The Efficacy of Virtual Positive Behavior Support in a Special School for Students with ASD

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Abstract
In response to the demand for adopting a social justice system to manage students’ challenging behaviors, many countries are implementing positive behavior support (PBS) programs at the school level. However, the use of PBS in Saudi Arabian schools is still a goal rather than reality. It is strongly evident that school-wide PBS can be applicable to different educational contexts. Therefore, the purpose of this study was to evaluate the efficacy of a virtual school-wide positive behavior support program for students with autism spectrum disorder (ASD) in Saudi Arabia. Teaching and reinforcement procedures were implemented to help the students replace interfering classroom behaviors with alternative, appropriate behaviors. Observations were conducted to collect data on the students’ classroom behaviors. The results of the study showed that there was an immediate and major improvement in the students’ behaviors upon the introduction of the program. The results support the conclusion that school-wide positive behavior support can be successfully applied to different educational settings and suggest several implications for special and general education schools.

Keywords Positive behavior support · Special schools · Autism spectrum disorder · Virtual classrooms

Introduction
Interfering student behaviors represent a prevalent and serious challenge in schools. In fact, research estimated that about 25% of students display interfering behaviors in the classroom and that these behaviors are associated with poor academic achievement, decreased instructional time, low attendance rates, and social and emotional

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problems (Akey, 2006; Harrison et al., 2012; Snider et al., 2002). The use of punitive procedures to address classroom misbehaviors has had a wide appeal to school teachers worldwide (Oxley & Holden, 2021). Despite their possible effectiveness in reducing challenging behavior in the classroom, punitive procedures have raised ethical and empirical concerns. School legislation and organizations concerning the rights of children around the world have been against the use of these procedures. In addition, research findings revealed many undesirable social and emotional reactions and limitations associated with punishment (Maag, 2018). As a result, the literature on school discipline started advocating the use of positive techniques for managing student behavior about four decades ago and suggested several positive approaches (Oxley & Holden, 2021; Schmidt, 1982).

Positive behavior support (PBS) is one of these approaches. PBS is a framework that incorporates proactive and positive elements to reduce interfering behaviors exhibited by students, and the key elements of PBS include the use of antecedent-based interventions and teaching and encouraging alternative, appropriate behaviors that serve the same functions as the interfering behaviors (Horner et al., 1990). These steps reflect a set of fundamental principles that PBS should result in enhancement in the quality of the targeted individuals’ lives, incorporate evidence-based practices, and be guided by a continuous assessment process (Gore et al., 2013).

Providing PBS to individual students with challenging behaviors has been widely adopted worldwide, with a strong evidence base supporting its effects (Allen et al., 2013; Solomon et al., 2012). However, system-wide applications of PBS are more cost-effective ways of managing student behavior, ensuring that all students receive support, enhance early and preventive intervening, and promote generalization and maintenance of acquired behaviors (Morrison & Jones, 2007). Empirical evidence supporting these benefits is mostly derived from care and educational facilities in the USA and the UK (Gore et al., 2013; Oxley & Holden, 2021).

A common system-wide application of PBS in the UK focuses on providing individualized support for many students with challenging behaviors and stakeholders by professional teams contributing to different components of the PBS process and targeting different facilities and geographical areas (Gore et al., 2013). A three-tiered PBS model (Sugai & Horner, 1999) is the common form of implementing system-wide PBS in the USA, and this model begins by teaching appropriate behaviors to all students in a particular school or facility (i.e., school-wide PBS). Students who still exhibit challenging behaviors are provided with more intensive support in small groups. Individualized PBS is provided in the third tier to individual students who are nonresponsive to support provided in the second level.

