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Positive Behavior Interventions: the Issue of Sustainability of Positive Effects

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Abstract

During the last decade, positive behavior interventions have resulted in improvement of school behavior and academic gains in a range of school settings worldwide. Recent studies identify sustainability of current positive behavior intervention programs as a major concern. The purpose of this article is to identify future direction for effective implementation of positive behavior interventions based on a comprehensive review of the current status of positive behavior interventions in terms of sustainability. The review will also examine implementation fidelity, as a factor that impacts upon sustainability. Literature reviewed in this study demonstrates that administrator support and professional development were the most frequently cited influential factors in previous research on sustainability of positive behavior interventions. In particular, the review highlights the significance of implementation fidelity at the classroom level for sustaining positive outcomes of positive behavior interventions over time. It is argued that in order to sustain positive effects of positive behavior intervention, future implementation efforts need to emphasize administrator support for the school team, ongoing high-quality professional development, and technical assistance. Moreover, a focus on coaching classroom-level implementation fidelity is of significant importance, as is the development and validation of evaluation tools for sustainability based on large-scale longitudinal international studies and more in-depth qualitative investigations.

Intervention programs with the aim of enhancing and supporting positive behaviors of students in schools have entered general use worldwide. Positive behavior interventions have been widely used in early childhood, elementary and high school settings to reduce students' problematic behaviors and improve educational outcomes. A meta-analysis conducted by Wilson and Lipsey (2007) shows overall positive effects of school-based interventions for reducing aggressive and disruptive behaviors. Results of this meta-analysis suggest that school-based interventions tend to have the greatest benefits for students from low socioeconomic backgrounds and students exhibiting high-risk behaviors. During the last decade, a growing number of research findings have documented significant developments in behavior interventions and the positive outcomes of behavior interventions across a range of school settings. These studies have identified two major issues when evaluating positive behavior interventions—sustainability and implementation fidelity.

Implementation fidelity, which is sometimes termed as integrity, refers to “the degree to which teachers and other program providers implement programs as intended by the program developers” (Dusenbury, Brannigan, Falco, & Hansen, 2003, p. 240). Sustainability may be defined as “durable, long-term implementation of a practice at a level of fidelity that continues to produce valued outcomes” (McIntosh, Campbell, Carter, & Dickey, 2009, p. 328). For this definition, sustainability embraces implementation fidelity and durability. The purpose of this article is to provide a comprehensive review of the literature to identify future directions for effective positive behavior interventions.

There is a large body of research reporting the results of PBIS, yet, only an emerging focus on the issue of sustainability. Further studies are needed to advance our knowledge of sustainability; however, given the extensive resources invested to conduct longitudinal research, this work must be informed by a clear synthesis of the current status of school-based programs in terms of sustainability. This review significantly contributes to future research and educational practice by offering this critical systematic review. A systematic review process suggested by the National

Centre for Vocational Education Research (NCVER, 2005) was followed: (1) identifying the questions; (2) developing a framework; (3) searching for studies; (4) selection of relevant studies; (5) appraising quality of selected studies; (6) synthesizing the findings; (7) presenting and disseminating the findings of the systematic review to stakeholders.

School-Wide Positive Behavior Interventions

Most of the literature in the area of positive behavior interventions has been contributed by researchers in the USA, who have been regarded as pioneers in the use of school-based positive behavior intervention (Lewis & Sugai, 1999). In the USA, it appears that the most widely adopted advance in positive behavior interventions is an evidence-based multi-level approach, named *Positive Behavioral Interventions and Supports* (PBIS). In 2014, nearly 20,000 schools across the USA have implemented PBIS (McIntosh, 2014). As a multi-level approach, PBIS involves three tiers of interventions targeting students' various levels of needs for behavior support. The process emphasizes analyzing data to inform decision making, identifying systems that support staff, and identifying, implementing and evaluating evidenced-based practices that improve the social-emotional and learning outcomes of all students. It assists the school's leadership team to structure the learning environment to support the academic and social success of all students.

PBIS is a proactive instructional approach to support pro-social behavior in schools. The implementation of PBIS involves building the capability of teachers to embed the teaching and monitoring of social skills into the curriculum. Teachers structure the environment so that pro-social skills are used by students more often. School-wide PBIS systems aim to explicitly teach students the positive behavior required in various school settings and as such promotes a positive school culture for all students. PBIS is driven by a team that represents the voices of students, families, staff and community to firstly establish strong school-wide universal systems (Tier 1) that promote early intervention, and the teaching and acknowledging of prosocial skills. PBIS also aims to develop consistent systems to discourage unproductive behavior and educate all staff in how to

implement and participate in the process. Staff members collaborate in teams to collect and utilize data for effective decision making related to school culture and the effectiveness of their universal systems and practices. Tier I interventions are school-wide interventions applied to all students to reinforce positive behavior as the school norm. The core elements of Tier I interventions include defining and teaching behavioral expectations, providing multiple opportunities for students to demonstrate appropriate skills and receive feedback/encouragement, and responding to problem behavior in a constructive and instructive manner (OSEP Centre on PBIS, 2009). It is estimated that Tier I interventions, when implemented with fidelity, are effective for about 80% of students.

Approximately 10-15% of students, despite general responsiveness to Tier I supports, may still exhibit a range of behavior-related issues. These students may be demonstrating academic and/or social-emotional problems that require more specific supports. As with Tier I systems, Tier II targeted support is a team-driven process designed to enhance and build upon what has been taught to students at the universal level (Tier I). Tier II interventions specifically address students' social-emotional competencies through evidence-based programs delivered to small groups of students or individual students. The involvement of the classroom teacher facilitates the generalization of new competencies and builds the teacher's capacity to better understand and effectively respond to students with unproductive and challenging behaviors.

Tier II strategies extend the basic logic of PBIS by providing additional and more targeted opportunities for instruction and feedback as well as more environmental structures to increase the likelihood of success. Tier II strategies cluster around three main foci: (1) additional social skill instruction, (2) self-management, and (3) academic supports. One widely used self-management strategy is Check In/Check Out (CICO, also known as the Behavior Education Program—BEP) (Campbell & Anderson, 2011; Campbell, Rodriguez, Anderson, & Barnes, 2013; Ennis, Jolivet, Swoszowski, & Johnson, 2012; Filter, Benedict, Horner, Todd, & Watson, 2007; Hawken, O'Neill, & MacLeod, 2011; Hunter, Chenier, & Gresham, 2013; Lane, Capizzi, Fisher, & Ennis, 2012;

Simonsen, Myers, & Briere, 2011; Swoszowski, McDaniel, Jolivette, & Melius, 2013).

This strategy involves increasing the amount of prompts and feedback, progress monitoring and structure throughout the day. Students “check-in” at the start of school to review expectations for the day with a trained CICO coordinator and receive their daily behavior report card. This is intended to provide specific positive and constructive feedback to students to help prevent future problem behavior. Class teachers also participate in the program by providing both written and verbal feedback and reminding students about the goals that they are trying to achieve. Throughout the day, students self-rate their behavior at the end of each class and confer with their teacher who provides additional positive, and at times corrective, feedback. At the end of the day, students “check-out” with the coordinator, enter their daily point total, celebrate progress and set goals for the next day. The students’ points cards are often sent home for parent review as well.

Another self-management strategy is Check and Connect (Anderson, Christenson, Sinclair, & Lehr, 2004; Christenson, Sinclair, Lehr, & Godber, 2001; Lehr, Sinclair, & Christenson, 2004; Lyst et al., 2005; Sinclair, Christenson, Lehr, & Anderson, 2003), which is characterized by the establishment of a mentor relationship to not only check in with the student on a weekly basis, but also to facilitate capacity building, targeted interventions, family-school partnerships and participation in school. Check, Connect, Expect (CCE) (Cheney et al., 2009), which pairs a positive role model, or coach, with the student to check in and out, and receive regular feedback and reinforcement throughout the day is another example of a Tier II self-management support. The coach’s role is to support the student to develop the capacity to self-monitor their behavior before exiting the intervention. Small group social skills are designed to provide additional instruction and practice with more targeted skills in which the student is displaying difficulty (e.g., respect, responsibility) (Gresham, Sugai, & Horner, 2001; Lane et al., 2003). Finally, students who come to the school PBIS team’s attention due to behavioral concerns may receive additional academic supports when indicated (Mitchell, Stormont, & Gage, 2011).

