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ARTICLE



# The impact of a schoolwide de-escalation intervention plan on the use of seclusion and restraint in a special education school

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## ABSTRACT

This research occurs in a specialized primary school for students having emotional and behavioural disorders (EBD) in a suburb of Montréal in Canada. The aims were to a) evaluate the impact of a schoolwide de-escalation intervention plan on the use of de-escalation and seclusion-restraint measures throughout the school year and b) to identify the precursors of seclusion and restraint use (SRU). Data were obtained from systematic observation of behavioural incidents over a period of three months. The frequency, the duration and the nature of behaviours were observed. Results showed a higher frequency of de-escalation measures compared to SRU. They also showed a significant decrease in the frequency and the total duration of SRU throughout the year. A high frequency of negative behaviours was observed among students and SRU was found to be significantly higher in younger students. Implementation of a behavioural support plan was found to promote self-regulation and prevent SRU in students with EBD. Young students and those with aggressive behaviours seemed to benefit more.

## KEYWORDS

Emotional and behavioural disorder; seclusion; restraint; de-escalation; primary school

## Introduction

Although controversial within the scientific and clinical community, seclusion and restraint uses (SRU) appear frequent interventions for children with emotional and behavioural disorders (PDD) in psychiatric settings (De Hert et al. 2011), residential (Green-Hennessy and Hennessy 2015) and school-based (Gagnon, Mattingly, and Connelly 2014; Massé et al. 2016). SRU constitute aversive procedures designed to reduce or eliminate students' serious behavioural problem (Rozalski, Yell, and Boreson 2006).

The World Health Organization (WHO 2017) defines seclusion as 'isolating an individual away from others by physically restricting their ability to leave a defined space' (17). It may be by locking someone in a defined space (e. g. room), by containing them in a specific area or by telling them they are not allowed to move from a defined space. In school, it involves removing students from the classroom environment, placing them in an involuntary confinement in a room or area where they are physically prevented from leaving (Busch and Shore 2000). Physical restraint imposes a bodily limitation of a person's movement (whole body or somebody parts) often using force. Physical restraints have also been referred to as ambulatory restraint, physical intervention, manual restraint, or therapeutic holding (CCBD 2009). In school settings, it usually involves one or more

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stakeholders using their bodies to restrict student body movement as a means of recovering behavioural control, and maintaining safety for the school environment (CCBD, 2009).

As noted by Villani et al. (2012), there are little data on the prevalence of SRU in a school environment, which raises questions about the interventions to be implemented in a context of crisis management in this environment. In an inpatient setting, Martin et al. (2008) reported a decline of SRU from 56 per 1,000 children and the adolescent patient to 1.7 per 1,000 patients days after a staff training program. Fogt et al. conducted a survey in 72 residential and day treatment schools for children having emotional and behavioural disorders. They found a wide variability in the use of physical restraint (from 0 to more than 12 instances per day per 100 students on a monthly base). Higher rates of physical restraint per 100 students per day monthly were from 1 to 4 (32.3%). Most schools (33%) declared having 1 to 3 restraints per weeks.

Villani et al. (2012) conducted a descriptive longitudinal study in a special education school, looking for the number and duration of SRU in lower/middle school and high school's students with multiple disabilities. Over a six years' period, the lower/middle school restraint and seclusion data show variability without evidence in the reduction in absolute numbers. For example, the higher rate was 422 restraints (12,78 per 1,000 student days) in the 2002–2003 school year for the lower/middle school students and 255 in the 2007–2008 school year (8,01 per 1,000 student days). Villani et al. (2012) also raised an age influence as they reported that lower/middle school students are more restrained than high school students.

SRU has been questioned and criticized (CCBD 2009; Masters et al. 2002; National Association of School Nurses 2015; National Disability Rights Network 2010; Peterson, Albrecht, and Johns 2009). Scheuermann et al. (2016) identified six important ethical issues related to the SRU in schools: '(a) potential for death or injury (b) failure to use the least intrusive intervention and evidence-based practices, (c) inappropriate restrictions on liberty and removal from access to education (d) repeated use of restraint or seclusion as the failure of programming (e) disproportionate use with certain critical groups, and (e) insufficient training, supervision, and monitoring'. De Hert et al. (2011) indicated that data about the effectiveness of SRU are missing, although there is some indication that SRU can lead to severe psychological and physical consequences. For example, SRU represent events that have the potential to cause child injury, staff injury, and re-traumatization (Masters et al. 2002). Children have been found to associate fear, pain, anger, reactivation of prior trauma experience and non-therapeutic relationship with the use of physical restraint (Buckman 2014; Fournier et al. 2018; Smith 2006; Steckley and Kendrick 2008). In a single-subject study, Magee and Ellis (2001) observed a detrimental effect of physical restraint as a consequence of inappropriate classroom behaviour: rates of these behaviours increased across sessions for both subjects instead of diminishing. For all these reasons, Peterson, Albrecht, and Johns (2009) recommended that SRU should be rare, limited to emergencies, well documented, and conducted by personnel appropriately trained in de-escalation and crisis response, highly monitored, and accompanied by the implementation of an evidence-based comprehensive behaviour support plan.