While the form adopted in the UK is more effective in targeting many students with disabilities who display challenging behaviors (Gore et al., 2020), such students are usually excluded from the benefits of school-wide PBS (Kurth & Enyart, 2016; Strutt, 2017). Therefore, research into school-wide PBS for students with disabilities is not as sufficient as the research on school-wide PBS for general education students. However, existing research showed promising results. In this research, the school-wide PBS consisted of several steps suggested by the literature (Horner & Sugai, 2000; Horner et al., 2010; Simonsen et al., 2011; Sugai & Horner, 2002).
The PBS programs began with an initial meeting with the school’s faculty to discuss the students’ current behaviors and to review possible concerns associated with the practices the schools were implementing. A team consisting of some of the schools’ faculty and staff was established and received training to guide the process of the programs. The team then set goals and expectations as alternatives to the challenging behaviors, developed procedures to teach the expectations to the students, and provided a system to reinforce the expected behaviors.

The PBS was implemented in special schools (Farkas et al., 2012; Gelbar et al., 2015; Miller et al., 2005; Park et al., 2019; Simonsen et al., 2010) and in residential schools where the majority of the students were receiving special education services (Feinstein, 2003; Karen, 2018; Miller et al., 2006). Students attending the schools ranged from 3 to 22 years of age, and most of the studies included students with emotional and behavioral disorders (EBD; Farkas et al., 2012; Feinstein, 2003; Gelbar et al., 2015; Miller et al., 2005, 2006; Simonsen et al., 2010). Other studies included students diagnosed with intellectual disability (Karen, 2018; Park et al., 2019; Simonsen et al., 2010), autism spectrum disorder (ASD; Miller et al., 2005; Park et al., 2019; Simonsen et al., 2010), attention deficit hyperactivity disorder (Farkas et al., 2012; Simonsen et al., 2010) visual impairment, traumatic brain injury, and orthopedic impairment (Simonsen et al., 2010).

The students exhibited a wide range of interfering behaviors related to class participation (Feinstein, 2003; Park et al., 2019), homework completion (Feinstein, 2003), adherence to classroom rules (Feinstein, 2003; Gelbar et al., 2015), behaving in non-classroom settings (Farkas et al., 2012; Gelbar et al., 2015), and aggression (Gelbar et al., 2015; Karen, 2018; Miller et al., 2005, 2006; Simonsen et al., 2010). The effects of the school-wide PBS programs on these behaviors were evaluated using a variety of measures such as the incidence of physical restraints and time-out (Gelbar et al., 2015; Miller et al., 2005, 2006; Simonsen et al., 2010), rating scales (Farkas et al., 2012; Feinstein, 2003; Karen, 2018; Park et al., 2019), and office discipline referrals (ODRs; Farkas et al., 2012). In general, the results obtained in this research showed a considerable improvement in the students’ behavior after the implementation of the school-wide PBS programs.

Notwithstanding the encouraging findings, the research on school-wide PBS programs for students with disabilities has several limitations. All but two of the studies (i.e., Karen, 2018; Miller et al., 2006) were descriptive, case studies that did not demonstrate a functional relationship between the PBS programs and the outcomes of interest. Without such demonstration, a firm conclusion that school-wide PBS leads to changes in student behavior cannot be reached (Solomon et al., 2012). Moreover, most of the studies used indirect, and perhaps technically inadequate, measures (e.g., ODRs; Lane et al., 2014) to assess the targeted behaviors. The use of more direct, valid, and reliable measures (i.e., direct observation) as a primary way for evaluating effectiveness is more sensitive to behavior changes resulting from PBS programs (Solomon et al., 2012).

Over and above the need for research addressing these limitations, there is a need to examine more implications of school-wide PBS. Little research on PBS at the organizational level has been done outside the USA and the UK, especially for students with ASD who are always at higher risk for developing interfering behaviors.
in the classroom (Neitzel, 2010; von der Embse et al., 2011). In addition, according to Allen et al. (2013), challenging behaviors occur as a function of the social and organizational context, and it is of keen interest to study the effects of school-wide PBS in other countries where differences in school systems and student demographics exist (Oxley & Holden, 2021; Park et al., 2019).

In Saudi Arabia, the move toward the use of positive, evidence-based practices (e.g., PBS) to address behavioral needs of students with ASD is emerging. However, services, including those related to behavior modification, provided to students on the spectrum attending government schools in non-major cities are still insufficient (Alnemary et al., 2017). Moreover, a large percentage of teachers of students with ASD in Saudi Arabia do not have specialist knowledge about positive approaches to addressing the students’ challenging behaviors; in fact, individualized behavior intervention plans (BIPs) designed by a behavioral specialist are the most popular and recommended practice to manage students’ challenging behaviors (Alotaibi, 2015; Ministry of Education, 2015).