A smaller group of students, approximately 1-5%, may require more individualized and intensive supports, in conjunction with Tier I and Tier II supports. In many cases, the problem behavior has become “chronic” as these students have experienced academic and behavioral difficulties over an extended period of time. With these students requiring individualized support programs, schools must build on the established foundations of the school-wide system, using data to identify the most appropriate program and intervention. Such interventions focus on creating and implementing individualized behavior support plans that are linked to the universal system.

Tier III interventions involve more intensive and individualized support but still follow the same basic logic of teaching and practicing appropriate replacement behaviors with high rates of feedback, and putting in place environmental supports to increase the likelihood of student success (OSEP Centre on PBIS, 2009). For example, individual plans are based upon school-wide expectations, and the identification of students in need of Tier III supports uses the established data decision making framework. Intensive and individualized behavior intervention plans are developed and implemented to reduce the intensity and severity of challenging behaviors. These plans are devised using functional behavioral assessment. This assessment examines contextual, learning and relationship factors to help explain the underlying reasons for the behavior. Evidence shows that understanding the function of behavior is essential for making the problem behavior ineffective, inefficient and irrelevant. At this level, community supports such as mental health are also often integrated into the support plan. In sum, Tier III intervention planning is driven primarily by conducting comprehensive team-based functional behavioral assessments, linking behavioral and academic supports, and designing personalized interventions based on the assessment of the individual (O’Neill, Albin, Storey, Horner, & Sprague, 2014; OSEP Centre on PBIS, 2009). Specifically, the personalized interventions focus on:

- (a) prevention of problem contexts, (b) instruction on functionally equivalent skills, and instruction on desired performance skills, (c) strategies for placing problem behavior on extinction, (d) strategies for enhancing contingency reward of desired behavior, and (e) use of negative or safety consequences if needed. (OSEP Center on PBIS, 2009, p. 2)

Tier III interventions include strategies such as wraparound supports (Bruns et al., 2010; Eber, Breen, Rose, Unizycki, & London, 2008; Suter & Burns, 2009;), Prevent-Teach-Reinforce (PTR) (Dunlap, Iovannone, Wilson, Kincaid, & Strain, 2010; Filter & Horner, 2009; Iovannone et al., 2009; Strain, Wilson, & Dunlap, 2011) and function-based interventions guided by a comprehensive functional behavioral assessment (Ebanks & Fische, 2011; Lane et al., 2007; Tarbox et al., 2013; Turton, Umbreit, & Mathur, 2011).

It is expected that the use of a continuum of supports across the three tiers can address the majority of school-based student problem behaviors that impede learning, and will thus result in improved academic and behavioral outcomes for students. In the USA, PBIS efforts have yielded positive outcomes in a wide range of contexts including early childhood settings, primary, middle, and high schools (Bohanon et al., 2006; Bradshaw, Mitchell, & Leaf, 2010; Flannery, Sugai, & Anderson, 2009; Horner et al., 2009; Irvin et al., 2006; Lassen, Steele, & Sailor, 2006; Menendez, Payne, & Mayton, 2008; Muscott, Mann, & LeBrun, 2008). These positive outcomes have attracted the attention of many other countries such as Australia (Mooney, Dobia, Barker, Power, Watson, & Yeung, 2008; Yeung, Mooney, Barker, & Dobia, 2009), New Zealand (Savage, Lewis & Colless, 2011), Belgium (Leflot, van Lier, Onghena, & Colpin, 2013), Canada (McIntosh, MacKay, Andreou, et al., 2011), Malaysia (Awang, Jindal-Snape, & Barber, 2013), Norway (Holsen, Smith, & Frey, 2008; Kjobli & Sorlie, 2008; Ogden, Sorlie, Arnesen, & Meek-Hansen, 2012), Singapore (Ooi et al., 2013), and South Korea (Blair, Umbreit, Dunlap, & Jung, 2007). These countries have recently adopted PBIS, or adapted the conceptual framework and strategies of PBIS, in various ways with a common interest of preventing problem behavior and improving student capabilities. Some of these countries have adapted PBIS and added their elements of interest. For example, Positive Behavior for Learning (PBL) in the state of New South Wales in Australia explicitly supports schools to integrate positive behavior intervention with a model of “Quality Teaching” promoted by NSW Department of Education and Communities in order to improve students’

behavior and learning outcomes (Yeung, Barker, Tracey, & Mooney, 2013). Another example of adaptation is in Norway where the emphasis is on the ‘positive behavior, supportive learning environment and interaction in school’, which is expressed in Norwegian as the acronym ‘PALS’, the term coined for Norway’s modified form of PBIS (Ogden et al., 2012, p. 40).

Sustainability as a Major Challenge

Despite success and positive results reported in numerous evaluation studies of PBIS and other behavioral interventions, the issue of sustainability has recently drawn the attention of researchers and practitioners (Bambara, Nonnemacher, & Kern, 2009; Greenberg, 2004; Sugai & Horner, 2006). At a conceptual level, sustainability has different dimensions. Viewed as a visible outcome, and as stated above, sustainability refers to “durable, long-term implementation of a practice at a level of fidelity that continues to produce valued outcomes” (McIntosh, Horner, & Sugai, 2009, p. 328). Viewed as a process, sustainability is conceptualized as involving a dynamic group of organizational systems and practices with reciprocal relationships. Sustainability is not simply about the length of implementation, but also involves quality, integrity and contextual factors of that implementation. Even though researchers have continuously evaluated school-based positive behavior interventions, evaluations focusing on the sustainability of school-based positive behavior interventions are limited (Bambara et al., 2009; Hume & McIntosh, 2013; McIntosh, Filter, Bennett, Ryan, & Sugai, 2010). It is not until recent years that increasing attention has been devoted to the sustainability of school-based programs.

Researchers have observed that some positive effects of positive behavior interventions do not seem to be sustained over time. For example, Warren et al. (2003) observed that the number of office discipline referrals and suspensions decreased significantly during the first year of implementation, but rose to a level that even exceeded baseline during the second and third years. Simonsen and her colleagues (2012) investigated 428 schools in Illinois and found that even though there was reduction in office referrals, suspensions did not decrease over 7 years of implementation

of PBIS. Wilson and Lipsey (2007) noticed in their meta-analysis that multifaceted programs with small and nonsignificant mean effect sizes are often long-term programs. They speculated that long-term programs may experience diluted intensity and focus. Solomon et al. (2012) suggest that it may take 3 to 5 years for SWPBS to reach maximum integrity in terms of changing community beliefs and behavior. However, no study in the Solomon et al. (2012) meta-analysis had implemented SWPBS for more than 2 years. Review of Tier II interventions by Mitchell, Stormont, and Gage (2011) also questioned the sustainability of positive outcomes of BEP/CICO. An examination of sustainability factors is of great relevance to educators and leadership teams. Failure to sustain existing programs involves significant costs. Firstly, the time, resources, and funding invested in previous implementation and training may be wasted. Secondly, abandoning effective programs will result in the loss of benefits in terms of students' behavior and academic outcomes already achieved during initial implementation (McIntosh, MacKay, Hume, et al., 2011). As such, the current systematic review highlighting key issues impacting sustainability has the potential to strengthen both educational practice and research agendas.

Factors Enabling and Impeding Sustainability

Considering these costs, some researchers have started to explore factors enabling and impeding sustainability (a brief summary is available in Table 1). From an intuitive perspective, the factors appear to be coherent at the surface level. From an analytical perspective, these factors lack a precise conceptual definition and may reflect diverse assumptions. This limits a systematic analysis of how the factors might interact or be weighted for priority. Hence researchers should aim at establishing operational definitions and conditions that maximize their respective contributions.