### **Risk factors for SRU**

The most frequently cited reasons for SRU are dangerous behaviours towards oneself or others, agitation or aggression (Allen et al. 2009; Busch and Shore 2000; Day, Daffern, and Simmons 2010), and safety concerns (Fogt et al. 2008; Petti et al. 2001). A survey in psychiatric units for youths revealed that three behaviours preceded the use of SRU more frequently SRU: threats (73%), agitation (63%) and physical aggression (63%) (Delaney and Fogg 2005). Risk factors that predict SRU in paediatric psychiatric units are morbidity, history of physical abuse, post-traumatic stress disorders, having any anxiety disorders (Timbo et al. 2016), developmental disorder (Duke, Scott, and Dean 2014), younger age (Donovan et al. 2003; Stellwagen and Kerig 2010; Timbo et al. 2016), and callous-unemotional traits (Stellwagen and Kerig 2010). Factors such as physical aggression,

early admission stage, occurrence in a private space were associated with SRU, although the time of the day was not associated (Duke, Scott, and Dean 2014).

### *Interventions for SRU reducing*

In order to reduce and prevent SRU and create a safe, supportive child-serving system, school systems are invited to apply expert recommendations strategies including providing leadership, using data to inform practice, using individualized crisis prevention tools, workforce development, debriefing, and youth and parent participation (NASMHPD 2011). However, few studies have examined alternative strategies for reducing SRU (Andrassy 2016; Valenkamp, Delaney, and Verheij 2014), and most of them have been conducted in a hospital or residential settings.

### *Staff training in conflict de-escalation or and crisis intervention*

A common recommendation to reduce SRU is to provide competency-based training for all professionals involved in the application of restrictive interventions (WHO 2017; CCBBD 2009; CEC, 2009). Several staff training programs are found in the literature. They mostly emphasize preventing behavioural escalation through identifying individual behaviours that may escalate in dangerous situations in addition to using verbal and non-verbal techniques for de-escalating behaviours (LeBel, Huckshorn, and Caldwell 2014). Two studies conducted in psychiatric facilities for children explored the effects of collaborative problem-solving training programs, which aimed not only to interrupt escalating behaviour but also to enhance the child's regulation and problem-solving skills. Greene, Ablon, and Martin (2006) observed a reduction (99%) in a number of restraint episodes following staff training. Martin et al. (2008) also reported significant reductions in the number of restraints (from 263 to 7 per year) and seclusions (from 432 to 133 per year). The average duration of restraints decreased from  $41 \pm 8$  to  $18 \pm 20$  min per episode, and the average duration of seclusion decreased from  $27 \pm 5$  to  $21 \pm 5$  min per episode. In a study on the impact of a staff training program on conflict de-escalation in a residential child care facility, Nunno, Holden, and Leidy (2003) observed a reduction of critical incidents and physical restraint episodes.

### *Comprehensive behavioural management*

Dean et al. (2007) studied the implementation of a comprehensive behavioural management plan in a psychiatric facility for children and adolescents. The plan included staff training in crisis prevention, individual aggression management plans, enhancing the child/adolescent's problem-solving skills via ongoing discussions with the child/adolescent about what behavioural alternatives would be most effective in particular situations, and management of aggressive behaviour in the least restrictive way. The implementation led to a significant reduction in episodes of aggressive behaviour, use of physical restraint, and duration of seclusion. Using a similar program based on the crisis intervention program of the Crisis Prevention Institute (CPI 2005), Ryan et al. (2007a) reported a reduction of the amount of physical restraint (17.6%) and seclusion episodes (17.6%) in a K-12 special day school.

### *Physical environment changes and sensory modulation*

Janice LeBel, Huckshorn, and Caldwell (2014) proposed that environmental changes ensuring healing and inviting environments (e.g. comfort and sensory rooms or areas) and the use of a range of sensory modulation materials in the early stage of the crisis may prevent or reduce the use of SRU. Comfort rooms constitute spaces designed with relaxation furniture, soothing colours, soft lighting, quiet music, and other sensory tools to reduce individual levels of stress (WHO 2017). According to Lane, Smith Roley, and Champagne (2013), sensory tools can reduce the physical tension associated with intense emotions (especially frustration and anxiety) by controlling them with objects or decreasing the reactivity of objects. These practices help individuals recognize and control sensory experiences, identify sensory preferences, and regulate behaviours through the

physical sensations of the body (Champagne and Stromberg 2004). Including these interventions in a prevention plan can help prevent a crisis and keep the youth in the classroom (LeBel et al. 2012). It also gives new tools for teachers to educate and teach children self-regulation skills instead of punishing disruptive behaviour (LeBel et al. 2010).

