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Using differential reinforcement for all to manage disruptive behaviors: three class interventions at kindergarten and primary school

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Introduction: Disruptive behaviors produce harmful effects, which reduce students' well-being and learning opportunities. This paper presents a new strategy named Differential Reinforcement for All (DR-All), which has been inspired by DR and Social Learning Theory.

Methods: We conducted one study in which we applied DR-All to three classes with first grade students (intervention 1), then in kindergarten (intervention 2), and fifth grade students (intervention 3). In all three interventions, the measurements of student–student relationships and disruptive behaviors were taken 1 week before implementation and after 2 weeks of implementation. In intervention 1, disruptive behaviors were measured again 1 year after, among the 10 students who remained with the same teacher the following year.

Results: Concerning student–student relationships, we only observed one effect, which was a positive effect on the most rejected pupils in the first-grade intervention, who were significantly less rejected by their classmates after the implementation. However, the results of all three interventions showed a significant decrease in the frequency of disruptive behaviors after the strategy implementation. This was also true for the intervention 1 measurement 1 year later.

Discussion: To conclude, the consistent application of DR-All can reduce disruptive behaviors in the classroom.

KEYWORDS

disruptive behaviors, differential reinforcement, normative focus, primary school, social learning theory

Introduction

Disruptive behaviors in class disturb lesson flow, conflict with learning processes, and damage student well-being and relationships in the class (Kessels and Heyder, 2020; Kremer et al., 2016; Ruus et al., 2007). These behaviors are sources of stress for both the teacher and the students (Debarbieux, 2015). Managing these behaviors is a real challenge for teachers who have to focus their attention on the class climate instead of teaching. In order to deal with these behaviors, teachers often deploy considerable energy in trying to find solutions and activities that create a positive class climate. Unfortunately, their efforts are not always rewarded with

the desired outcome. Indeed, these initiatives often create or maintain disruptive behavior by relying on ineffective reactive management strategies (Heekes et al., 2022). Many disruptive behaviors are unwittingly encouraged by teachers who wrongly believe that their reprimands will put a stop to bad behavior. On the contrary, their reprimands reinforce this behavior. Although threats and punishment are thought to play a preventive role that aims to encourage appropriate behaviors, these reactions are not the most reliable means of ensuring that students self-regulate their behaviors (Van Acker et al., 1996). Threats and punishment may have a positive short-term impact, but the long-term effects are uncertain, and often the opposite of those hoped for because certain children (e.g., “badly behaved”) may interpret the attention given to them as a reward (Petursdottir and Ragnarsdottir, 2019). While the approach that encourages teachers to develop their students’ intrinsic motivation to behave well is an interesting one, it does not tell teachers how to react when bad behavior occurs. Among the reactive strategies used in class to manage disruptive behaviors based on Applied Behavior Analysis (ABA), a large body of research has shown the effectiveness of Differential Reinforcement of Alternative behavior or DRA (Alberto and Troutman, 2013). For the teacher, this strategy consists in ignoring disruptive behaviors while reinforcing appropriate ones. DRA can have positive effects, such as the development of reinforced alternative behavior and the reduction of teacher stress (Flynn and Lo, 2016). However, when used exclusively toward certain students, it may have negative consequences on interpersonal relationships and class cohesion, by promoting comparison among students and stigmatization of targeted students (Stanley, 2003). It is important to consider these aspects when implementing DRA in order to foster an inclusive and positive learning environment for all students.

The Differential Reinforcement for All (DR-All) strategy that we tested here was partly inspired by DRA, which was based on the principles of operant conditioning procedures (Skinner, 1953), but mostly inspired by Social Learning Theory and the importance of the role model (Bandura, 1977). It is built on consistent teacher attitudes, behaviors and reinforcements. It seeks to alter student behavior by creating a new behavioral norm in class that systematically reinforces desirable behaviors, while putting a stop to the negative reinforcement of disruptive behaviors. To achieve this, teachers have to ignore all disruptive behaviors and reward all desirable behaviors. No student must be excluded from this strategy. We implemented this strategy in three classes at kindergarten and primary school. We expected DR-All to generate a powerful effect on the modeling of classroom behavior via the phenomenon of extinction, and learning through the observation of desirable behaviors made possible by vicarious reinforcement (Bandura, 1977; Brown and Elliott, 1965; Naylor et al., 2018).

