.36	.75	1.41	.84
4. There are high levels of turnover of school personnel who served as key leaders ("champions") of SWPBIS (i.e., within three years).	1.39	.70	1.51	.85	1.46	.80
5. There are high levels of general school personnel turnover (i.e., 50% of staff).	1.31	.69	1.34	.76	1.34	.76
Sample Size (*n*)	180		329		195	

Note. Respondents to the ABISS are asked to indicate "To what extent is this statement true for your school right now?"

Table 3

Latent Fidelity and ABISS Scores Regressed on School Demographic Variables by

Implementation Group

| | | Implementation Group | | |
| | | Initial | Full Operation | Sustainability |
Criterion	Predictor	β	β	β
Fidelity	ABISS	-.279**	-.426**	-.034
	Middle vs. Elementary	-.060	.004	-.193*
	High vs. Elementary	-.237*	-.237***	-.137
	Enrollment	.040	-.202**	-.156
	Percentage Minority Students	-.285	-.204*	.069
	Percentage Free/Reduced Lunch	.249	.072	-.003
	School Location	-.041	-.013	-.428**
ABISS	Middle vs. Elementary	.075	.156	.261*
	High vs. Elementary	.100	.127	.334**
	Enrollment	.108	.007	-.129
	Percentage Minority Students	.005	.116	.158
	Percentage Free/Reduced Lunch	.291*	.277*	.034
	School Location	.217	.147	.026
Sample Size (*n*)		180	329	195

Note. *p < .05, **p < .01, ***p < .001