In a study of the impact of a comfort room in a psychiatric facility for adults, Sivak (2012) found a significant reduction of SRU. A meta-analysis reported beneficial effects of using sensory tools for the behavioural and emotional regulation of children, but the size of the effects was found to be small and most of the studies included very small samples consisting mainly of children with ADHD, children with autism spectrum disorder or with intellectual disabilities (May-Benson and Koomar 2010). Furthermore, in a review of sensory integration therapies for children, Barton et al. (2015) reported that there is insufficient evidence to support the use of these tools because of weaknesses in study methodology.

In spite of frequent use, few studies have addressed issues of SRU in school settings and little is known about the risk factors associated with SRU since much of the literature on seclusion and restraint is merely based on data from mental health settings, juvenile justice programs, residential treatment centres and psychiatric hospitals (Bon and Zirkel 2014). Villani et al. (2012) argue that the literature regarding the use of seclusion and restraint appear limited in school settings, perhaps due to the controversial nature of the topic.

The present study was conducted at a special education primary school for students with emotional behavioural disorders located in a suburb of Montréal in Canada. Considering the prevalence of SRU (Scheuermann et al. 2016), their negative impacts, the lack of data regarding risk factors associated with SRU in school settings (Villani et al. 2012) or alternative strategies for reducing SRU (Andrassy 2016; Trader et al. 2017; Valenkamp, Delaney, and Verheij 2014), the school designed a schoolwide de-escalation intervention plan including calming areas in the classroom and various calming rooms in the school. The intervention plan was grounded into a perspective supported by practitioners and researchers aimed at challenging the use of SRU in school, as successful efforts are ongoing in other youth settings to reduce and prevent their use (LeBel et al. 2012).

## ***Aims and hypotheses***

This study had two aims. First, to evaluate the impact of the schoolwide de-escalation intervention plan on the frequency and duration of de-escalation measures (self-regulated or adults regulated) and seclusion-restraint measures. Second, to identify the precursors of SRU by evaluating the nature of the behaviours and the grade of the students. The first hypothesis supposed that the intervention plan would lead to a significant increase in the use of de-escalation measures and a significant decrease of SRU throughout the school year. A second hypothesis assumed that aggressive behaviours would appear more frequent among younger students and these behaviours would more likely to be associated with SRU.

## ***Materials and methods***

### ***Research design***

The study used a quantitative-empirical design (Coutu, Provost, and Bowen 1998). Systematic observations of behavioural incidents were used to collect objective data from students with an emotional and behavioural disorder. This study was part of a larger research project including a qualitative component not presented here.

### ***School characteristics***

Data were gathered from a special education primary school for children having emotional and behavioural disorders, located in a metropolitan area in the province of Québec. To be admitted in the de-escalation intervention plan, the student's level of need had to exceed the services available in the regular school setting. The goal of placement in this specialized facility was to eventually return the student to a less restrictive regular school setting. Alternately, the student may graduate from the specialized school with a diploma from the local school system. Students attending the special school received educational services delivered by certified special education teachers and a special educator in classrooms with a reduced number of students. They were supported by a psychologist, a special educator and an occupational therapist. Classrooms were located near enclosed calming rooms staffed by specialists including psychologists and special education educators. Students were accompanied by staff to these areas to take breaks from class and to utilize de-escalation strategies. Seclusion and restraint rooms can also be found in these locations (Fournier et al. 2018).

### ***Staff training***

All staff members received extensive training in non-violent crisis intervention (12 h) from two accredited trainers from the Crisis Prevention Institute (CPI) in the year prior to the implementation. Throughout the year, the trainers ensured implementation of best practices. The goal of the manualized program was to adopt effective practices for decision-making and problem solving in order to prevent, de-escalate, and safely respond to disruptive or assaultive behaviours (CPI 2005, 2009). The program focused on the prevention of aggressive acting-out behaviour through identifying individual behaviours that may escalate in dangerous situations and using verbal and non-verbal techniques to de-escalate, nonviolent physical crisis intervention and team interventions that may be used in a situation where student behaviours and safety becomes an issue.

### ***Schoolwide de-escalation intervention plan***

Incoherence with provincial governmental policies and legislative frameworks (MEESR 2015; MSSS 2015), a school committee including the principal, teachers and special education technicians established guidelines for the interventions in relevance with the need of the students and to lead stakeholders in the most effective practices for crisis management (Doyon 2013). These included a crisis management protocol (CPI 2005) and daily recording of all incidents.