Insert Table 1 Here

Taylor-Greene and Kartoub (2000) conducted a descriptive case study of a middle school with PBIS in place for more than 5 years. This case study found that supportive structures, defined improvement goals, administrator support, teamwork (e.g., regular meetings for planning, training,

data collection, budgeting, and ongoing communication within the school), positive reinforcement (e.g., student rewards) and formative evaluation are facilitators for sustainable implementation of programs. Sugai and Horner (2006) maintain that school leadership works as an essential factor underpinning sustainability by coordinating training, evaluation, funding, and political support.

Lohrmann et al. (2008) investigated the sustainability of PBIS Tier I interventions by interviewing 14 technical assistance providers of program implementation. The interviews indicate that a lack of administrator direction and leadership, skepticism about the need for Tier I interventions, feelings of hopelessness about change, philosophical differences, staff feeling disenfranchised from each other, and the administrator or the mission of the school are the five major barriers for sustaining Tier I interventions (Lohrmann et al., 2008).

Bambara, Nonnemacher, and Kern (2009) employed semi-structured interviews to explore factors strengthening the sustainability of Tier III interventions perceived by school PBIS team members. School culture, administrator support, structure and use of time, professional development and support for professional practice, as well as family and student involvement were identified as the major factors for sustaining positive behavior interventions for individual students with disabilities (Bambara et al., 2009). A further study was conducted by Bambara et al. (2012) to identify facilitators and barriers to implementing individualized or Tier III supports within a PBIS framework. In the survey of 293 school-based professionals, respondents reported greater experience with barriers than facilitators in school settings, which implies the importance of addressing barriers. The top three barriers identified by Bambara et al. (2012) were all related to time for planning, implementing, and meeting as a team.

Forman and colleagues (2009) interviewed the developers of interventions that were identified as 'evidence-based' in multiple vetted lists. They found the following themes as the most frequently cited issues influencing the long-term sustainability of interventions: (1) administrator support, (2) teacher support, (3) financial resources, (4) high-quality training and consultation, (5) the alignment

of interventions with school philosophy, goals, policies and programs, (6) visibility of outcomes and impact, as well as (7) turnover in school staff and administrators. Clearly, the factors that may enable or impede sustainability are both numerous. With so many broad and generic factors, it would seem that sustainability needs to be defined within the broader contextual features of the school. Is sustainability reliant on training? Does the intervention rely on staff 'buy-in'? Does the turnover of staff that schools experience affect sustainability and fidelity of implementation? What prerequisite conditions enable any school-wide program to flourish?

Coffey and Horner (2012) conducted a quantitative study of 117 schools across six states in the USA to investigate factors for sustaining PBIS programs. They found that administrator support, communication, and data-based decision making were the main contributing factors for sustainability. Teaching behavior expectations, establishing a reward system and a system of monitoring and decision-making are critical features of programs sustained for at least 5 years. Other factors influencing sustainability include coaching, training, staff buy-in, teaming, resources and turnover.

Mathews et al. (2013) used regression analyses of self-reported data from participants from 261 schools across the US to identify predictors for sustained implementation. Their three-year study revealed that regular acknowledgement of expected behaviors, matching instruction to student ability and accesses to additional support were critical features of PBIS that predicted sustained implementation.

McIntosh and his colleagues have developed and validated the School-wide Universal Behavioral Sustainability Index-School Teams (SUBSIST) as a tool for assessing the enablers and barriers for the sustainability of Tier I interventions in a series of studies (Hume & McIntosh, 2013; McIntosh, MacKay, Andreou, et al., 2011; McIntosh et al., 2013; McIntosh et al., 2014). This instrument is composed of eight subscales (priority, building leadership, external leadership, effectiveness, efficiency, use of data, capacity building and potential barriers) with 50 items

(McIntosh, MacKay, Andreou, et al., 2011). Using SUBSIST as the measure, Hume and McIntosh (2013) identified in their study of 217 schools that frequent school team meetings, presentation of data to school staff, access to an external coach or consultant and a longer period of implementation were related to the sustainability of school-wide programs.

McIntosh et al. (2013) identified two school-level factors (school priority and team use of data) and two district-level factors (district priority and capacity building) which were significantly associated with the sustainability of school-wide programs. The finding was confirmed in a subsequent study (McIntosh et al., 2014) surveying 257 school team members. Quantitative and qualitative analyses in this second study highlight administrator support, regular team meetings and high priority of PBIS as strongly correlated with the sustainability of SWPBIS. The major finding in the review of the studies above is that the most prominent factors that either facilitate or impede sustainability are essentially systemic. It has important implications theoretically and for practice. In practice, it is probably the observed effectiveness of interventions at a systems level that has attracted large numbers of schools worldwide to adopt the approach. In terms of theory, the strong emphasis on applied behavior analysis (Dunlap, 2006) has progressed to considering various theoretical perspectives ranging from individuals to groups of individuals (i.e., systems) such as social cognitive theory and ecological systems theory (Bandura, 1986; Carr et al., 2002; Yeung et al., 2013). In addition, the emerging field of "implementation science" has contributed to implementation designs. Covering various levels of input, the principles of contextual fit, priority, effectiveness, efficiency, and data analysis are applied to the selection and assessment of practices (Cook & Odom, 2013; Fixen et al., 2005).

Conceptual Considerations

As emphasized by NCVET (2005), a systematic review starts with the identification of questions and development of a conceptual framework. The literature concerning sustainability research is at an early stage of development. Our review indicates that the variables require

conceptual clarification to extend our knowledge and inform fidelity in practice. Researchers have used different perspectives when examining sustainability issues. For example, McIntosh, Horner, and Sugai (2009) proposed a model for sustainable implementation of school-based interventions that involves three recursive activities: (1) identifying valued outcomes, (2) identifying and modifying practice, and (3) implementing practices. In this model, these three activities are further enhanced by three processes including continuous measurement, data-based problem solving, and capacity building. Based on this model, McIntosh et al. (2010) hypothesized five principles for sustainability derived from implementation theorizing; contextual fit, priority, effectiveness, efficiency, and continuous regeneration.

Shedia-Rizkallah and Bone (1998), while discussing the sustainability of community-based health programs, proposed a conceptual framework defining three operational indicators and three influential factors for sustainability. Operational indicators include: (1) maintenance of benefits achieved through an initial program, (2) level of institutionalization of a program within an organization and (3) measures of capacity building in the recipient community. Influential factors include: (1) project design and implementation factors (negotiation process, effectiveness, duration, financing, project type and training), (2) factors within the organizational setting (institutional strength, integration with existing programs, leadership), and (3) factors in the broader community environment (socioeconomic and political environment, and community participation).

The McIntosh, Horner, and Sugai (2009) and Shedia-Rizkallah and Bone (1998) models provide an excellent starting point for examining the sustainability of intervention programs. These models provide a useful framework for scrutinizing the procedural and structural issues involved in the interventions. Apart from the differences in the nature of intervention, it seems that a major conceptual difference between the two models is that McIntosh et al. (2009) focused more on procedural aspects (fidelity at various stages of implementation) whereas Shedia-Rizkallah and Bone (1998) focused more on structural aspects of sustainability (fidelity at various levels of the

system). Using these models, we were able to interrogate the maintenance of benefits gained from interventions, focus on administrator support and fidelity of implementation, and uncover the importance of professional development. Using Shediac-Rizkallah and Bone's (1998) model, for example, we could identify that the cost of external coaches may be a great obstacle to sustainability. In fact, any business that involves external coaches would have noted the cost factor (Grant, Curtayne, & Burton, 2009; Kemp, 2008). The pragmatic concerns regarding financial sustainability and long-term institutional commitment are always substantial and pervasive. Nevertheless, our analysis found that neither of these models has captured the interaction of the various salient factors. Neither an emphasis on the procedure aspects nor the structural aspects of intervention seems to be able to explain intervention sustainability. Hence future research should consider more the interplay among these crucial factors that either facilitate or impede sustainability.