The purpose of the current study was multifold. First, the study expanded the research base on school-wide PBS for students with disabilities by experimentally determining the relation between a school-wide PBS program implemented in a special school and student behavior and by using observation as a main method for data collection. Second, the study added to the literature on ASD and PBS by evaluating the applicability and effects of school-wide PBS for students with ASD in Saudi Arabia. Third, most students around the world have been suspended from school to reduce the risk of COVID-19 transmission and have been attending virtual classrooms instead, and the current study was one of the initial investigations into virtual school-wide PBS.

Method

Participants and Setting

The study took place in a special elementary school for male students with ASD. The school was located in Riyadh Region, Saudi Arabia. Thirty-one students, ranging from 8 to 13 years of age, were attending the school during the study, and there were nine special education teachers specialized in ASD, in addition to the school principal and psychologist. The placement of the students in a special school was congruent with special education regulations in Saudi Arabia that only students with high functioning or mild ASD without accompanying intellectual disabilities can be placed in regular classrooms (Ministry of Education, 2015). Students on the spectrum who have intellectual disabilities can attend special classrooms or schools (Ministry of Education, 2015). All the students had mild intellectual disabilities, and four of them had language disorders. Based on the Gilliam Autism Rating Scale (Gilliam, 1995), 22 of the students had mild autism, and the other students had moderate autism.

The students used to attend special education classrooms in a regular school, but due to the difficulties in adapting to the regular school, they were placed in a special
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school. On a regular school day, the students were divided into 7 to 9 groups based on their grade level and needs. Each group went to a separate classroom where they had six 40-min lessons in reading, writing, mathematics, social studies, visual arts, and physical education. In addition, students received individualized instruction in different areas (e.g., social skills) to meet objectives stated in the student’s individualized education programs. There were two 20-min recess periods where the students could go outdoors and play.

In response to the government’s restrictions on large gatherings to control the rapid spread of COVID-19, the school was closed. The students received online classes via Microsoft Teams as an alternative. The virtual classes resembled the regular classes in terms of the number of students, class duration, and learning outcomes or objectives. Every 3 to 4 students were placed in one virtual classroom, and students in each classroom could attend the school twice a week after the school day for two hours to receive individualized instruction and to attend the arts and physical education classes.

The participants in the study were nine students attending three classrooms, with three students in each classroom. All the participants had accompanying mild intellectual disabilities. Classroom 1 included second-graders, all of whom were nine years old, and one of the students had language disorders. Classroom 2 was a third-grade classroom with students ranging in age from 9 to 10 years, and Classroom 3 involved fifth-grade students ages 11 to 12. One of the students in Classroom 3 had language disorders. Table 1 shows information about intelligence quotient (IQ), chronological age, mode of communication, and interfering behavior being addressed in the BIP for every student.

The study was approved by the institutional review board at a local university and took place during the second semester. Written consent from the students’ parents and oral assent from the teachers were obtained before the study began.

| Table 1 | Participants’ characteristics |
|---------|-------------------------------|
| Student | IQ   | Age | Mode of communication | Interfering behavior in BIP |
| Classroom 1 |     |     |                     |                             |
| Student A | 64  | 9   | Speech              | Not following instructions |
| Student B | 59  | 9   | Speech              | No BIP                      |
| Student C | N/A | 9   | Vocalizations/pictures | Tantrum                    |
| Classroom 1 |     |     |                     |                             |
| Student A | 61  | 9   | Speech              | No BIP                      |
| Student B | 54  | 10  | Speech              | No BIP                      |
| Student C | 58  | 9   | Speech              | Tantrum                     |
| Classroom 1 |     |     |                     |                             |
| Student A | N/A | 11  | Vocalizations/pictures | Aggression/ tantrum        |
| Student B | 64  | 12  | Speech              | No BIP                      |
| Student C | 56  | 12  | Speech              | Social isolation            |

IQs were based on Stanford-Binet Intelligence Scale (5th edition). N/A indicates the IQ was not available.
participating classrooms were chosen because of the teachers’ willingness to participate and because the students’ parents gave their consent earlier than the other parents.