### ***Behavioural support for students***

In order to improve self-regulation of students with EBD, in particular, their emotional regulation, and to promote a rapid return into learning tasks, the school proceeded to set-up a hierarchy of progressive behavioural support interventions based on four levels (Fournier et al. 2018). The first level included self-regulated de-escalation measures, which promote students' self-awareness of their state and encourage them to seek help from an adult. Self-regulated measures were used at the request of the student in class or in the outside rooms. The second level also involved de-escalation measures that were encouraged and regulated by the adult who observes the student's behavioural manifestations. At this level, the student was not able to regulate behaviours by himself. He was, however, able to accept the propositions made by the adult, de-escalation measures are therefore not imposed. The third level consisted of withdrawal or seclusion in an isolated room imposed by an adult. At this level the student was not able to regulate behaviours by himself, nor to accept the adult's decision. The adult had to make decisions for the student to help him calm down and resolve the problem. Finally, the fourth level was that of restraint measures. Restraint measures were established in the

student's intervention plan. All interventions were completed by a feedback discussion on the situation between the adult and the student. In addition to the school's behavioural support protocol, as soon as a student had seclusion or restraint episode more than three times, an individual protocol was drawn up and each level of the crisis was analysed according to strategies adopted in each level.

### *Participant characteristics*

The school included 72 students, 56 of whom were present throughout the school year, while another 16 were admitted later in the year. Of those who were present all year, only 45 students experienced de-escalation, seclusion or restraint measures.

Groups were separated into three cycles: first cycle (grades one and two), second cycle (grades three and four), third cycle (grades five and six) as well as two special education groups including students of fifth or sixth grades who suffered from learning difficulties in addition to emotional and behavioural difficulties. Student's distribution between cycles was: 1st cycle ( $n = 9$  students; 12.5%), 2nd cycle ( $n = 21$  students; 29.2%), 3<sup>rd</sup> cycle ( $n = 25$  students; 34.7%), special education ( $n = 17$  students; 23.6%).

### *Procedure*

Data were collected from a behavioural incident record (Table 1). Incidents were compiled daily throughout the year by using an electronic directory tool facilitating the follow-up with students. All stakeholders were trained for this tool.

### *Institutional review board agreements and ethical standards*

The project was approved by the Ethics Committee of the University of the principal researcher. Researchers were only allowed access to anonymous data in order to respect confidentiality. With the agreement of the school principal, data of all students attending school at the time of the research were analysed.

### *Measures*

For the purposes of this study, data from the behavioural reports were used for October, January and April for all eight groups ( $n = 72$  students). Variables included levels of intervention applied, duration of de-escalation, seclusion and restraint measures and the nature of the behaviours observed.

### *Analyses*

In order to answer the first hypothesis, repeated measures ANOVA on the data of students who attended school throughout the year and who used the interventions ( $n = 45$ ) were used to evaluate the impact of the intervention plan on frequencies, total and average duration of de-escalation and seclusion or restraint by month.

For the second hypothesis, the data for all students who attended the school ( $n = 72$ ) were analysed using descriptive statistical analyses of the frequencies and percentages of the activities carried out at the time of the behavioural incident, the nature of the behaviours observed, the level of intervention applied and the duration of use of de-escalation, seclusion and restraint measures. Pearson's chi-squared test has been used to look at the relationship between categorical variables. Multiple comparison tests were performed between the independent variables using the procedure of Marascuilo (1966) (cited in Howell 2013) to distinguish the results separately. The effect size



**Table 1.** Behavioural incident record.

Variables	Definition	Categories
1. Student name	2. Date; hour: minute	3. Duration of class exit (minute)
4. Activities		Academic English Transition time (recreation, lunch, etc.) Physical education Art calming room other
5. Trigger	The trigger is an event that occurred immediately before the behaviour, just before the observed situation.	Delay Physical environment Interaction with the adult Interaction with peers Emotion Medication Transition Work tasks Other
6. Observed behaviour	The different observable behaviours are classified into 3 intensity levels according to the CPI approach (2005).	Agitation Emotional regulation Elopement Refusal Verbal or physical aggression
7. Level of intervention	According to the hierarchy of interventions	Self-regulated de-escalation Adult regulated de-escalation Seclusion Restraint
8. Outcomes of intervention	Allow to understand the situation from the perspective of a functional behavioural analysis.	Short qualitative report

was obtained through the Phi Coefficient test (Field 2013). The results are considered significant when  $p < .05$ . Statistical analyses were performed using the SPSS 22.0 statistical software.

## Results

The results are presented according to the order of the objectives.

### *Frequencies and duration of de-escalation and restraint procedures*

The number of students using the de-escalation measures was 38, 40 and 34, respectively, for the months of October, January and April (89% of students). The total number of de-escalation uses was 1348 with an average of 7.0 events by students for three months observed. Total duration was 112.6 min per month per student and mean duration of 13.7 min per month per student (Table 2).