Social learning of normative behavior

DR-All is anchored in the social learning of normative behavior. According to this theoretical perspective, behaviors are regulated by their consequences. Behaviors generate expectations of similar consequences on future occasions (Bandura, 1977), positive effects are memorized, and when the person is motivated, they reproduce the behaviors in question. In contrast, behaviors that produce a non-informative response do not act on motivation and cease to occur over time. In a learning situation, the student’s behavioral response is

either reinforced or ignored (extinction). However, the student’s response to the teacher’s reinforcement is also subject to factors within the student. Indeed, the expectations associated with behavioral effects are subjective, influenced by personal values, and depend on how the behavioral response is interpreted. For example, a child who fails to enjoy a task or who dislikes the teacher, may decide to misbehave or provoke a situation leading to dismissal from the class (Cothran et al., 2009). The child thus avoids the unpleasant situation, and may attract peer attention by standing up to the teacher (Shores et al., 1993). Here, the child may attach a positive value to the negative action which is quite different from the teacher’s intention. This reinforces the child’s deviant self-concept. Many inappropriate behaviors are reinforced in this manner. In certain cases, punishment may inhibit a behavior, while in others it might encourage the behavior by drawing peer attention to it (Kodak et al., 2007; Petursdottir and Ragnarsdottir, 2019), which leads to memorization of its functional value (benefits). To sum up, both punishment and praise can increase the occurrence of normative or deviant behaviors. By stigmatizing a student, the punishment bestows a particular status on the student concerned, and can be perceived as a form of recognition. In this case, the disruptive behavior becomes a recognized deviant behavior, which may then be reproduced in order to maintain status within the group (Lemaine, 1967, 1974). Repeated attention given to a deviant behavior will lead to the formation of a distinctive character trait. At school, students have many opportunities to comply with teacher expectations. In doing so, students become categorized, and ultimately accept the label given to them (Tajfel, 1978, 1981; Tajfel et al., 1971; Tajfel and Turner, 1986). Let us look at this from the point of view of the student’s self-concept. When a student’s self-concept values are in line with the inappropriate behavior, there is a strong chance that they will repeat this behavior when the threat of punishment is absent. In this case, the student attributes a positive value to the reprimand and their deviant self-image is reinforced. On the other hand, when the inappropriate behavior conflicts with the student’s self-concept values, they may experience dissonance or negative emotions (shame) and avoid repeating the behavior in the future. Thus, depending on whether the social reinforcement given by the teacher (external source) reinforces or contradicts the student’s internal response, this may lead to some kind of self-regulation.

Furthermore, the teacher’s feedback given to a student is witnessed by the entire class and provides information relating to the types of behaviors that may or may not be rewarded. This is in line with social learning theory (Bandura, 1977) and the place of role models within it. Most human behaviors are learned through observation. The new behaviors we learn by observing our peers form the basis of our future actions. Students therefore learn by observing their peers and the treatment they receive as a consequence of their behavior. In this way, their classmates become their role models. However, people do not necessarily reproduce every behavior they observe because this depends on the observer’s degree of attention, their ability to perceive the situation correctly and memorize it (acquisition). Behavioral reproduction is also dependent on the mental mechanism which leads to motor reproduction of the model’s actions (reproduction), on the value given to the model’s actions and to the relationship with the model (motivation). Role models have the potential to inspire “role aspirant” behaviors because they act as an upward identification target (Lockwood and Kunda, 1997). Role models convey information to observers about the characteristics of appropriate responses in a situation (Bandura, 1972). The premise is that the role aspirants

internalize the new response, resulting in compliance with prosocial aspirations and behaviors. Over time, this process generates new expectations, which in turn, create a new behavioral norm. Because role models demonstrate target behaviors and strategies that role aspirants internalize and mimic, they can be used in the field of education to change student behaviors, promote empathy, and improve class climate. The role model is a major component of the DR-All program.