**Experimental Design**

A multiple-baseline design across three classrooms (Baer et al., 1968) was used to demonstrate the effects of the school-wide PBS program on the students’ classroom behaviors. Baseline data were collected simultaneously in the three classrooms until the data for Classroom 1 showed a stable pattern. When the effects of the intervention were evident in Classroom 1, the intervention was implemented in Classroom 2. Similarly, the intervention was introduced to Classroom 3 after a clear demonstration of the program’s effects on the students’ behaviors in Classroom 2 (Horner et al., 2005; Kazdin, 2011).

**Dependent Measures**

Observations lasting for 30 min were conducted to collect data on the target behaviors. The number of observations in each phase was at least five (Kratochwill et al., 2013). The observations took place two times a week and during virtual literacy classes. The literacy classes were chosen to observe the students based on the teachers’ suggestion that the students displayed a high level of inappropriate behaviors during these classes. The observers had access to the online classes and used frequency recording to count the number of times the targeted behaviors occurred during the observation periods. The behaviors were recorded if exhibited by any student in the classroom, and then, the mean of the behaviors was calculated for each classroom by dividing the total number of the behaviors by the number of students.

Two observers independently and concurrently recorded the data in each classroom to calculate the reliability. Special education teachers who were specialized in ASD and had considerable experience in counting and recording behavior served as the reliability checkers. The inter-observer agreement was evaluated by dividing the smaller frequency by the larger frequency and multiplying by 100.

| Classroom  | Baseline | Intervention |
|------------|----------|--------------|
|            | % of Sessions | Range | Mean | % of Sessions | Range | Mean |
| Classroom 1 | 20       | N/A    | .82  | 45       | .84–1 | .97  |
| Classroom 2 | 50       | .85–1  | .91  | 50       | N/A   | 1    |
| Classroom 3 | 36       | .89–92 | .91  | 60       | N/A   | 1    |

N/A indicates the range was not applicable because either there was one reliability session or there were multiple sessions with equal reliability.
The inter-observer reliability was calculated for at least 20% of the observation sessions within each phase (Horner et al., 2005; Kratochwill et al., 2013). Table 2 and Table 3 present the reliability data.

The dependent variables in this study were the average interfering behaviors, and the average desired behaviors the students displayed in the classrooms. The interfering behaviors were operationally defined by the teachers as (a) participating or talking before clicking on the raised hand icon and before the teacher’s permission, (b) being absent from class as indicated by the student’s name not appearing on the screen or by not responding to the teacher’s questions or instructions within 5 s after the questions or instructions were stated, (c) not finishing homework on time, and (d) tardiness as indicated by being three minutes late after the class starts. The desired behaviors were operationally defined by the teachers as (a) clicking on the raised hand icon before talking, (b) being in class as indicated by the student’s name appearing on the screen or by responding to the teacher’s questions or instructions within five seconds after the questions or instructions were stated, (c) doing homework on time, and (d) not being late.

### Procedures

#### Baseline Condition

During the baseline phase, classes usually began by checking student attendance. After the teachers made sure no student had technical problems, they started the class by reviewing the knowledge covered in the prior lesson and discussing the students’ homework. The teachers then began teaching the new content by presenting the content to the students and discussing it with them. The teachers used various technology platforms such as PowerPoint, videos, and other visual aids to enhance the students’ understanding of the content. The teachers always elicited frequent responses from the students during the classes. The classes concluded with a discussion of what would be done before and during the next classes. When a student misbehaved during class, the teachers gave a brief reprimand, told the student he would do extra homework, or

| Classroom   | Baseline | Intervention |
|-------------|----------|--------------|
|             | % of Sessions | Range | Mean | % of Sessions | Range | Mean |
| Classroom 1 | 20       | N/A       | .83  | 45          | .86–1 | .93  |
| Classroom 2 | 50       | N/A       | 1    | 50          | .87–91 | .89  |
| Classroom 3 | 36       | N/A       | 1    | 60          | .83–1 | .91  |

N/A indicates the range was not applicable because either there was one reliability session or there were multiple sessions with equal reliability.
denied the student’s access to the class or to the microphone. All the teachers used verbal praise when a student exhibited an appropriate behavior.

