☑ CE Article

The Perspectives of Teachers and Paraeducators on the Relationship Between Classroom Clutter and Learning Experiences for Students with Cerebral Visual Impairment

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Structured abstract: *Introduction:* Cerebral visual impairment (CVI) typically affects children's overall functioning in visually cluttered environments. This study aims to consider whether the removal of classroom clutter ameliorates visual problems and the associated behavioral difficulties for these children. *Methods:* Two classrooms at a special school were de-cluttered. Changes included: covering glass panels with thick black paper; hanging sheets over open shelving; creating areas of blank wall in front of the student to focus attention on work; removing unnecessary equipment and furniture; and taking down information on windows and walls, and that hanging from ceilings. Teachers, paraeducators, and students worked in these classrooms for two weeks, following typical daily routines. Observations by teachers and paraeducators of students' behavior and learning experiences before and after de-cluttering were sought through interviews. *Findings:* The perspectives of the teachers and paraeducators were that de-cluttering had a positive effect on the students' learning experiences and behavior and also on their own functioning. They also considered the fact that creation of learning spaces lined with black paper resulted in greater attention and focus, but that students continued to be distracted by the noise and movement of others. *Discussion:* The potential link between cluttered classrooms and students' functioning and behavior indicates that visual clutter may amplify the visual difficulties associated with CVI and distract the students from learning activities, and is in line with current literature. Changes to classroom layouts that include specific areas for different learning activities, including "black hubs," may therefore benefit students with CVI. *Implications for practitioners:* This pilot study suggests that the elimination of classroom clutter and the creation of black hub learning spaces enhances functioning and merits further investigation. A study that compares specific behaviors and performances, before and after implementation of de-cluttering strategies, might also determine whether the positive effects described by the teachers can be further corroborated.

Cerebral visual impairment (CVI) is a complex visual condition that in recent times has become the most common cause of visual impairment affecting children in the developed world (Lam, Lovett, & Dutton, 2010; Macintyre-Beon et al., 2012). Each child with CVI may experience a variety of visual difficulties including low visual acuities; abnormal visual fields; difficulty controlling eye movement; accommodation disorders; difficulties in perception of movement; concerns with visually guided movement; and difficulties with object recognition, visual attention, and visual perception (Goodale, 2013; Lueck, 2010). These visual anomalies often affect how a child is able to function both visually and cognitively in different situations, especially in cluttered and complex environments (Gillen & Dutton, 2003). Buultjens, Hyvärinen, and Walthes (2010) wrote that classrooms that have an excess of children's paintings and other decorations cause clutter, which can make it harder for children with CVI to concentrate on what the teacher is saying or on the learning task that they are meant to be doing. Recent research has also suggested that classroom layouts may affect visual skills and learning and behavior for all children, but more so for those with CVI and for those with CVI plus other disabilities (Fisher, Godwin, & Seltman, 2014; Godwin & Fisher, 2011; Little & Dutton, 2014).

Providing a suitable physical environment that is conducive to learning is vital for any classroom, since it is an important factor in strengthening children's educational development (Asiyai, 2014; Edwards, 2007). However, for the learning environment to be effective, care needs to be taken in regard to the placement of equipment and material and the use of spaces (MacNaughton & Williams, 2009). Simonsen, Fairbanks, Briesch, Myers, and Sugai (2008) wrote that the physical layout of furniture and objects in a classroom can negatively affect the behavior of both students and teachers. They recommended minimizing clutter to help reduce distractions for students and teachers. Visual displays are another aspect that can negatively affect student behavior, and care needs to be taken to ensure there is a balance between the functional requirements of a classroom and the aesthetic preferences, since too much visual stimulation hinders learning (Barrett, Zhang, Moffat, & Kobbacy, 2013). Fisher et al. (2014) further supported this view, reporting that maintaining focused attention in classroom environments that contain extraneous visual displays can be particularly challenging for young children. Through research comparing classroom activities in cluttered versus uncluttered environments, Fisher et al. (2014) found that visual environments play a significant role in how young children allocate their attention during instruction. Godwin and Fisher (2011) also showed that visual features of the classroom environment can be potential sources of distraction that can affect the ability of children to attend to the content of a lesson, which ultimately hinders their learning.