When analyzing and synthesizing the existing literature using these two models, we found that the factors for sustainability outlined in the literature can be summarized in four interconnected dimensions: (1) ongoing professional development and technical assistance, (2) administrator support for school team, (3) emphasis on classroom-level implementation fidelity, and (4) effective evaluation of implementation fidelity and sustainability. Each of these four dimensions may encompass both procedural and structural elements, and each dimension enhances or is enhanced by the other three dimensions. By conceptualizing sustainability of positive behavior intervention in an interactive way, we will be able to understand the dynamic nature of mutually influencing factors for sustainability in a system approach. Given the interrelationship between different dimensions, a holistic approach to addressing sustainability by actively addressing all dimensions (such as the four dimensions examined here) should be considered. Such relationships among the four dimensions derived from the literature may be conceptualized as a tetrahedron as shown in Figure 1 (a and b). Our synthesis of the findings from the literature is presented below using this conceptualization.

Insert Figure 1(a) and Figure 1(b) Here

Four Essential Dimensions

Overall, the lists of enablers and barriers provided in each of the previous studies vary a lot. There is, in fact, little agreement on the definitions of contributing factors. However, at a surface level, most of the research to some extent acknowledged administrator support and professional development as factors related to sustainability. Some research mentioned administrator support and/or professional development directly as factors related to sustainability (Bambara et al., 2009; Coffey & Horner, 2012; Forman et al., 2009; Lohrmann et al., 2008; McIntosh et al., 2014; Taylor-Greene & Kartoub, 2000). In other research in which administrator support and professional development were not mentioned explicitly, some other concepts closely related to them were included (Bambara et al., 2012; Hume & McIntosh, 2013; McIntosh et al., 2013; Sugai & Horner, 2006). In addition, other factors related to fidelity of implementation of PBIS such as reinforcing or rewarding positive behavior (Mathews et al., 2013; McIntosh et al., 2010; Sugai & Horner, 2006; Taylor-Greene & Kartoub, 2000), use of data (Coffey & Horner, 2012; Hume & McIntosh, 2013; McIntosh et al., 2013), and matching instruction to student ability (Mathews et al., 2013) were listed. In the following section, four major dimensions as illustrated in Figure 1 are elaborated.

Administrator support. Administrator support such as agreeing with PBIS principles, allowing teacher release time for training and team meetings, allocating resources for implementation has been explicitly listed as a significant factor related to the sustainability of PBIS in numerous studies (Bambara et al., 2009; Coffey & Horner, 2012; Forman et al., 2009; Lohrmann et al., 2008; McIntosh et al., 2014; Taylor-Greene & Kartoub, 2000). In addition to these, the significance of administrator support for sustainability has been verified in some other studies in indirect ways. For example, Sugai and Horner (2006), by emphasizing the importance of school leadership as demonstrated by coordinating training, evaluation, funding and political support, highlight the essential role of administrator support for sustainability. Similarly, according to

McIntosh et al. (2013), school administrators treating PBIS as a priority is one of the school-level factors related to sustainability. Miller-Richter and colleagues also found administrator support to be a significant factor related to teachers' confidence in their ability to address social behavior challenges (Miller-Richter, Lewis, & Hagar, 2012).

Nevertheless, the quantitative analysis that McIntosh et al. (2014) conducted indicates that administrator support is not the most direct influential factor as it does not make a statistically significant independent contribution to the sustained implementation of PBIS. Instead, administrator support contributes to sustained implementation of PBIS by enhancing another two factors which have more direct impact on sustainability, namely, team functioning and team use of data for decision making (McIntosh et al., 2014). This is consistent with findings in other research showing that teaming and use of data are major factors related to sustainability (Bambara et al., 2009; Bambara et al., 2012; Coffey & Horner, 2012; Hume & McIntosh, 2013; Taylor-Greene & Kartoub, 2000). For example, insufficient time for the PBIS team to meet, plan and implement together is often a problem for sustaining interventions across the continuum (Bambara et al., 2012). Strong administrator support plays a significant role because with such support, PBIS is more likely to be treated as a top priority for the school, and allows sufficient time for the PBIS team to meet regularly and develop their skills in data use (McIntosh et al., 2014). According to McIntosh et al. (2014), strong administrator support alone is unlikely to result in sustained implementation of PBIS if team functioning and expertise in using data for decision-making are not developed. In other words, the interplay of administrator support with other factors may be more important than the role of administrator support alone. In fact, McIntosh et al. (2014) further speculated that if the school PBIS team continues to function effectively and efficiently, PBIS programs can be sustained in the school even without strong administrator support.

In terms of future direction, Bambara et al. (2012) stressed that school principal support and advocacy is more immediate than district-level administrator commitment. At the school level,

developing administrator support is crucial for sustaining school-based programs because the daily decisions and actions occur within the school. It is therefore essential that principals demonstrate positive attitudes towards PBIS and the inclusion of PBIS into the school vision through words and action (Bambara et al., 2009). Warren et al. (2003) suggest establishing an oversight team with dedication to the implementation of PBIS to buffer against changes due to other programs that are inconsistent with PBIS. Also for the longevity of PBIS, a committee may be set up to show staff how other school initiatives (e.g., bullying programs and mental health reforms, teacher quality initiatives, curriculum focused programs, etc.) can be integrated into the systems approach of PBIS rather than being perceived as an additional activity for schools and teachers (McIntosh et al., 2013).

Further to the need for administrator support, recent debates have extended to the nature of such support. As pointed out in a recent study by McIntosh et al. (2014), support from administrators may not have as much direct impact on sustainability as may team functioning and data-based decision making, which are the most direct factors for sustainability. They argue that it is ultimately the team within the school that makes things happen, and therefore, administrator support will contribute to sustainability only if it promotes better team functioning and better use of data to make decisions. This argument is also supported by other researchers (Coffey & Horner, 2012; McIntosh et al., 2014) who demonstrated that team functioning enhanced implementation fidelity and was highly correlated with sustainability. In essence, administrators who support the implementation of PBIS in their schools should devote particular attention to the functioning of teams and the development of team members' expertise in using data for decision-making.

To support team effectiveness, administrators need to provide opportunities for school team members to meet regularly and have access to high-quality data, while for themselves, they may need training in organizing efficient meetings and using data for decision-making (McIntosh et al., 2014). Administrators' attitudes towards data on behavior influence teachers' reporting of problem

behavior, which in turn affects the accuracy of data for decision-making and implementation fidelity. Therefore, it is crucial for administrators to establish a consistent and systematic process of problem behavior reporting which clearly defines the behavior to be reported and accurately documents details of reported behavior. The implementation of PBIS should aim to directly achieve this goal, by creating systems that increase the consistency of adult judgment. It would also be beneficial if principals actively collaborate with team members in decision-making, actively participate at team meetings, listen to team members' concerns, and acknowledge team efforts (Bambara et al., 2009). It is also essential for principals to provide the resources needed for implementation, including funding, staff development opportunities, teacher release time for training and meetings, technical assistance consultants, as well as other professional personnel to assist the team (Bambara et al., 2009). We recommend that more future research is needed to investigate systems that relate to team factors such as composition, skills, communication and use of data.