## Intervention Condition

### School-wide PBS

The virtual school-wide PBS program was implemented following the steps suggested by Lane et al. (2009). The program started with an initial meeting with the school’s teachers. The purpose of the meeting was to provide a detailed description of positive behavior support, its importance, and the rationale behind it. In addition, the meeting included a discussion of the students’ current behaviors and a review of possible concerns associated with the practices the school had implemented. The meeting concluded with a discussion of how the PBS program would help the teachers to improve the students’ behaviors in the virtual classrooms.

In another meeting, the teachers discussed several behavioral expectations and agreed on three expectations for the students. The expectations were (a) be on time, (b) participate, and (c) be organized. For each expectation, a few observable and measurable behaviors were developed. For example, the expectation “be on time” included behaviors such as doing homework on time and coming to class early. Although the involvement of students and their families in this step is an essential feature of school-wide PBD (Horner et al., 2010), the targeted school’s students in the current study and their families contributed little input into the expectations due to some constraints. Most of the students had difficulty understanding the concept of identifying behaviors, and the teachers could not maintain regular contact with the families because of the COVID-19 restrictions.

The following step of the program involved conducting a series of training sessions for the teachers. The focus of the training sessions was on the use of direct observation to collect data on the students’ behaviors, teaching the expectations to the students, and reinforcing the students’ desired behaviors. In addition, the teachers received instruction in how to analyze the data every week to get information about the students’ behaviors and to determine whether the students in each classroom would need more support or a specialized group intervention (i.e., the secondary tier of the PBS program). The teachers were then told they could use the data to identify individual students who would not benefit from the interventions provided in the secondary tier and implement an individualized, comprehensive function-based intervention to the students in the tertiary tier. Because of practical constraints (e.g., lack of time), which might limit rigor in data collection, the study did not provide data on the implementation of the secondary and tertiary tiers.

### Explicit Instruction

The expectations were taught using explicit instruction (Archer & Hughes, 2011). A scripted model lesson was created to be implemented across the classrooms. The lesson started by gaining the students’ attention and explaining the purpose of the lesson. The
teachers then reviewed the students’ knowledge of the expected behaviors. Some teachers needed to teach the expected behaviors to some students who did not know how to perform the behaviors. After all the students were able to perform the behaviors, they began to learn the rules about when and where to behave according to the expectations. The teachers modeled the behaviors several times while involving the students by asking them questions about the rules and giving examples and non-examples of the rules.

After modeling the behaviors, the teachers provided guided activities in which both the teachers and students modeled the behaviors. The teachers in these activities used frequent visual and verbal prompts. The use of prompting was gradually faded until each student learned the rules. A similar model lesson was also designed to teach the rules related to reinforcing the behaviors. Teaching the rules took place during two regular class periods each day for three to four days. Symbols and pictures representing the expectations always appeared on the virtual board in each class to remind the students. For the purpose of demonstrating a functional relationship between the PBS program and student behavior, the lessons started in different weeks for the classrooms.

**Token Economy**

The school used a token economy to reinforce the students’ behaviors. The teachers used a website that allowed them to reward the students with tokens. The website showed 25 white boxes, and each box displayed a star when being clicked on. The token economy was combined with interdependent group-oriented contingencies (Lewis et al., 2002). Students in each classroom needed to work together to earn a reward that they had agreed on. The teachers clicked on one box when a student exhibited a desired behavior. The students received the reward when every box displayed a star. The stars the students earned in each class remained the same in the following class, so the students could progress toward getting the reward.