Distraction is significantly worse for children with CVI due to the many difficulties associated with this impairment, including simultanagnosia (an inability to see more than a few objects at a time), optic ataxia, lower visual field impairment, and apraxia of gaze. Simultanagnosia, caused by damage to the posterior parietal lobes, may cause difficulties with simultaneously processing the large volumes of visual information in a classroom environment (Dutton, 2015c). Therefore, children with this condition are often unable to differentiate between information in the background and foreground and are also unable to locate specific objects on a patterned or cluttered background (Dutton, 2015c).

Optic ataxia is also caused by damage to the posterior parietal lobes and can be generalized or limited to the lower visual field (Dutton, 2015a; Milner & Goodale, 2006). Optic ataxia causes children to have difficulty using vision to direct a grasp or to aim movement towards a specific location (Goodale, 2013). Relating this condition to a classroom environment, children may have problems reaching for objects or may seem clumsy and use exaggerated movements when moving around the environment (Lam et al., 2010). This kind of difficulty is heightened in cluttered environments and can cause frustration, which can lead to negative or disruptive behavior (Lam et al., 2010; Macintyre-Beon et al., 2012).

Reduced visual fields, especially in the lower field, are another common impairment caused by damage to the white matter in the occipito-parietal brain areas (Jacobson, Flodmark, & Martin, 2006; Kran & Mayer, 2015). Children with restricted visual fields may have difficulty with moving safely and efficiently in the environment, and issues such as difficulty negotiating obstacles, frequent tripping, and missing low-lying objects are often reported (Fielder & Wright, 2015; Macintyre-Beon et al., 2012). Within a classroom environment, these kinds of issues could be problematic and could cause accidents, especially when the environment is extremely cluttered.

Apraxia of gaze is the inability or difficulty with moving the eyes from one visual target to another, and is caused by bilateral damage of the posterior parietal lobes (Dutton, 2015b). Affected children have difficulty locating different visual targets in a specific environment, especially if they have no prior knowledge of where these targets are (Dutton, 2015b). Apraxia of gaze is often misinterpreted as an attention deficit, since the apparent lack of attention is seen as a behavioral issue rather than a visual issue. Overall, dysfunctions in these areas conspire to create an inability to process the visual information within an environment and to maintain visual attention for periods of time, and these ultimately cause major difficulties within cluttered classroom environments.

There is also evidence suggesting that cluttered classroom environments can negatively affect the classroom behavior of students with CVI. For instance, Lam et al. (2010) describe how cluttered environments can cause behavior that includes tantrums and crying. Children with CVI can also show negative and disruptive learning behaviors in the classroom that affect their own learning and that of those around them. Anecdotal evidence indicates that a busy classroom environment often heightens counterproductive visual and learning behaviors (G. Dutton,

personal communication, July 26, 2017). However, these behaviors are commonly misinterpreted as the child being uninterested in learning, having a lack of ability to learn, or even possessing an aversion to learning (Dutton, 2015c). The recommendation, therefore, is to create a less stressful environment that allows children to cope with situations they would otherwise find difficult (Buultjens et al., 2010).