Professional development and technical assistance. Like administrator support, the provision of professional development, training, consultation and coaching across the multiple levels of the three tiered continuum, as well as systematic collection and analysis of student data has been often cited as a prerequisite for sustained implementation of PBIS in existing studies (Bambara et al., 2009; Forman et al., 2009; Hume & McIntosh, 2013; Mathews et al., 2013; McIntosh et al., 2014). Unfortunately, it seems that behavior management has not been sufficiently addressed in pre-service teacher training. Beginning teachers often complain about the inadequacy of teacher education programs in preparing them for classroom and behavior management (Atici, 2007; McKenzie, Rowley, Weldon, & Murphy, 2011; NCTQ, 2013; O'Neil & Stephenson, 2014). As a consequence, new teachers often feel overwhelmed by the disruptive behaviors of students (Beaman, Wheldall, & Kemp, 2007; Oliver & Reschly, 2007; Sullivan, Johnson, Owens, & Conway, 2014). Without appropriate training in positive behavior support, new teachers are likely

to respond to students' disruptive behaviors with a reactive approach (Oliver & Reschly, 2007).

Behavior management training in teacher education programs is often dominated by theoretical and philosophical models without a solid evidence-based approach such as PBIS (Banks, 2003; O'Neil & Stephenson, 2014). In Australia, despite the inclusion of behavior management in teacher education programs, time spent on the practical aspects of PBIS is limited compared with theoretical and philosophical models (O'Neil & Stephenson, 2014).

Furthermore, researchers found that professional development may not be effective in bringing sustained implementation if there is a lack of ongoing technical assistance provided to teachers after initial training (Coffey & Horner, 2012; Forman et al., 2009; Hume & McIntosh, 2013; Mathews et al., 2013). Technical assistance, which often includes consultation and coaching, uses knowledge to facilitate adoption and implementation of certain educational practices (Coffey & Horner, 2012; Yin & White, 1984). Technical assistance in the form of ongoing consultation and coaching are considered important for refining implementation to successfully fit positive behavior interventions into school contexts (Forman et al., 2009; Mathews et al., 2013). To increase teachers' capability of meeting the diverse needs of all students, teachers need to be trained and continually supported to use classroom-based data both at a whole-class level and at an individual-student level for decision-making about academic, social, and behavioral interventions.

McIntosh, Campbell, Carter, and Zumbo (2009) ascertain that the problems with the use of behavior data such as office disciplinary referrals (ODRs) to inform teachers' decision-making are likely to be reduced through professional development on the accurate reporting and use of ODRs. Such professional development involves areas such as defining reportable behaviors with clear and feasible criteria, conducting data summaries and accuracy checks, increasing supervision, and avoiding cultural bias in issuing ODRs.

Increased support for teachers may be required when interventions for students become more intensive and individualized. Bambara et al. (2009) maintain that teachers should be adequately

trained to implement more individualized and sophisticated interventions. For sustained implementation to occur, ongoing technical assistance in the form of consultation and coaching needs to address practical classroom issues with a focus on core principles of positive behavior interventions (Coffey & Horner, 2012). Ongoing technical assistance aims at contextualizing and aligning positive behavior interventions with the school philosophy, goals and policies as well as to meet the evolving needs of teachers (Bambara et al., 2009; Colvin & Fernandez, 2000; Forman et al., 2009; Mathews et al., 2013; Warren et al., 2003). Essentially, a tiered technical assistance for teachers is required in order to match tiered support for students (Lewis, Barrett, Sugai, & Horner, 2010). Mathews and his colleagues (2013) recommend school teams to meet with district coaches and teams from other schools and districts to build up their knowledge of PBIS implementation. Joyce and Showers (2002) highlight the value of peer coaching and found that peer-coached teachers are more likely to transfer training into their practice as they practice new strategies more often, adapt new strategies more appropriately to their own goal and context, retain and further develop their skills, ensure students understand their strategy and expectation, and have clearer understanding about new strategies.

Some authors suggest a sustained partnership between universities and schools as a solution for the sustainability of school-based programs (Colvin & Fernandez, 2000; Warren et al., 2003). Experts from universities can strengthen ongoing training, consultation and evaluation for schools. While schools' experiences of implementation enrich practical understandings about positive behavior interventions and generate rich data, university scholars can refine positive behavior interventions at a theoretical level. Results generated by further research at universities can then be applied to schools to benefit students' outcomes further. To provide sustainable tiered support for teachers, wider collaboration beyond partnership between university and school seems to be necessary. Wider collaboration may involve schools, universities, governments, hospitals, families, youth development organizations and community agencies, with each party sharing their knowledge

and expertise to achieve a common goal (Barrett, Eber, & Weist, 2013; Greenberg, 2004; Warren et al., 2003).

In response to the challenges of sustainability, a technical assistance center has been established in which staff from universities and other organizations (Office of Special Education Programs of U.S. Department of Education, Maternal and Child Health Bureau of the Health Resources and Services Administration of the U.S. Department of Health and Human Services) work collaboratively to provide technical assistance to the large-scale implementation of PBIS (Eber, Weist, Barrett, 2013; Sugai & Horner, 2006). Currently, efforts have been put on the Interconnected Systems Framework (ISF) which represents a partnership between schools and community mental health providers. By interconnecting PBIS and School Mental Health (SMH) systems, ISF aims to enhance the effectiveness of prevention efforts at Tiers I, II and III interventions to address students' more complex behavioral and mental health needs (Eber et al., 2013). Since 1999, over 20,000 schools across every state in the USA have been served by the technical assistance center (McIntosh, 2014). We expect more systematic evaluations of different forms of partnership in providing effective technical assistance and more evidence-based research into the core elements of high-quality professional development in the future.

Emphasis on classroom-level fidelity. Sustainability is not merely the continued implementation of programs, but a continued implementation with high fidelity (Han & Weiss, 2005). As mentioned earlier in this article, implementation fidelity is concerned about whether a program is implemented accurately by the educator, as designed and tested by the developers (Dusenbury et al., 2003). The evidence suggests that programs with high implementation fidelity will have a more positive impact on student outcomes (Bradshaw, Debnam, Koth, & Leaf, 2009; Childs, Kincaid, & George, 2010; Horner et al., 2009; Lassen et al., 2006; McIntosh, MacKay, Hume, et al., 2011; Rodriguez, Loman, & Horner, 2009; Simonsen et al., 2012; Wilson & Lipsey, 2007). If implementation fidelity is not maintained, suboptimal outcomes may occur. Without

observable positive outcomes, teachers' motivation to sustain positive behavior management will be negatively affected. In this sense, implementation fidelity should be an essential element of sustainability (McIntosh et al., 2010). The issue is then what should be done to ascertain fidelity.

Given that Reinke et al. (2013) found that high regard for positive behavior interventions at a school-level does not necessarily indicate high implementation fidelity at a classroom-level, the issue of fidelity may need to be revisited at the classroom level. The significance of in-service teacher training becomes a major point to consider. In fact, research has shown its significance in promoting implementation fidelity (Bradshaw et al., 2008; Bradshaw et al., 2009; Bradshaw et al., 2010; Rodriguez et al., 2009). Nonetheless, as explained before, not all teachers may implement positive behavior interventions with fidelity even though all of them attend professional development. In some situations, even when individual teachers design their classrooms in ways consistent with PBIS, they may use ineffective and/or non-evidence-based strategies. Some of these practices may create positive outcomes for students, while others may compromise implementation fidelity and lead to lower student outcomes (Elliott & Mihalic, 2004; Han & Weiss, 2005). In essence, some teachers may receive incomplete professional assistance or may misinterpret professional assistance towards implementing practices consistent with the principles of PBIS (Warren et al., 2003). Therefore, extra attention should be focused on ongoing coaching after initial training for classroom-level implementation fidelity.

Coaching for classroom-level fidelity covers the essential areas of classroom systems, such as structure, feedback, instruction, and expectations (Reinke et al., 2013). It also involves topics such as the collection and analysis of data to identify students' responsiveness to strategies. It aims to develop a deeper understanding of the purpose of behavior, how to formulate appropriate behavioral objectives and to implement them (Bambara et al., 2009; Reinke et al., 2013). As an evidence-based approach, a critical aspect of classroom-level implementation fidelity of PBIS is the collection of valid data on students' behavior to support teachers' decision-making. Currently, a change in the

numbers of ODRs is often used as a readily available data source to indicate students' behavior change after implementing PBIS (Clonan, McDougal, Clark, & Davison, 2007; Barrett, Bradshaw, & Lewis-Palmer, 2008; Mass-Galloway, Panyan, Smith, & Wessendorf, 2008; Muscott & Mann, 2008; Reynolds, Irwin, & Algozzine, 2009; Putnam, Luiselli, Handler, & Jefferson, 2003).