To date, some evidence-based programs have been developed to manage disruptive behaviors in the entire class. Class-Wide Function-Related Intervention Teams (CW-FIT) (Wills et al., 2009) involve social skills training, extinction of disruptive behaviors, and social positive reinforcement of appropriate behaviors. This program also includes group contingency, which is a type of group reinforcement for appropriate behaviors (Rodriguez and Anderson, 2014). Another disruptive behavior management program is Positive Behavior Support (PBS) or Positive Behavior Intervention and Support (PBIS), involving explicit teaching of appropriate behaviors, positive reinforcement of appropriate behaviors, and a reduction in the use of reprimands (Cohn, 2001). PBS has three goals: (1) to promote positive interactions between the students themselves, and between the students and school staff; (2) to teach clear behavioral expectations in class through direct instruction; and (3) to reinforce appropriate behaviors (Benedict et al., 2007). In both CW-FIT and PBS, classes are divided into three groups based on their usual level of disruption. All students follow the Tier 1 intervention, which is the program as described above. Fifteen percent of the students, who have a higher level of disruption than their classmates, also follow a Tier 2 intervention with additional strategies to manage their behaviors. Finally, the 5% of students with the most disruptive behaviors follow a more intensive intervention. For example, in CW-FIT, the second group uses self-management charts and help cards. The third group uses teacher-controlled functional assessment to identify the triggers of their individual disruptive behaviors. CW-FIT and PBS have been found to be effective programs (Goh and Bambara, 2012; Naylor et al., 2018). When used with only the Tier 1 intervention, they could be likened to DR-All. These strategies assume that teachers cannot manage all student behaviors in the same way: on average, one fifth of students per class is managed differently. However, when the students observe teachers' reactions are different, they also perceive a visible categorization. This can create an identification within a group and a differentiation between groups: "us" the "good students" and "them" the "bad students." Although the categorization can enhance social identity and foster group cohesion, it can also overemphasize group differences and increase intergroup conflict (Tajfel et al., 1971). The objective of DR-All is to break down this differentiation so that students feel they belong to the same group. The originality of DR-All lies in its the theoretical framework of vicarious reinforcement and social learning theory.

Program implementation and teacher training

The Grenoble Education Authority (France) contacted us because they wanted to run a new program to help kindergarten and primary school teachers to manage disruptive behaviors. They put us in touch with three teachers who had volunteered to take part in the program, one of whom had specifically requested assistance in dealing with unruly behavior. Two teachers also volunteered for the

control condition. All the teachers had several years' experience. There were three schools, two of which were located in an urban area, and one in a rural area. To ensure successful program implementation in all three experimental classes, it was essential to give the teachers explicit training so that they were fully engaged, understood the issues at stake, and could anticipate and overcome obstacles. Our teacher training sequence was structured as follows: (1) explanation of the theory underpinning the method; (2) demonstration of the method in use; (3) practice and feedback; (4) debriefing and coaching.

The teachers received two 2-h training sessions prior to the strategy implementation. Both sessions involved the entire school teaching staff. In the first session, the authors explained reinforcement, social learning theory, and the importance of role models in the acquisition of class rules. They also explained how adults (parents, school staff) could unwittingly encourage inappropriate behaviors by paying attention to them, and how students could acquire some behaviors through observation. In the second session, the authors focused on the two theoretical principles on which the DR-All strategy is based: (1) the first principle being the removal of the attention given to disruptive acts while paying attention to appropriate behaviors by using behavior specific praise (Markelz et al., 2021), and (2) the second principle being the acquisition of a new behavioral norm, which can only be achieved if the teacher acts in exactly the same way with every student in the class. The authors explained that the teacher must reproduce exactly the same responses at all times for both well-behaved and badly-behaved students. The authors presented Brown and Elliott's study (1965) which used this procedure to reduce aggressive responses among 3–4-year-old boys in a nursery school class by ignoring them and waiting for appropriate behaviors before giving reinforcement. Finally, a teacher handbook summarizing the content of the training sessions was given to all attendees (see [Supplementary material](#)). Throughout the program implementation, the authors provided refresher training as and when required. Debriefing sessions at the end of each school day were organized in order to support the teacher because it was sometimes difficult for them to ignore physical disruptive behaviors. During these debriefing sessions, the teacher spoke about their difficulties and the researchers helped them to find a solution to avoid a recurrence of a similar situation. In class interventions 2 and 3, implementation fidelity was assessed 1 hour per week by observation of teacher use of DR-All (see implementation section).