The number of students using SRU measures was 34, 32 and 28, respectively, for the months of October, January and April (76% of students). The total number of SRU uses was 541 with an average of 5.7 events by students for three months observed (mean of 180 SRU per month or 83.3 per 1,000 student day). Total duration was 117.4 min per month per student and the mean duration was 15.7 min per month per student.



**Table 2.** Comparisons of frequencies and duration of de-escalation and seclusion-restraint.

	October		January		April	
	DE	SRU	DE	SRU	DE	SRU
Students (nb)	38	34	40	32	34	28
Frequency (total nb/month)	241	242	316*	184	234	115
Duration (Total min/students)	97.8 ± 111.4	158.9 ± 236.1	119.8 ± 131.7*	118.4 ± 180.3 <sup>†</sup>	93.8 ± 133.9	74.8 ± 101.0
Duration (Mean min/students)	13.2 ± 9.7	16.3 ± 17.9	12.6 ± 8.2	15.3 ± 21.7	10.4 ± 8.2	15.5 ± 32.6

DE = de-escalation self-regulated and adult regulated; SRU = seclusion and restraint use; \*Significantly different from October  $p < 0,05$ ; <sup>†</sup> Significantly different from April  $p < 0,05$

### Intervention throughout the months

A factorial-repeated measures ANOVA were performed to compare the frequency of de-escalation measures and seclusion-restraint levels utilization between 3 months. Mauchly's test indicated the assumption of sphericity has been violated for the main interaction effect between levels and months  $\chi^2(2) = 10.219, p = .006$ . Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = .83$  for the interaction effect). There was a significant interaction effect on the frequency of de-escalation and seclusion-restraint number of utilization and months  $F(1,88) = 72.373, p = .012$ . Contrast revealed that the number of de-escalation use was significantly higher than seclusion restraint in January compared to October  $F(1,44) = 9.472, p = .004, r = .42$ .

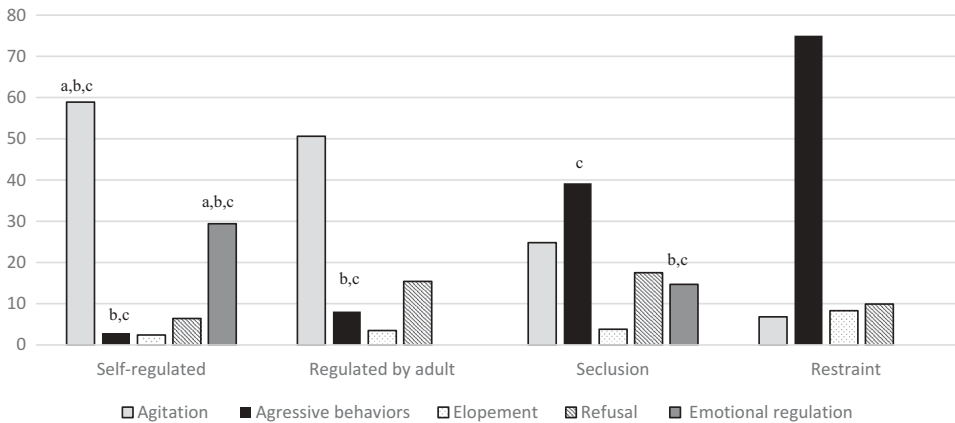
A factorial-repeated measures ANOVA were performed to compare monthly total duration (min/students) of de-escalation and seclusion-restraint levels utilization between 3 months. Mauchly's test indicated the assumption of sphericity has been respected for all effects. The general linear model showed a principal effect for de-escalation  $F(2,88) = 3.719, p = .028$ . Contrast revealed interactions effect between October and January. Total duration (min/students) of SRU was significantly higher in January compared to October for de-escalation measures  $F(1,44) = 4.731, p = .035, r = .31$ . Also, a one-way repeated measure ANOVA showed a significant difference in duration for restraint-seclusion  $F(2,88) = 3.999, p = .022$ . Contrast revealed that duration in minutes per student is higher in October compared to April  $F(1,44) = 6.122, p = .017, r = .34$ .

### Nature of disruptive behaviour

Figure 1 shows the distribution of behaviours that lead to the use of each of the intervention levels. Agitation and emotional regulation difficulties were most present in de-escalation measures whereas aggressive behaviours led particularly to the use of SRU procedures. According to this figure, the Chi-square test revealed a significant association between behaviours and the intervention levels  $\chi^2(df = 18, N = 1477) = 600,130, p < .001$ . The strength of the relationship measured by the Phi coefficient test was  $.637, p = .000$  indicating a significant association. According to the Marascuilo multiple comparison test, there were significant differences for all levels of intervention with respect to emotional regulation and agitation behaviours ( $p < .005$ ) except between the encouraged de-escalation measures and seclusion level for agitation. There were significant differences between aggressive behaviours for all levels ( $p < .005$ ) except between self-regulated and adult regulated de-escalation measures.