Despite the existing evidence (Irvin et al., 2006; Pas, Bradshaw, & Mitchell, 2011; Spaulding et al., 2010; Sugai, Sprague, Horner, & Walker, 2000) that the ODR is an efficient, valid and reliable assessment of the level of problem behavior in a school, there are several concerns over the adequacy of using ODRs as a dependent variable. ODRs are issued by teachers in response to a student's major problem behavior (McIntosh, Campbell, Carter, & Zumbo, 2009). As the issuing of ODRs is subject to a teacher's judgment, ODRs are not purely a reflection of student problem behavior, but also a result of teacher behavior. Firstly, the skills and level of supervision provided by the teacher may be related to the number of ODRs (McIntosh et al., 2009). A major problem behavior may not be issued with an ODR simply because it was not observed by the teacher. Therefore, it is possible that a school with more effective supervision systems report more ODRs than a school with less effective supervision systems (Colvin, Sugai, Good, & Lee, 1997). Such a relationship between teacher supervision and ODRs is to some extent confirmed by a previous finding that most ODRs were generated from the classroom where students receive more teacher supervision (Spaulding et al., 2010; Skiba, Peterson, & Williams, 1997).

Moreover, the invalidity of ODRs may also be a consequence of teachers' varying criteria regarding which problem behavior warrants an ODR (Kern & Manz, 2004; Nelson, Gonzalez, Epstein & Benner, 2003), inconsistent school policies on ODR entry (Rusby, Taylor, & Foster, 2007), and teachers' disproportionate use of ODRs with students from particular cultural backgrounds (Krezmien, Leone, & Achilles, 2006; Shaw & Braden, 1990; Skiba, Michael, Nardo, & Peterson, 2002). Furthermore, teacher judgment with ODR use is likely to be related to a number of additional factors, such as the school leadership's attitude toward ODR use. Teachers may be

more willing to use the ODR system if it results in more support from administrators. Conversely, teachers may under-report problem behavior if the ODR is perceived as evidence of their difficulties with teaching (McIntosh et al., 2009). To achieve classroom-level implementation fidelity, performance feedback is important to minimize a reporting bias due to the teacher behavior listed above. The design of PBIS as an intervention recognizes the significance of ODRs as being both a dependent and independent variable. Systems are developed to increase the consistency of teacher judgment, particularly with distinguishing minor from major problem behaviors, reporting problem behaviors accurately, and increasing the level of active teacher supervision.

Teachers should also be coached to fit positive behavior interventions into their own repertoire to help achieve their goals. Real-classroom examples may be particularly helpful to encourage authentic, problem-based learning. Mathews et al. (2013) pointed out that teachers should not only be taught effective classroom practices, but also how and why preventative systems work, and how they may vary from their own beliefs and assumptions about student learning. Otherwise, there may be only modifications at the surface such as changing activities and materials which do not transform classroom norms (Mathews et al., 2013). Importantly, teachers need to develop a sound and solid understanding about positive behavior intervention so that they can adapt it to suit their local context without sacrificing the core components of positive behavior interventions (Han & Weiss, 2005). Feedback for classroom teachers when implementing classroom systems by a mentor, consultant or coach is highly recommended for ensuring implementation fidelity (Han & Weiss, 2005). A combination of training and consultancy may be a good way to promote fidelity and sustainability.

To promote classroom-level implementation fidelity and sustainability, developing teachers' and administrators' high commitment is important. Teachers' and administrators' commitment to a large extent depends on their belief in their own ability to implement behavior supports. Without high commitment and strong belief, staff may resist following positive behavior interventions at the

classroom-level even when the school has introduced it as a priority. Incompatible staff beliefs, for example, that high-risk behavior should be punished and students with severe challenging behavior should be educated in special settings, is identified as a strong impediment to Tier III interventions (Bambara et al., 2009, 2012). Hence, addressing teachers' and administrators' beliefs is considered as an integral part of training. Teachers' acceptance of a program is deemed to be significantly influenced by administrator support, the time required for implementation, the needs of their students, the compatibility of the program with their belief about behavior management and the observable effectiveness of the program (Han & Weiss, 2005). Skeptical teachers may only accept positive behavior interventions when the effectiveness of the program is clearly visible to them (Forman et al., 2009; McIntosh et al., 2014). Teachers' perception that positive behavior interventions just add more to their workloads needs to be changed by making all implementation efforts relevant to outcomes that teachers value (e.g., improved academic outcomes, increased respect for others) (Joyce & Showers, 2002). Stewart, Benner, Martella, and Marchand-Martella's (2007) meta-analysis showed that when integrated with a three-tiered positive behavior intervention model, reading programs yielded better literacy skills development outcomes. Such evidence on students' progress is essential to establishing compelling reasons for implementing positive behavior interventions.

One important outcome for all educators is scores on standardized academic tests as these are often publically reported as a reflection of the overall quality of the school including instruction (Han & Weiss, 2005; Warren et al., 2003). This, however, may take time to achieve. Published reports and multimedia resources with real classroom examples are helpful because they give evidence of effectiveness. Previous research shows that presentations by teachers and administrators from schools operating under situations similar to the trainees' schools are very useful in motivating teachers to implement the program (Warren et al., 2003). Such evidence needs to demonstrate not only the improved student outcomes, but essentially the strong link between the improved student

outcomes and the implementation of problem solving process.

When teachers understand the integrative systems approach to PBIS, they are more likely to value that PBIS can be adaptive to other programs that are introduced to the school and classroom (e.g., social skills building, pedagogy and curriculum programs) such that these programs are ‘integrated’ rather than additive in workload (McIntosh, 2013). It is also crucial to make teachers aware that in order for the PBIS problem solving process to achieve desired student outcomes, teachers must ensure high implementation fidelity of essential features. Training on intensity of implementation and in-class feedback will benefit teachers in developing in-depth understanding about PBIS and implement the program with sustained fidelity (Han & Weiss, 2005). Administrator commitment is often regarded as the driving force for the shift of school culture from punishing problem behavior to reinforcing appropriate behavior and hence training for administrators to develop such commitment is also necessary. Nevertheless, neither administrator commitment nor any other identified factor would guarantee sustainability of success. The consistency between PBIS and existing school policy, philosophy, and goals needs to be addressed in training for administrators to advocate and internalize PBIS as part of the school culture.

Effective evaluation of fidelity and sustainability. Given the importance of fidelity when implementing PBIS, researchers have devoted significant amounts of effort to measure implementation fidelity. To judge students’ non-responsiveness to a particular intervention, we need to first ensure that intervention programs are delivered as intended. For this to be achieved, an accurate measure of implementation fidelity is essential. Fixen, Naoom, Blasé, and Friedman (2005) identified three dimensions that are relevant to fidelity measurement: context, compliance, and competence. Context refers to the prerequisite conditions that should be addressed prior to intervention. Compliance refers to the selection and use of core components, while competence covers the skill level of the program deliverers. The work of Fixen et al. (2005) primarily examines the stages of implementation with respect to the developmental cycle school teams go through as

they build and implement a full continuum of tiered supports. All implementers of new strategies go through the discernable stages of: (a) exploration, (b) initial installation, (c) full implementation, and (d) adaptation. The assessment of fidelity should therefore take into account which implementation phase the school team is in across each of the three tiers of support. Using PBIS as an example, Fixen et al. also drew a distinction between *structural* fidelity and *process* fidelity. Measures of *structural* fidelity may be a rubric or checklist that objectively documents the adherence to a protocol based on core or critical components set by the developers. Attention also needs to be given to the *process* features, which relate to the qualitative dimensions such as subjective ratings concerning the application of the intervention and its impact on student outcomes. Recent discussions in the literature suggest that both forms of fidelity need to be captured (Harn, Parisi, & Stoolmiller, 2013).