Objectives

The idea behind DR-All is that applying differential reinforcement to each and every student in a class has powerful effects on children's behaviors, via extinction and observational learning of appropriate behaviors. In DR-All, vicarious reinforcement is a key element, which involves learning through observation of the consequences of actions of other classmates. When a student observes their role model (another student with whom they identify) receiving reinforcement from the teacher, the student will be motivated to imitate the behavior as if they had received the reinforcement themselves (Bandura, 1977; Naylor et al., 2018; Solomon et al., 2012; Wilson and Lipsey, 2007). Modeling therefore plays a vital role in DR-All (Bandura, 1977). Our aim was to demonstrate that DR-All can produce behavioral changes in a classroom setting. We also examined the impact of DR-All on relationships within the class.

Our study of DR-All comprised three class interventions. Class intervention 1 concerned first/second grade pupils at elementary school. We were also able to test the long-term effect of the strategy for half a class (first grade) who continued with the same teacher in the following school year (second grade). Class interventions 2 and 3 concerned kindergarten and fifth grade students, who were compared with a control group (teaching as usual) to ensure that observed behavior changes resulted from the program implementation.

Class intervention 1

Participants

We implemented the DR-All program in a class of 22 first and second grade students (6–7 years old, 9 girls and 13 boys) for 2 weeks, after having trained the teacher. One boy had individual help from a teaching assistant assigned to him. He was absent from class twice a week to attend medical appointments. The school staff's and parents' consent were requested and all accepted.

Measures

Behavioral and self-reported measures taken 1 week before and 1 week after the implementation were used to assess the effect of the strategy.

Behavioral measures

Observations of behaviors in class were filmed for 1 week before and after the implementation: 6h 16min of recording before the program, and 6h 27min after the program (approximately 90min per day). Video recordings were made for approximately 45min at the same time each morning and each afternoon on Monday, Tuesday, Thursday and Friday. The camera was placed in a corner to cover the entire classroom. It was far enough away from the students to be non-intrusive. We also calculated the disruptive behaviors per hour. The behavioral data (films) were coded by two judges with a double-blind procedure using a specifically designed behavioral grid. Interrater agreement was calculated by dividing the number of agreements by the total number of observations (agreement + disagreement). The percentage of agreement was satisfactory (97%). The judges were asked to rate inappropriate behaviors on the 9 categories commonly used in the literature: pulling faces, moving inappropriately, inappropriate sexual behavior, physical aggression, throwing objects, destructive behavior, speaking at inappropriate times, making noise, verbal aggression and making fun of others (Flynn and Lo, 2016; Slocum and Vollmer, 2015; Wright-Gallo et al., 2006). These categories were divided into two groups: physical disruptive behaviors (the first six) and verbal disruptive behaviors (the last three, see [Supplementary material](#)). The gap between the frequency of disruptive behaviors during the pre-test and posttest provides the behavioral measure.¹

¹ Behaviors, such as verbal disruption by the entire class or an unidentified child, or inappropriate noise such as the stamping of feet, were added as an additional behavior for every student in the class.

Class relationships

We measured of student–student relationships within the class. We created a sociogram to observe the affinities among students, and to identify the most and least popular students in the class (Moreno, 1934). The students had to say which classmates they would choose and which ones they would not choose to partner them in a creative dance task. They could choose as many classmates as they wanted. This task was presented as a familiar class project which did not require any particular physical or cognitive aptitude and was accessible to all students. We calculated a popularity score based on the number of positive and negative choices per student. For instance, if a student was chosen five times and rejected twice, their popularity score would be 3 (5–2).