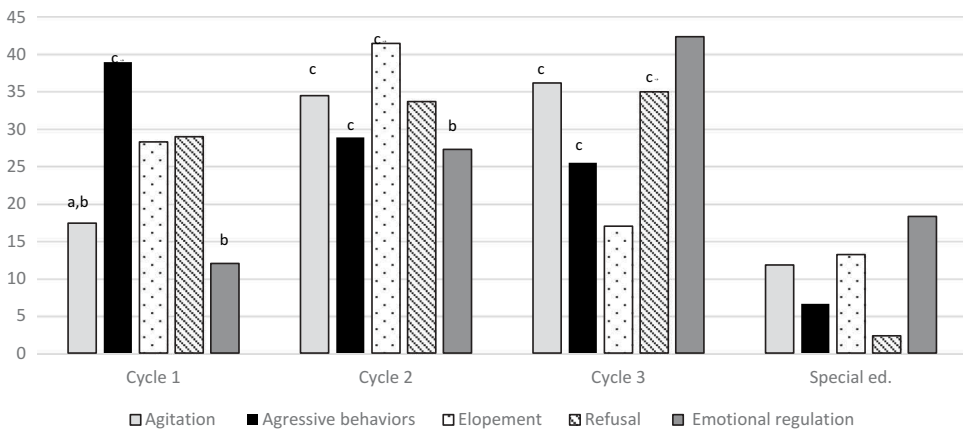
### Grade level

Figure 2 showed the distribution of disruptive behaviours by cycles. All three cycles showed a variety of disruptive behaviours with the exception of the special education groups. The figure of



**Figure 1.** Distribution in the percentage of disruptive behaviours by intervention levels.

<sup>a</sup>difference with regulated by adult; <sup>b</sup>difference with seclusion; <sup>c</sup>difference with restraint.

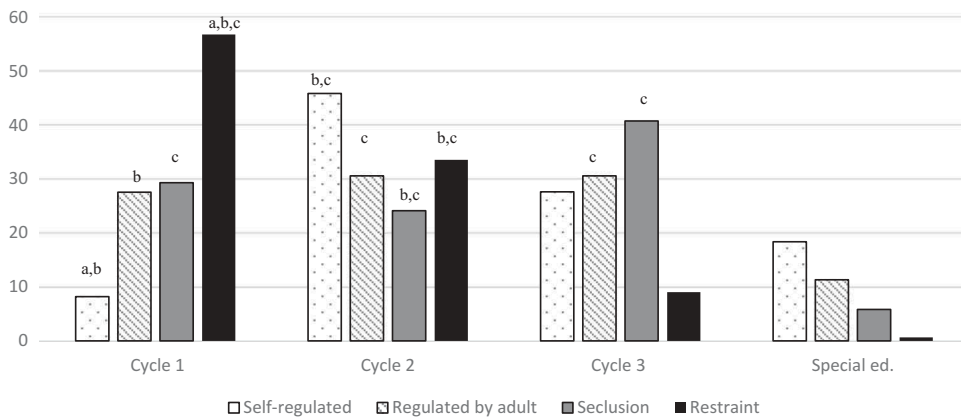


**Figure 2.** Distribution in the percentage of disruptive behaviours by cycles.

<sup>a</sup>difference with cycle 2; <sup>b</sup>difference with cycle 3; <sup>c</sup>difference with special education.

the Chi-square test results showed a significant association between the behaviours and grade level  $\chi^2(df = 18, N = 1633) = 148.931, p < .001$ . The strength of the relationship measured by the Phi coefficient test was  $.302, p = .000$ , indicating a significant association. Aggressive behaviours were found at all ages and there was no significant difference between the 3 cycles. According to the Marascuilo multiple comparison procedure, there were significantly more agitation behaviours at the 2<sup>nd</sup> and 3<sup>rd</sup> cycles, and more difficulties with emotional regulation in the 3<sup>rd</sup> cycle ( $p < .005$ ). Groups in special education were showing lesser behavioural difficulties.

Figure 3 showed a significant association between the level of intervention used by and grade level  $\chi^2(df = 9, N = 1560) = 289.261, p < .001$ . The strength of the relationship measured by the Phi coefficient test was  $.431, p = .000$ , indicating a significant association. According to the procedure of multiple comparisons of Marascuilo, the students in the first cycle were those with the lowest self-regulated de-escalation use and the highest use of seclusion-restraint procedures. The students of the 2<sup>nd</sup> cycle were those who use the most of the self-regulated de-escalation measures. They also use less seclusion and more seclusion restraint than third cycle. Third cycle students are using



**Figure 3.** Distribution in the percentage of intervention levels by cycles.

<sup>a</sup>difference with cycle 2; <sup>b</sup>difference with cycle 3; <sup>c</sup>difference with special education.

more seclusion. Finally, students in the special education group are those who least use procedures, especially seclusion and restraint levels ( $p < .005$ ).