In previous research, the wide variety of evaluation tools for assessing the implementation fidelity of universal-level school-based programs include: Self-Assessment Survey (SAS) (Mathew et al., 2013; Sugai, Horner, & Todd, 2003), School-wide Benchmarks of Quality (BoQ) (Cohen, Kincaid, & Childs, 2007; Mathew et al., 2013), School-wide Evaluation Tool (SET) (Bradshaw et al., 2008; Horner et al., 2004; Mass-Galloway et al., 2008; Nersesian, Tood, Lehmann, & Watson, 2000; Vincent, Spaulding, & Tobin, 2010), Team Implementation Checklist (TIC) (Mass-Galloway et al., 2008), Treatment Acceptability Rating (Lyst, Gabriel, O'Shaughnessy, Meyers, & Meyers, 2005), Implementation Phase Inventory (IPI) (Bradshaw et al., 2009), etc. The state-level studies in the USA (Barrett et al., 2008; Childs et al., 2010; Mass-Galloway et al., 2008; Muscott et al., 2008; Reynolds et al., 2009; Simonsen et al., 2012) show that the majority of schools have implemented school-wide positive behavior interventions with high fidelity and have achieved improved implementation fidelity based on the School-wide Evaluation Tool (SET), Team Implementation Checklist (TIC) or Benchmarks of Quality (BoQ). It was also shown in two recent studies that it seems to be more challenging to achieve high implementation fidelity in middle schools and high

schools than in elementary schools (Childs et al., 2010; Simonsen et al., 2012), but this is yet to be fully investigated. Positive findings regarding implementation fidelity have also been shown in other research on Tier I interventions (Bohanon et al., 2012; Farkas et al., 2012) and Tier II interventions (Filter et al., 2007; Hawken, 2006; Hawken et al., 2007; Hawken et al. 2011).

Notably, all the evaluation tools outlined above measure implementation fidelity at the school-wide universal level. Despite the proven validity and reliability of these evaluation tools (Cohen et al., 2007; Horner et al., 2004; Vincent et al., 2010), it was found that high scores on a school-level evaluation might not accurately predict teachers' fidelity of implementation of PBIS at the classroom level (Reinke et al., 2013). This implies that the measurement of fidelity needs to cover various levels in a school-wide intervention.

In terms of future direction, effective evaluation of fidelity and sustainability requires extending existing evaluation tools to match the conceptual framework encapsulated in PBIS. In response to the challenge of sustainability, evaluation tools need to be further developed in three aspects. Firstly, it is necessary to develop evaluation tools for measuring sustainability, that is, the long-term implementation of practice. Currently, the School-wide Universal Behavioral Sustainability Index-School Teams (SUBSIST) is the only research instrument available for measuring sustainability. However, it is only applicable to Tier I interventions, hence undermining researchers' and educators' capacity to evaluate the sustainability of Tier II and Tier III. Regardless of whether a procedural or structural model for sustainable implementation is adopted within various measurement tools, practices and processes visible within Tier I, Tier II, and Tier III must be assessed to adequately measure levels of sustainability. Apart from a series of studies done by McIntosh and his colleagues (Hume & McIntosh, 2013; McIntosh, Campbell, et al., 2009; McIntosh, Horner, et al., 2009; McIntosh, MacKay, Hume, et al., 2011; McIntosh et al., 2013; McIntosh et al., 2014), SUBSIST has not been validated in other large-scale longitudinal studies outside the USA. In this sense, the cross-cultural validity of SUBSIST remains to be tested.

Secondly, concerning the importance of implementation fidelity for sustainability, valid and reliable measurement of implementation fidelity is important. Even though a number of tools for measuring implementation fidelity have been developed and validated, most of these tools focus on school-wide implementation. There is a need to develop evaluation tools for measuring implementation fidelity at a classroom level. Among existing tools, Self-Assessment Survey (SAS) (Sugai et al., 2003) and Benchmarks of Quality (BoQ) (Cohen et al., 2007) have components regarding classroom-level implementation. Similarly, the recently released Tiered Fidelity Inventory, which considers fidelity across the full continuum, evaluates the implementation of specific classroom components at the universal level (Algozzine, Barrett, Eber, George, Horner, Lewis, Putnam, Swain-Bradway, McIntosh, & Sugai, 2014). One evaluation tool which specifically focuses on classroom-level implementation fidelity is the Classroom Ecology Checklist (Reinke & Lewis-Palmer, 2005). This tool has 20 items that assess classroom-level implementation fidelity based on observations of the classroom structure, behavioral expectations, instructional management, positive interaction, response to appropriate behavior, and response to inappropriate behavior (Reinke et al., 2013). Like SUBSIST, the validity and reliability of this evaluation tool remain to be tested in large-scale longitudinal studies and cross-cultural situations. The applicability of Classroom Ecology Checklist to interventions at different tiers is another unknown issue. Moreover, different evaluation tools may be required for measuring classroom-level implementation fidelity of Tier I and II interventions due to the different features of these interventions. There is also concern about the way evaluation data are collected, and Solomon et al. (2012), for example, emphasize that direct observation should be used as the primary evaluation of classroom-level implementation. Further research concerning the use of performance feedback for increasing the use of evidence-based classroom practices is another important area to consider (Reinke, Stormont, Herman, Wang, Newcomer, & King, 2014).

Thirdly, to provide sustainable support for teachers, there need to be some tools for

identifying their evolving needs. As a known mediating variable between knowledge and actual behavior (Bandura, 1989), teacher efficacy needs to be assessed in order to identify teachers' needs for training or coaching (Reinke et al., 2013). Low teacher efficacy is an indicator calling for extra support. However, despite the numerous tools available, not every important aspect that ensures fidelity and sustainability is covered. Teacher efficacy, for example, is mostly neglected in such tools. In fact, there may be too many existing tools with overlapping purposes, probably reflecting the historical development of PBIS in different geographical areas of the USA with a common goal. With new evolutions into more diversified goals and more dynamic models of implementation (e.g., the Australian version known as PBL emphasizing learning outcomes), ongoing research is required to develop new instruments to meet their diversified needs.

Conclusion

Despite the reported success of school-based positive behavior interventions, sustainability and implementation fidelity have only received particular attention from researchers in recent years. The current review provides critical advice for both educators and researchers by synthesizing the key findings of this emerging research so that future practice and research may be bolstered to the benefit of students, schools, and the community. In practice, initial insights into sustainability reveal administrator support and the provision of high quality professional development and ongoing technical assistance (consultation and coaching) as the most frequently cited factors influencing sustainability. It is also emphasized that administrator support alone does not guarantee sustained implementation. For effective implementation of PBIS, administrator support is needed to promote team effectiveness and data-based decision making. Even though overall implementation fidelity in current programs seems to be high at the school level, there is likely to be uncertainty about classroom-level implementation fidelity due to a lack of extensive assessment on classroom implementation. It could be difficult to accurately evaluate outcomes of certain interventions unless it has been implemented as intended in the classroom, and unless the measurement of effects is

valid and reliable. In response to the challenges of sustainability and classroom-level implementation fidelity, several future directions are suggested for positive behavior intervention programs, which include: increasing administrator support for school teams, providing ongoing professional development and technical assistance (consultation and coaching) for teachers, focusing on classroom-level implementation, developing and validating evaluation tools for sustainability.

In research, a future direction may be to provide a better understanding of crucial factors related to the sustainability of school-based positive behavior interventions, and to understand the interplay of such factors. A number of weaknesses in the literature of intervention sustainability may need to be addressed. Firstly, research should seek to collect diverse data sets and adopt diverse methodology in order to address the nuanced questions emerging from the current state of empirical evidence. A limited number of research studies have explored sustainability of school-based programs on a large scale. Quantitative evaluation of sustainability requires the analysis of longitudinal data over multiple time points, but such analysis is insufficient in the current research literature. To enrich our understanding about how schools overcome barriers to sustainability, researchers are encouraged to conduct more in-depth qualitative approaches. This mixed-method approach serves as a complementary research agenda to advance knowledge.