Procedure

At the beginning of the first week, class relationship questionnaires were completed and the camera was placed in the class. Disruptive behaviors were filmed for 90min (45min in the morning and again in the afternoon) each day of the first week. Then, the teacher received the two 2-h DR-All training sessions. From then on, the teacher used DR-All constantly for 2 weeks, during which time the teacher took part in debriefing sessions. Disruptive behaviors were filmed for 90min (45min in the morning and again in the afternoon) each day of the fourth week. The class relationship questionnaires were completed again in the fourth week.

Results

Behavioral measures

We analyzed the differences in disruptive behaviors before and after the program using repeated generalized linear model measures, allowing us to test within-subject effects. The results showed that differential reinforcement reduces the emergence of disruptive behaviors in an ordinary class at primary school with first and second grade students. We observed a decrease in physical disruptive behaviors, [$F(1, 21) = 4.14, p = 0.055, \eta_p^2 = 0.17$, per hour: $F(1, 21) = 4.38, p = 0.049, \eta_p^2 = 0.17$] as well as in verbal disruptive behaviors [$F(1, 21) = 39.17, p < 0.001, \eta_p^2 = 0.65$, per hour: $F(1, 21) = 39.15, p < 0.001, \eta_p^2 = 0.61$]. Consequently, total disruptive behaviors decreased [$F(1, 21) = 29.37, p < 0.001, \eta_p^2 = 0.58$, per hour: $F(1, 21) = 29.54, p < 0.001, \eta_p^2 = 0.58$]. [Table 1](#) presents the average number of physical and verbal responses, and disruptive behaviors for each of the two observation periods. As expected, the number of disruptive behaviors decreased significantly after the program ($d = -2.91$).

We also observed the effectiveness of the strategy on the boy who was often absent for medical reasons of a psychiatric nature. His verbal, physical and total disruptive behaviors before the program were, respectively, 45 (7.78), 19 (3.29), and 64 (11.07 per hour), whereas after the program his disruptive behaviors were, respectively, 13 (2.40), 11 (2.03), and 24 (4.43 per hour). These figures refer to the days this boy was present in class and this corresponds to 5h 47min of recording before the program and 5h 25min after it.

TABLE 1 Number of disruptive behaviors in the two observation periods in class intervention 1.

Observation time	Disruptive behaviors (per hour)		
	Physical	Verbal	Total
Before the program	108 ^a (17.23 ^a)	126 ^a (20.11 ^a)	234 ^a (37.34 ^a)
After 2 weeks of the program	59 ^b (9.15 ^b)	51 ^b (7.91 ^b)	110 ^b (17.06 ^b)

In the columns, the two mean values marked ^a and ^b are statistically different.

TABLE 2 Number of disruptive behaviors for the students that stayed with the same teacher the following year in class intervention 1.

Observation time	Disruptive behaviors (per hour)		
	Physical	Verbal	Total
Year 1: pretest	87 ^a (13.88 ^a)	72 ^a (11.49 ^a)	159 ^a (25.37 ^a)
Year 1: posttest	41 ^a (6.36 ^a)	20 ^b (3.10 ^b)	61 ^b (9.46 ^b)
Year 2: 1st measure	3 ^b (0.90 ^b)	43 ^b (12.93 ^b)	46 ^b (13.83 ^b)
Year 2: 2nd measure	8 ^b (1.09 ^b)	72 ^a (9.84 ^a)	80 ^b (10.93 ^b)

In the columns, the two mean values marked ^a and ^b are statistically different.

Class relationships

Concerning student–student relationships, 21 participants answered the questions in the sociogram after the program because one student was absent at the beginning. Overall, the results did not reveal any relationship differences before and after the program ($F(1, 20) = 1.07, p = 0.31$). However, after carrying out a median split to separate the least rejected students (score from 0 to 6) and the most rejected students (score from 7 to 14), we observed a significant difference in the most rejected ones [$F(1, 7) = 10.17, p = 0.015, \eta_p^2 = 0.59$] who were less often rejected after the program ($M = 8.25; SD = 2.66$) than before the program ($M = 10.37; SD = 2.45$). The popularity score of the boy who was often absent for medical reasons went up from -6 before the program to -2 after it.