Students in each classroom agreed on a reward from a preference list that showed pictures of a variety of activities and items. These activities and items were included in the list based on discussions with the students, teachers, and parents whose children could not communicate what they would have liked. Every teacher discussed the items and activities with his students by showing the list on the virtual board and encouraging every student to select the most preferred and second most-preferred items or activities. The reward that was ranked first by most students in each class was then chosen as the targeted reward. Examples of the rewards included snack foods, toys, school supplies, being excluded from a homework assignment, and watching an animated video. It was possible for each class to earn as many rewards as they could using the same procedure. Students who agreed on a tangible reward and earned it got it when they came to their remedial classes.

When a student displayed an interfering behavior, the teacher immediately provided corrective and informative feedback to the student by reminding the student about the alternative behavior (i.e., the expectation) and by encouraging him to do it.
**Intervention Fidelity**

Information about the intervention fidelity was gathered using three checklists. The first checklist was completed by the researcher and included the steps for designing and implementing school-wide PBS programs. The major steps included meeting with the school’s teachers and staff, establishing and training a team, developing and conducting a screening program, and developing expectations and procedures for teaching the expectations (Lane et al., 2009). The fidelity of the PBS program was determined during the first few weeks of the semester and before introducing the intervention to the students, and 100% of the steps were followed.

The second checklist was used for implementing explicit instruction (Archer & Hughes, 2011). An independent observer attended all sessions during which explicit instruction was being delivered to the students and observed the teachers. The fidelity of the explicit instruction in the three classrooms ranged from 90 to 100% with a mean of 96%. The third checklist showed the steps for the token economy program (Maag, 2018). The teachers self-assessed their use of token economies (Smith et al., 2007) and showed high levels of fidelity with a minimum of 90%.

**Data Analysis**

A visual analysis of the data both within and between phases in Figs. 1 and 2 was used to evaluate the effects of the school-wide PBS. Within each phase, the data analysis involved evaluation of the level, trend, and variability of data. The level of change was evaluated by calculating the range and median; reporting the median instead of the mean is recommended since the latter is more likely to be influenced by outliers in the data (Lane & Gast, 2014). Trends were estimated by using the split-middle method when there were seven or more data points within a phase (Kennedy, 2005) or by using the modified weighted mean trend procedure (Nugent, 2000) for phases with less than seven points (i.e., baseline in Classroom 1 and intervention in Classroom 3). The stability envelope was used to estimate the variability of the data (Lane & Gast, 2014). Across the phases, the data analysis involved estimating the immediacy of change observed in the behaviors and the overlap of data. The immediacy of change was assessed by comparing the initial data points in the intervention phases with the final data points in the baseline, and the overlap of the data was evaluated by calculating the percentage of overlapping data (Kazdin, 2011).
Fig. 1  Average inappropriate behaviors
Fig. 2  Average desired behaviors
Results

Students’ Inappropriate Behaviors

Classroom 1

The students in Classroom 1 exhibited high frequencies of interfering behaviors in the baseline. The baseline averages of interfering behaviors ranged from 9 to 15 with a median of 13. The baseline data had an acceptable level of stability and showed no trend. This information indicates that the students kept displaying a high number of interfering behaviors during the baseline. Upon the introduction of the school-wide PBS, the averages of behaviors decreased immediately with 0% overlap between the baseline and intervention averages. The averages ranged from 0 to 2 with a median of 0. The data pattern during the intervention showed a slightly descending trend with no variability.

Classroom 2

The students in Classroom 2 also showed high levels of interfering behaviors before the intervention. The averages of the behaviors ranged from 6 to 14 with a median of 6.5 and low variability. The baseline data revealed a slightly ascending trend. There was an immediate and noticeable decrease in the behaviors after the implementation of the PSB program (range 0–1, $Mdn=0$) with no overlap with the baseline data. No variability or trends were observed in the intervention phase, suggesting that students maintained decreased frequencies of problem behaviors. The score of nonoverlap of all pairs (NAP; Parker & Vannest, 2009) for the three classrooms was 100, indicating a strong effect size.

Classroom 3

Data in Fig. 1 showed a stable pattern of student behavior in Classroom 3. The average behaviors ranged from 3 to 5 ($Mdn=4$) with no variability. There was a steady decrease in the averages of the behaviors (range 0–1, $Mdn=0$) when the students received the intervention, with no overlap between the baseline and intervention data.