Secondly, of the limited large-scale research available, all of them were conducted in the USA to evaluate the sustainability of PBIS. Future research direction could be to explore the factors related to sustainability at an international level or to validate measurements of sustainability in cross-cultural situations. It is important because interventions outside the USA have not been implemented over an extended period as in the USA, and there has been a heavy reliance on US personnel to deliver training overseas. There remain uncertainties between fidelity and adaptation in an international context. Because the tools for implementation, support, and evaluation were all developed in the US with their education system and resourcing models in mind, the kinds of

sustainability factors that apply to the US context may not apply to another context, given the vast difference in school systems and expectations. In this sense, the sustainability issue of positive behavior intervention programs in other countries has remained unexplored.

Thirdly, measurement tools specifically for sustainability have only been developed for Tier I interventions. Future research could support the appraisal of the full multi-level approach by developing tools that measure the sustainability of all three tiers of intervention underpinning PBIS. With the conceivable potency of PBIS to improve behavioral, academic and social outcomes of children, few would argue that these are challenges that are certainly worth tackling.

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Table 1. Factors impacting sustainability identified in previous research

Study	Factors impacting sustainability
Taylor-Greene & Kartoub (2000)	<ul style="list-style-type: none"> • Defined improvement goals • Administrator support • Teamwork • Positive reinforcement (e.g., rewarding students for desirable behaviour) • Formative evaluation
Sugai & Horner (2006)	<ul style="list-style-type: none"> • School leadership • Administrator support • Student reward systems
Lohrmann, Forman, Martin, & Palmieri (2008)	<ul style="list-style-type: none"> • Administrator support • Scepticism • Hopeless about change • Philosophical differences • Disenfranchisement
Bambara, Nonnemacher & Kern (2009)	<ul style="list-style-type: none"> • School culture • Administrator support • Structure and use of time • Professional development • Support for professional practice • Family and student involvement
Forman, Olin, Hoagwood, Crowe & Saka (2009)	<ul style="list-style-type: none"> • Administrator support • Teacher support • Financial resources • High-quality training and consultation • The alignment of interventions with school philosophy, goals, policies and programs • Visibility of outcomes and impact • Turnover in school staff and administrators
Bambara, Goh, Kern & Caskie (2012)	<ul style="list-style-type: none"> • Time for planning, implementing and meeting as a team
Coffey & Horner (2012)	<ul style="list-style-type: none"> • Administrator support • Communication • Data-based decision making • Coaching and training • Staff buy-in • Teaming • Resources • Turnover
Hume & McIntosh (2013)	<ul style="list-style-type: none"> • Frequent school team meetings • Presentation of data to school staff • Access to an external coach or consultant

	<ul style="list-style-type: none">• Duration of implementation
Mathews, McIntosh, Frank, & May (2013)	<ul style="list-style-type: none">• Regular acknowledgement of expected behaviors• Matching instruction to student ability• Access to additional support
McIntosh, Mercer, Hume, Frank, Turri & Mathews (2013)	<ul style="list-style-type: none">• School priority (manifested as strong administrator support and better team functioning)• Team use of data• District priority• Capacity building
McIntosh, Predy, Upreti, Hume, Turri & Mathews (2014)	<ul style="list-style-type: none">• Administrator support• Regular team meetings• High priority of PBIS

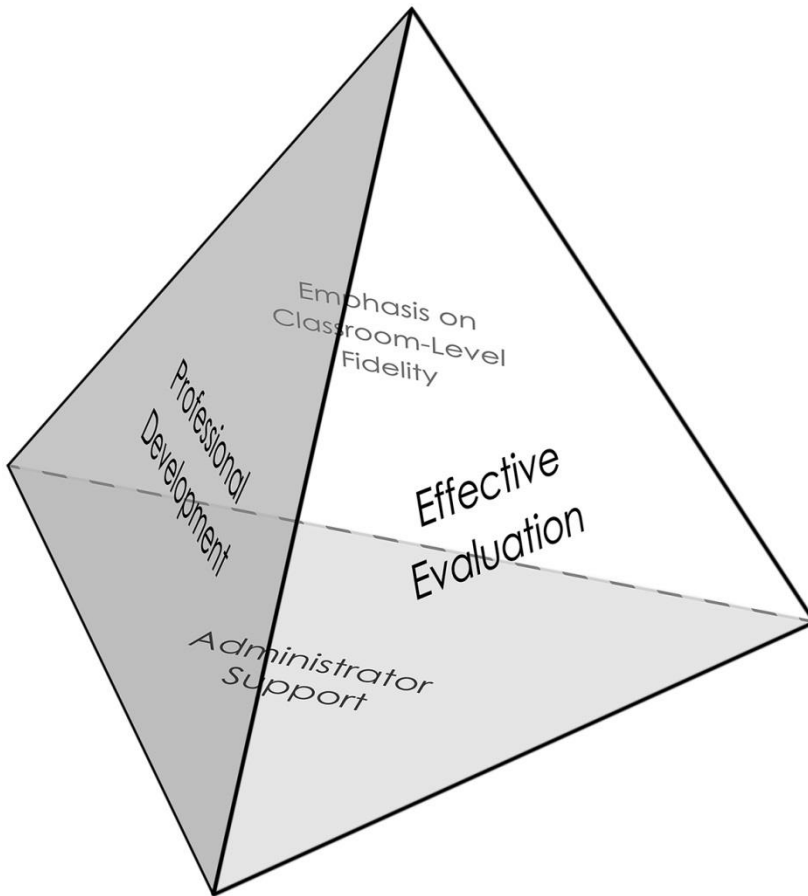


Figure 1(a). 3D sustainability tetrahedron for positive behavior interventions

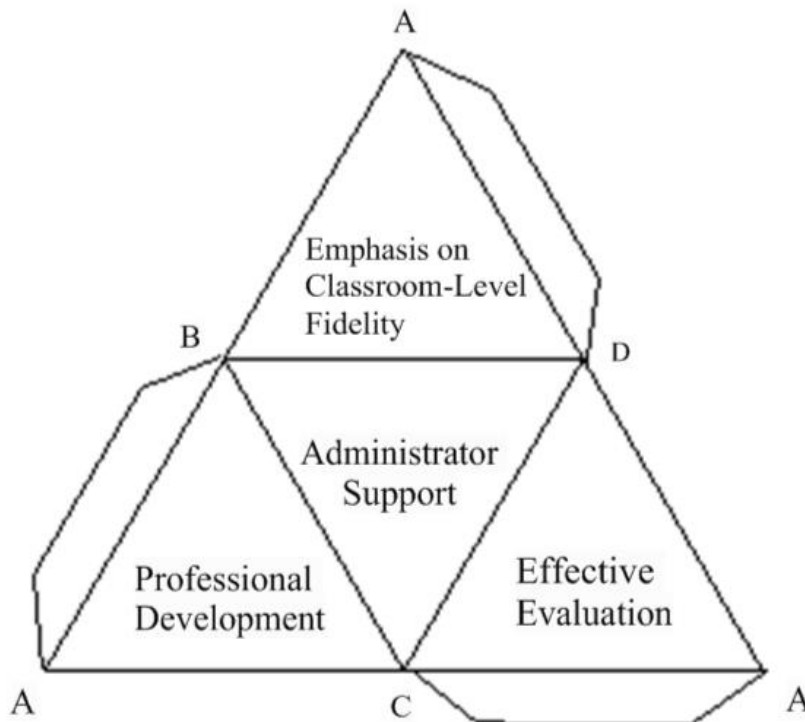


Figure 1(b). Flattened sustainability tetrahedron for positive behavior interventions