One year follow-up

Among the 22 study participants, 10 stayed with the same teacher the following year, which allowed us to measure their behavior over a two-year period (see Table 2, see total column). We therefore extended the study to the second year, and only retained the behaviors produced by these 10 target students, and not those produced by the entire class because the other students had not participated in the first year of the program. The filmed observation of the first week lasted 3 h and 20 min, approximately 50 min per day (this filming time was reduced due to technical issues with the camera). In the second week, 7 h and 10 min were filmed, approximately 1 h 40 min per day. The average hourly rate of disruptive behaviors per student was 0.95 ($SD = 1.03$) at the end of the first year of the program, and 1.38 ($SD = 2.36$) at the beginning of the following year. We used Friedman ANOVA (non-parametric test) because the distribution was abnormal. This increase is not significant [$\chi^2(1) = 0.40, p = 0.527$], which implies that the effects of the program had remained over time. After a reminder of the strategy in the second year, the average hourly rate stood at 1.09 ($SD = 2.28$), which was similar to the posttest score in

the first year [$\chi^2(1) = 0.40, p = 0.527$] and at the beginning of the second year [$\chi^2(1) = 2.0, p = 0.157$]. To sum up, the frequency of disruptive behaviors decreased after the first program and did not significantly rise the following year probably because the students had integrated the new class norm.

Preliminary findings

The results of class intervention 1 are relevant in more ways than one. First, they show that the DR-All strategy can reduce the emergence of disruptive behaviors in young learners. Here, it was also successful with the participant who had special needs. We also observed that disruptive behaviors did not significantly rise the year following the program implementation, probably because the students had integrated the new class norm. Additionally, these results reveal some positive effects for the most rejected students because their peer relationships had improved after the program. However, it cannot be excluded that these results are due to factors that were specific to the class (class effects). The absence of a control group is another limitation. For these two reasons we decided to replicate the programs in two other classes: one in kindergarten with students aged 5–6 years (class intervention 2) and one at the end of primary school with students aged 10–11 years (class intervention 3).

Class interventions 2 and 3

Participants

We implemented the DR-All program in two other classes for 2 weeks to check whether the prior findings recurred. Both class interventions were compared to control groups (teaching as usual). Class intervention 2 took place at a suburban kindergarten school near Grenoble (France). Two teachers and their 58 students aged from 4 to 6 years old participated. Twenty-seven of these students were assigned to the experimental group (14 girls), and 31 were assigned to the

TABLE 3 Number of pretest and posttest disruptive behaviors in the experimental groups in class interventions 2 and 3.

Observation time	Disruptive behaviors (per hour)	
	Kindergarten (class intervention 2)	Fifth grade (class intervention 3)
Pretest	660 (65.45) ^a	897 (69.35) ^a
Posttest	452 (41.40) ^b	318 (28.54) ^b

In the columns, the two mean values marked ^a and ^b are statistically different.

control group (14 girls). A teaching assistant was also present in each group, as required in all French kindergartens. In the experimental group, the assistant received the same training as the teacher. Class intervention 3 involved 2 teachers and their 54 fifth grade students (9–11 years old). Twenty-six were assigned to the experimental group (11 girls), and 28 were assigned to the control group (12 girls). The school and the parents gave their full consent for both class interventions. Permission was also obtained for video recording in class intervention 3.

Procedure

As in class intervention 1, we applied the DR-All strategy for 2 weeks and observed the students' behaviors 1 week before and 1 week after. In class intervention 2, instead of filming the students, we trained 3 experimenters to code the inappropriate behaviors in real time in order to comply with the parents' wishes. The experimenters coded the behaviors for 3 hours per day. However, in class intervention 3 (as in class intervention 1), we filmed the students' behaviors during the program implementation. We compared our results with the control groups and added a measure of class relationships. Further, we measured implementation fidelity because this is an essential factor for the strategy to succeed. The protocol was identical to the one used in class intervention 1.