## Discussion

This study took place in a special education primary school for EBD students. A schoolwide de-escalation intervention plan was designed and implemented throughout one school year. Based on systematic observation of behavioural incidents, the aims of the study were first to evaluate the impact of the schoolwide de-escalation intervention plan on the frequency and the duration of de-escalation measures and seclusion-restraint measures. Second, to identify the precursors of SRU by evaluating the nature of the behaviours and the grade of the students.

Regarding the first purpose, this study is in line with recent research supporting the importance of considering alternative strategies for reducing SRU (Andrassy 2016; Trader et al. 2017; Valenkamp, Delaney, and Verheij 2014). The results indicate a significant impact of the intervention plan as a higher frequency of de-escalation measures and a lower frequency of SRU were found. The results also show a significant decrease in the frequency and the total duration of SRU, especially in the middle of the school year, which also supports in part the first hypothesis. This could indicate that self-regulation of primary school students with severe behavioural difficulties in a specialized school setting can be enhanced by a set of interventions promoting student autonomy while supporting staff members and teachers.

Incoherence with Clunies-Ross, Little, and Kienhuis (2008), stakeholders in this specialized school spend a large amount of time in behaviour management issues. However, they use an expanded range of proactive and reactive practices contrary to previous research which showing that teachers in specialized environments had a limited inventory of behavioural management practices and were regularly oriented towards reactive practices (Clunies-Ross, Little, and Kienhuis 2008; Evans, Weiss, and Cullinan 2012). The average duration of SRU was about 15.7 min per month per student, which is lower than reported in clinical settings (Donovan et al. 2003; Fryer, Beech, and Byrne 2004; Martin et al. 2008) but similar to results found in educational settings (Ryan, Peterson, and Rozalski 2007b; Villani et al. 2012). However, the number of SRU and the average duration of 15 min exceeds the actual recommendations (Villani et al. 2012). As mentioned by (Kazdin 2012), long seclusion or restraint periods (more than 5 min) do not increase effectiveness, and may instead provoke snarling or aggressive behaviour. In this regard, interviews with some students of the school ( $n = 39$ ) realized in the qualitative part of the project (Fournier et al. 2018) revealed that they

preferred de-escalation measures and perceived that they are more effective to get calm than SRU; 96% of them say they do not like SRU because they are imposed by adults and seen as punitive.

Besides student perceptions of efficacy, the nature of behavioural interventions with EBD students is likely to explain their adoption by teachers. Indeed, Elliott et al. (1984) indicate that positive interventions are perceived as more acceptable, promoting their use, compared to negative interventions, such as seclusion or restraint. In addition, interventions that require less time are also perceived as more acceptable (WHO 2017). Moreover, it is found that de-escalation measures are usually less-time-consuming than coercive practices (WHO 2017). Present results did not show any difference between average duration of de-escalation and seclusion-restraint measures.

One key factor in reintegrating EBD students into mainstream schools is to foster the development of their emotional regulation and self-management strategies (Smith, Katsiyannis, and Ryan 2011). The schoolwide de-escalation intervention plan evaluated in this study allows a differentiated response to disruptive behaviours. Results show that negative behaviours such as agitation and emotional regulation difficulties are mainly associated with the use of de-escalation measures aimed at the empowerment of the students. However, SRU and aggressive behaviours are decreasing but are still very prevalent. Indeed, this could indicate that additional interventions other than SRU should be considered. Thus, it may be relevant to include other interventions that have been shown to be effective in improving the emotional regulation of children, such as self-regulation strategies, cognitive restructuring, causal re attribution (Lochman et al. 2012; Nelson, Finch, and Cash Ghee 2012) or mindfulness exercises (Malow and Austin 2016) in the behavioural support interventions proposed in this study.

### *Precursors of seclusion and restraint use*

Regarding the second purpose, a high frequency of negative behaviours was observed among all three cycles, except for students in the special group. Aggressive behaviours were common among all cycles, but older students had greater difficulties with agitation and emotional regulation. Also, the results showed that SRU was more frequent with younger students which is consistent with recent research (Duke, Scott, and Dean 2014; Timbo et al. 2016; Villani et al. 2012).

Age is considered an important moderating variable in EBD student interventions (Elliott et al. 1984) although not all researchers agree on its impact (Fryer, Beech, and Byrne 2004). It is argued that younger students have fewer mechanisms to cope with frustration and anger and regulate themselves (Miller, Walker, and Friedman 1989; Persi and Pasquali 1999). Young students exhibit more immature behaviours, impulsivity, a lower threshold of frustration tolerance, communication difficulties and limited attentional abilities which constraint their self-regulation ability (Villani et al. 2012). These difficulties make it possible for students to adopt severe aggressive behaviours (making tantrums, throwing objects, biting or hitting) that have a high potential for dangerousness for the student or those around him while leading to SRU (Ryan et al. 2007b). Villani et al. (2012) argue that as children mature and progress through school, they may improve their abilities to tolerate frustration, manage impulsivity and accept a delay of gratification which facilitates their self-control.