Students’ Desired Behaviors

Classroom 1

Baseline data indicated low frequencies of desired behaviors with averages ranging from 2 to 3 ($Mdn=2$). The data pattern had a slightly decreasing trend with no
variability. Immediate improvement in the students’ desired behaviors was evident upon the implementation of the PBS program. The averages of the behaviors during the intervention phase ranged from 4 to 10 with a median of 8. There was a slightly ascending trend with some variability and no overlap with the baseline data.

Classroom 2

The students in Classroom 2 displayed low rates of desired behaviors before receiving the intervention (range average: 0–2, \text{Mdn} \text{ average}=1). The baseline data showed some variability and a marginally increasing trend. The effect of the school-wide PBS was immediate as proven by the increase in the averages of the behaviors (range 6–10, \text{Mdn} = 8.5). The data were variable and revealed no trend.

Classroom 3

Like the other students, the students in Classroom 3 did not exhibit an acceptable level of desired behaviors in the baseline phase. The averages of the desired behaviors ranged from 1 to 2 with a median of 1, with a marginally ascending trend and some variability. When the students started receiving the PBS, their desired behaviors immediately improved (range average: 8–10, \text{Mdn} \text{ average}=9). The data pattern in the intervention phase was stable without a trend. The obtained NAP for each classroom was 100, suggesting strong effects.

Social Validity

The participating teachers and the school principal completed the Primary Intervention Rating Scale (PIRS; Lane et al., 2002) in the final week of the semester. All the participants agreed that the program was acceptable for the school and beneficial for the students in general. However, two teachers slightly disagreed that the PBS program was appropriate for all students. These teachers’ answers to the open-ended questions indicated that at least one student in their classrooms was not happy with the rewards the other students agreed on as part of the group-oriented contingencies, and they suggested using individualized reinforcement instead. The teachers and principal all agreed that the most noticeable effect of the program was on the students’ attendances and homework completion, but they indicated a similar effect was not noticed for class participation. The participants concluded by stating that the use of visuals to teach and reward the students was very helpful and that the program was cost-effective and easy to use.
Discussion

The intent of the study was to contribute to the literature on PBS by evaluating the efficacy of a virtual PBS program implemented at the school level for students with ASD. The data for the three classrooms revealed similar patterns of change regarding the effects of the PBS on the participants’ behaviors. The students in the three classrooms exhibited high frequencies of interfering behaviors before receiving the interventions. However, the students learned to replace their interfering behaviors with appropriate ones, which led to a considerable reduction in the interfering behaviors upon the introduction of the school-wide PBS. The fact that the PBS effects were replicated across the classrooms at three different points in time supports the conclusion that the program implemented in the study resulted in significant improvement in the students’ classroom behaviors (Horner et al., 2005).

The results were consistent with those obtained in previous research that indicated a functional relationship between school-wide PBS and student behavior for students with different characteristics (e.g., Miller et al., 2006; Solomon et al., 2012). In addition, similar to other studies about the use of school-wide PBS for special education students, the current study suggested that school-wide PBS can be successfully implemented with students with different disabilities and educational needs and in varied alternative settings (e.g., Park et al., 2019; Simonsen et al., 2010). Nevertheless, compared to other experimental studies implementing similar procedures followed in the current study (Franzen & Kamps, 2008; Lewis et al., 2002) or targeting students with disabilities (Miller et al., 2006), the current study showed more significant decreases in or complete elimination of the targeted problem behaviors.

There are several possible explanations for the immediate and significant change in the students’ behaviors. One hypothesis is that the students in the current study had an acquisition deficiency, which is usually addressed by simply teaching new behaviors (Gresham et al., 2001; Maag, 2018). That is, it was possible the students did not know how to perform the replacement behaviors or were uncertain as to the most appropriate behavior for a given event. This hypothesis seems likely given that the students were unfamiliar with the new virtual system and that using computers was a new experience for them. On the other hand, considering the fact that the students targeted in the other studies (i.e., Franzen & Kamps, 2008; Lewis et al., 2002) had already received school-wide PBS before participating in the studies, they might be unwilling to perform the replacement behaviors (i.e., performance deficiencies; Gresham et al., 2001). Compared to acquisition deficiencies, performance deficiencies can be more difficult to address and sometimes may require individualized support (Maag, 2018).