Results

Implementation

A score of appropriate teacher reactions to disruptive behaviors was calculated by dividing the score of appropriate teacher reactions by the number of total teacher behaviors (appropriate + inappropriate reactions). Inappropriate reactions were teacher reactions that were not in line with the DR-All program instructions—for example, when a teacher reprimands a disruptive behavior. The score was multiplied by 100 to obtain a percentage. One point was allocated to each appropriate reaction and no points were given for inappropriate reactions. Finally, the appropriate teacher reaction scores went from 0 (inappropriate reactions only) to 1 (appropriate reactions only). When the score was equal or below 0.70, the program was considered to have been correctly implemented. To make reading easier, we divided the number of times praise was given by the time in hours. We considered the program had been correctly implemented when praise had been given at least four times per hour. In both interventions, the

teachers used the strategy correctly. The appropriate teacher reaction scores were 92.5% for class intervention 2 (kindergarten: 172 appropriate and 14 inappropriate teacher reactions), and 93% for class intervention 3 (fifth grade: 55 appropriate and 4 inappropriate teacher reactions).

Behavioral measures

As in class intervention 1, behavioral measures taken 1 week before and 1 week after the implementation were used to assess the effect of the strategy. First, the percent of interrater agreement was satisfactory (intervention 2_{Experimental/control} = 91%/93%; intervention 3_{Experimental/control} = 70%/71%).

As in class intervention 1, behaviors, such as verbal disruption by the entire class or an unidentified child were added as an additional behavior for every student in the class. The total results are shown in Table 3 for the students in kindergarten and for the students in fifth grade for each of the two observation periods in the class intervention groups and in the control groups. The number of disruptive behaviors decreased significantly after the program in both class intervention groups.

At the pretest stage in the kindergarten (class intervention 2), the frequency of disruptive behaviors was significantly different between the experimental group and the control group ($U = 0.00$, $p < 0.001$). The frequency of disruptive behavior in the experimental group was significantly lower at the posttest than at the pretest [$\chi^2(1) = 27.0$, $p < 0.001$]. Before the implementation of the program, the average number of disruptive behaviors per student was 20 per hour ($SD = 11.7$). This decreased to 9.87 per hour after 2 weeks of implementation ($SD = 4.92$). The program had a medium and significant effect of decreasing disruptive behaviors ($d = -0.62$). The increase observed in the control group was significant [$\chi^2(1) = 20.2$, $p < 0.001$], as the average disruptive behavior per student per hour went from 4.16 ($SD = 1.20$) to 4.92 ($SD = 1.27$).

At the pretest stage in fifth grade (class intervention 3), the frequency of disruptive behaviors was significantly different between the experimental group and the control group ($U = 93.00$, $p < 0.001$). The frequency of disruptive behavior in the experimental group was significantly lower at the posttest than at the pretest [$\chi^2(1) = 26.0$, $p < 0.001$]. Before the implementation of the program, the average number of disruptive behaviors per student was 4.84 per hour ($SD = 4.56$). This decreased to 1.66 per hour after 2 weeks of implementation ($SD = 1.34$). The program had a strong and significant effect of decreasing disruptive behaviors ($d = -3.56$). In the control group, the average disruptive behavior per student per hour went from 1.45 ($SD = 1.18$) to 1.17 ($SD = 0.84$) [$\chi^2(1) = 3.57$, $p = 0.059$].

Class relationships

The results did not reveal any positive effect on class relationships at the end of the program.