The nature of behaviours is a second important moderating variable in EBD student interventions (Elliott et al. 1984). Present findings show that aggression was more significantly associated with the use of seclusion and restraint measures. This converges with research showing that people with severe behavioural difficulties, particularly those who engage in aggressive behaviour, are more likely to be placed in SRU (Allen et al. 2009; Ryan, Peterson, and Rozalski 2007b). This highlights the need to explore other interventions for severe negative behaviours such as aggression. In this regard, a qualitative study with primary EBD students found that the use of a high-intensity interval training exercises provided the greatest benefits compared to SRU when students exhibited highly disruptive behaviours (Fournier et al. 2018).

Results illustrated that behaviours other than aggressive ones can lead to SRU. Agitation, refusal and emotional regulation difficulties were also triggers for SRU, although they were less prevalent than aggressive behaviours in this study. Some authors report that refusal and elopement could be the precursor of SRU in school settings (Ryan, 2007b), as well as threats, agitation or physical aggression in psychiatric units (Delaney and Fogg 2005). This leads to questions about the triggers to consider in order to guiding the use of restrictive measures. SRU can depend on the severity and interference of the negative behaviours (Sourander et al. 2002), however, present findings do not allow to validate this information.

As well as the age and nature of behaviours, the perception of intervention effectiveness by stakeholders may also explain why SRU measures are frequently used with younger students. In a review, Ryan and Peterson (2004) explains that stakeholders perceive that minor interventions are less effective for this age group. Fryer, Beech, and Byrne (2004) shows that stakeholders have a limited range of interventions with younger students in contrast to older ones. Also, they believe that intrusive procedures may be more appropriate for younger students while they would be more apprehensive about using SRUs in older and stronger students (Ryan et al. 2007a).

SRU must be used as a last resort intervention, when other strategies have failed and the safety of the student or of others is threatened. The precursors of SRU found in this study, therefore, support the recommendations of LaVigna, Willis, and Koegel (2005) who propose that the number of episodes of aggression and the severity of behaviours should be monitored and considered as independent variables to evaluate the effectiveness of interventions. The results also reveal that not all students use de-escalation (11%) or seclusion and restraint (24%). As noted by Smith, Katsiyannis, and Ryan (2011), these findings suggest that not all EBD students require educational placement in a segregated environment. Future research should focus on students who are considered to be outliers and who therefore contribute to this prevalence of both de-escalation and SRU measures (Trader et al. 2017). Otherwise, schools must carefully consider the circumstances in which placement in a special education setting is required based on the needs and educational benefits of students.

### **Limits**

Some limits restricted the scope of the study. It is not possible to distinguish the effects of all the measures used in the study (staff training, comprehensive behavioural plan, physical environment changes, sensory modulation, etc.). It can be assumed that all measures explain the change.

### **Conclusion**

This study underscores the need to reduce restrictive and increase preventive measures to promote self-regulation and reduction of challenging behaviours in primary EBD students, which is in line with evidence-based practices. Study also clarifies the nature of behaviours and student characteristics, underlining the special attention that must be given to younger students as well as those with particular aggressive behaviours (Allen et al. 2009). The results also call for the vigilance to monitor the use of SRU in EBD students in a specialized school environment (Andrassy 2016; Valenkamp, Delaney, and Verheij 2014; Villani et al. 2012).

This study underscores the need for decision-makers to address important ethical issues related to the use of SRU at school. Interventions in managing difficult behaviours should minimize risks for students, be carried out in the least restrictive environment, encourage a quick return to learning, be well documented, be conducted by personnel appropriately trained in de-escalation and crisis response, be highly monitored, and accompanied by the implementation of evidence-based, comprehensive behaviour support (Scheuermann et al. 2016; Trader et al. 2017). It is imperative that restrictive measures be considered as a 'response to an emergency and not a method of intervention' (Trader et al. 2017).

Change appears possible when clear and decisive policies are implemented (Nelson 2017). All actors and decision makers must work together to establish guidelines towards more effective learning environments for EBD students (LeBel et al. 2012; Simonsen et al. 2014; Trader et al. 2017). In the province of Quebec, guidelines are provided by the Ministry of Health (Ministère de la Santé et des Services Sociaux (MSSS) 2015) and not by the Ministry of Education. Given the prevalence of SRU measures in schools, schoolboards have to adopt evidence-based policies that respect the existing legislative framework. Recently, some have made proposals to this effect (Commission scolaire des Découvreurs 2012; Commission scolaire des Estuaires 2014; Commission scolaire des Premières Seigneuries 2016). Future research will be important in order to document their implementation in these different environments and their multiple effects for the students involved.

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