Another explanation for the significant change in the students’ behaviors is that unlike the schools targeted in the other studies, the current study took place in a school with a small number of students. In fact, the ratio of students to teachers was about 3:1. Smaller class sizes can provide students, especially students with disabilities, with better opportunities for learning (Biddle & Berliner, 2002). Moreover, there is a possibility that the complexities and quantities of the targeted behaviors
might lead to different levels of improvement in the students’ behaviors. The other studies focused on a wide range of more serious challenging behaviors that are more resistant to change (Quinn et al., 1999), such as aggression and talking back to teachers, while the current study targeted less serious and more specific behaviors. Research showed that the more specific the targeted behavior is, the more effective the intervention is likely to be (Quinn et al., 1999).

An additional tentative explanation of the considerable improvement in the study is that because the PBS program was implemented online, there might be familial support. Indeed, the observers noticed a parent or sibling providing verbal prompts to some of the students to engage in the desired behaviors. A final hypothesis about the results relates to the settings in which the school-wide PBS was implemented. The PBS program in the current study was implemented in virtual classrooms, but the PBS in the other studies targeted less structured settings (e.g., recess areas) with confined spaces. In such settings, unlike classrooms, teacher supervision is seldom provided and there are many opportunities for students to engage in interfering behaviors (Franzen & Kamps, 2008; Maag, 2018; Morrison & Jones, 2007).

Despite its findings, the study has several limitations. First, due to the nature of applied research, it was difficult to address some variables (i.e., familial support and technical problems) that might influence the students’ performance. Second, effective interventions in applied settings should result in persistent improvement without continuous implementation of the interventions. However, the effect of the virtual school-wide PBS on maintaining the students’ performance was not determined because the program was designed to be implemented throughout the school year. The third limitation pertains to the treatment integrity of the reinforcing procedure. Because the teachers self-assessed their use of token economies, they might overestimate the levels of treatment integrity (Smith et al., 2007). Fourth, a wide range of important variables such as externalizing behaviors, internalizing behaviors, academic performance, and even quality of life should be considered during the implementation of school-wide PBS using a variety of measurements such as rating scales and curriculum-based measurements (Gore et al., 2020; Gresham, 2007; Lane et al., 2009). However, the sole variable of interest in this study was the students’ classroom behaviors, which were evaluated using only direct observation.

Future research is required to replicate the current study while addressing these limitations. That is, there is a need for further research to evaluate the effects of school-wide PBS on academic achievement, different behaviors, and maintenance of acquired behaviors while addressing potential variables that may influence the effectiveness of the PBS implemented online. Additional work is also needed to determine the efficacy of a PBS program similar to the one implemented in the current study for secondary students with ASD or other developmental disabilities. The last point that may require further investigation relates to the possible effect of school-wide PBS on teachers’ use of punitive strategies to address student behavior. Anecdotal evidence of the study suggested a noticeable increase in the teachers’ use of positive procedures instead of punishment to manage the students’ behaviors.

Finally, although there is a growing trend toward positive approaches to school discipline in Saudi Arabia, current policies and legislation (e.g., the Student Code
of Conduct, 2014; the Regulatory Guide to Special Education, 2015) concerning student conduct in special and general education still emphasize punitive approaches (e.g., response cost and school exclusions) to addressing students’ challenging behaviors. Related research into student behavior in Saudi Arabia revealed unfortunate results and stressed the need to adopt positive behavioral practices in schools (Almakadma & Ramisetty-Mikler, 2015). The results of the current study suggest that school-wide PBS can be applicable to the educational context in Saudi Arabia without major modifications, helping to improve the chance of advancement in the education systems (Alqahtani et al., 2021).

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Declarations

Conflict of interest The author declares that he has no conflict of interest.

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