Discussion

Overall, this DR-All program provides evidence that ignoring inappropriate behaviors (e.g., aggression) and rewarding good ones (e.g., prosocial behaviors) in the same way for all students may produce behavioral effects in kindergarten and elementary schools. Indeed, we observed a significant decrease in the frequency of disruptive behaviors after the program in all three class interventions. By responding consistently to all the students, the teacher establishes a new norm to shape student behavior and gives every student the opportunity to understand and acquire appropriate behaviors that comply with this new norm. Role models play an important part in this process because the students observe the teacher's reactions to their classmates' appropriate behaviors. Students see a way of behaving in class that does not generate threats and punishments. They see that appropriate behaviors lead to praise from the teacher, so they are motivated to try out these new behaviors and adopt the new norm (Social Learning Theory, Bandura, 1977). As a result, the students encode the "behavior-consequence" sequence they have observed (Bandura, 1977, 1986). Because inappropriate behaviors are no longer the focus of attention, they gradually disappear. If a student wants to provoke a reaction from their teacher, they must behave in an appropriate manner. Of course, students do not immediately internalize and reproduce everything they see. Repeated observations are essential for them to be able to assimilate a behavioral rule, and they must be able to identify with the role models. Indeed, identification with the role model and the value assigned to the "behavior-consequence" sequence are key factors in the motivation process. According to Bandura (1972), repeated observations of class role models producing target behaviors allow role aspirants to internalize and mimic them, thereby strengthening the motivation to adopt the new behavioral norm. Furthermore, in class intervention 1, the results showed that DR-All was especially effective when the teacher changed their practices consistently over time. After a reminder of the strategy in the second year, the number of disruptive behaviors was similar to the posttest score in the first year. In class intervention 1, we also observed that this strategy can be applied when a student has a special need. This is important because it promotes inclusion, as the teacher's reactions are the same for all students. Of course, in practice, there are always small adjustments to be made, particularly when it comes to cognitive learning. Most strategies have a positive short-term impact, but can be counter-productive in the long term, especially when the student's self-concept values are in accordance with the inappropriate behavior. In addition, it has been shown that the threat of punishment can add value to a deviant behavior, which may cause it to reoccur (Aronson and Carlsmith, 1963). Threats of punishment do not therefore contribute to the construction of a value system that is suited to the school environment. Disruptive behaviors at school can nevertheless be reduced in the long term. This all depends on how teachers and school staff react to these behaviors. If behavior specific praise is given and value is consistently attributed to appropriate behaviors, and extinction is used when

disruptive behaviors occur, a new behavioral norm can be created. By rolling out this strategy for all the students in the school, the new norm becomes a prominent feature of school life, which will ensure its effectiveness over time. The students adopt this new way of behaving in class without threats or punishments. Teachers no longer rely on reactive management strategies which produce harmful effects and negatively impact learning opportunities and relationships (Kessels and Heyder, 2020; Muscott et al., 2008). Moreover, in class intervention 1, we observed that the most rejected pupils were significantly less rejected by their classmates after the program. Therefore, as disruptive behaviors decrease in number, peer rejection also decreases, especially for those students whose behavior was inappropriate before the program. This was not observed in the other two interventions because there was no real rejection or stigmatization in the classes concerned. This suggests that in extreme cases of rejection, the program can help to promote the inclusion of the most stigmatized students in a class.

The limited sample size and the absence of an equivalent control group (e.g., behavior frequency in class interventions 2 and 3 were lower in the control group at the pretest) are the two main limitations of this study. Future studies based on larger sample sizes are needed. In class intervention 2, the disruptive behaviors were coded in real time because filming was not possible. Real time coding made interrater reliability difficult to assess and meant that the raters could not rewind a film to check every behavior. Another limitation is that the success of the program relies solely on the teacher's willingness to apply DR-All in class. Since, the teachers in the interventions described in this paper were all volunteers, future research could focus on teacher engagement. Because the extinction principle in DR-All can conflict with many teachers' preconceived ideas, explicit guidance is crucial so that teachers are fully engaged in the program, understand the issues at stake, and can overcome the obstacles created by these preconceived ideas. Despite these limitations, the consistent application of this program showed that ignoring disruptive behaviors while praising good ones for all the students in a class had a clear and sustainable effect upon behavior, including when a student has a special need (class intervention 1). Finally, providing clear guidelines for teachers is a key factor in helping them change their daily practices, create new behavioral norms and reduce disruptive behaviors.

In the light of these results, we may conclude that applying DR-All consistently to all the students in a class not only ensures its long-term success by creating a new behavioral norm, but also gives real hope to teachers whose aim is to optimize the valuable time they spend in their classrooms.

Data availability statement

The original contributions presented in the study are publicly available. This data can be found here: <https://osf.io/rzxkw/>.

Ethics statement

Ethical approval was not required for the study involving human samples in accordance with the local legislation and institutional requirements. Written informed consent for

participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

PP: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. IF: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing. BH: Data curation, Methodology, Resources, Validation, Writing – review & editing.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1411743/full#supplementary-material>

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