Often children with CVI have additional disabilities that further affect their learning and behavior, which can also make it difficult to ascertain their level of functional vision (Dutton & Lueck, 2015). However, as Little and Dutton (2014) demonstrate, it is possible to elicit hitherto unrecognized visual functions by surrounding a child with multiple disabilities that include CVI in the totally uncluttered environment of a monochromatic tent. In their case study research on two students with CVI and multiple disabilities, Little and Dutton (2014) observed improvements in the children's visual behaviors, as well as changes in cognitive, emotional, and physical functioning, through the use of such a tent. Their findings are in line with the perspectives of other practitioners who suggest that the specific learning environments need to be tailored carefully for children with multiple disabilities that include CVI to ensure they are not affected by sensory overload, which could lead to behavioral consequences (Jan et al., 2013). It is, therefore, important to create areas in which these children are not distracted by visual clutter, which can be achieved by creating a black background that will allow for the visual material of a highly contrasted color to stand out more (Lueck & Dutton, 2015). Alternatively, it can help to ensure that any distracting visual material is placed behind the students, so that they do not have to face it when concentrating on learning tasks (Buultjens et al., 2010). Within these environments, noise also needs to be considered, because as Buultjens et al. (2010) wrote, visual and auditory overload in classrooms causes tiredness and concentration difficulties. Scheuermann and Webber (2002) also highlighted the importance of creating an inclusive environment for all students. They recommended that a classroom be organized with designated areas for specific, clearly identifiable learning tasks.

In summary, it is clear that on account of their increased difficulties with visual attention and visual perception, children with CVI could potentially have an increased risk of being unable to focus and concentrate in a cluttered classroom environment. Even in classrooms where there are children with CVI and those with multiple disabilities that include CVI, teachers tend to display as much information on the walls as possible in an attempt to keep the classroom bright and colorful. These colorful displays distract children from their work and lessons. It is, therefore, imperative that professionals understand the necessity of providing the best possible visual environment that supports the learning and behavior of children with CVI. This research aims to examine the effect of cluttered classroom environments on the learning experiences and behavior of those children. It will also investigate how classroom layouts can be improved to better support their learning needs.

Methods

A qualitative research design was used to conduct semi-structured interviews

with a teaching team from two classrooms at a special school in New Zealand. The goal of the interviews was to ascertain the perspectives of the teaching team in relation to the effect of classroom clutter on the learning experiences and behavior of their students with CVI. The research also considered the participants' perspectives on how classroom layouts could be improved to better support learning for these children.

Two classrooms at a special school were identified as being suitable for the inquiry, since they each provided an environment in which more than one student with CVI and multiple disabilities was in attendance. Within each classroom, there were 4 students, ranging in age from 5 to 17 years. Of the 8 students, 6 were diagnosed with CVI and had additional disabilities, and throughout the research period the participants were reminded to focus on these students only. All students were following a functional curriculum. Ethical approval was obtained from Massey University and the Blind and Low Vision Network New Zealand ethics committees.

Participants

Three trained teachers of students with visual impairments, who had between 17 and 48 years of experience in the field of visual impairment, and 3 paraeducators from the classrooms agreed to participate in the research.

Procedure

The first author and lead researcher, who is a qualified teacher of students with visual impairments and an orientation and mobility specialist, first met with the six adult participants as a group to outline the main concepts and the rationale behind the inquiry. During the hour-long meeting, the participants were introduced to a one-page diagram of behavioral characteristics as shown in Figure 1.

The characteristics were identified in the literature as possibly being of significance for children with CVI in cluttered environments, and their meaning was defined during this meeting. Participants were asked to note any specific behaviors they observed in their students with CVI throughout the research period in a notebook that was provided to them, and they were advised to include the context of their observations to give clarity to their findings.

Following the meeting, the adult participants were asked to observe the current behaviors of their students with CVI in their classrooms for a two-week time period in order to establish a baseline of learner outcomes and behaviors. The classrooms were then prepared by the researcher using specific de-cluttering strategies gleaned from the literature. Changes included using thick black paper to cover a large glass-panel sliding door between the two rooms, hanging black and white sheets over open shelving, removing all unnecessary furniture and objects, removing materials from windows and those hanging from the ceiling, and creating areas on the wall where there was no information so that the students could face into this area for focused activities. Teachers were also asked to consider the best placement of students in the classroom to ensure they avoided glare and distractions from others.

The students and teachers then spent a period of two weeks working in the decluttered classrooms following typical

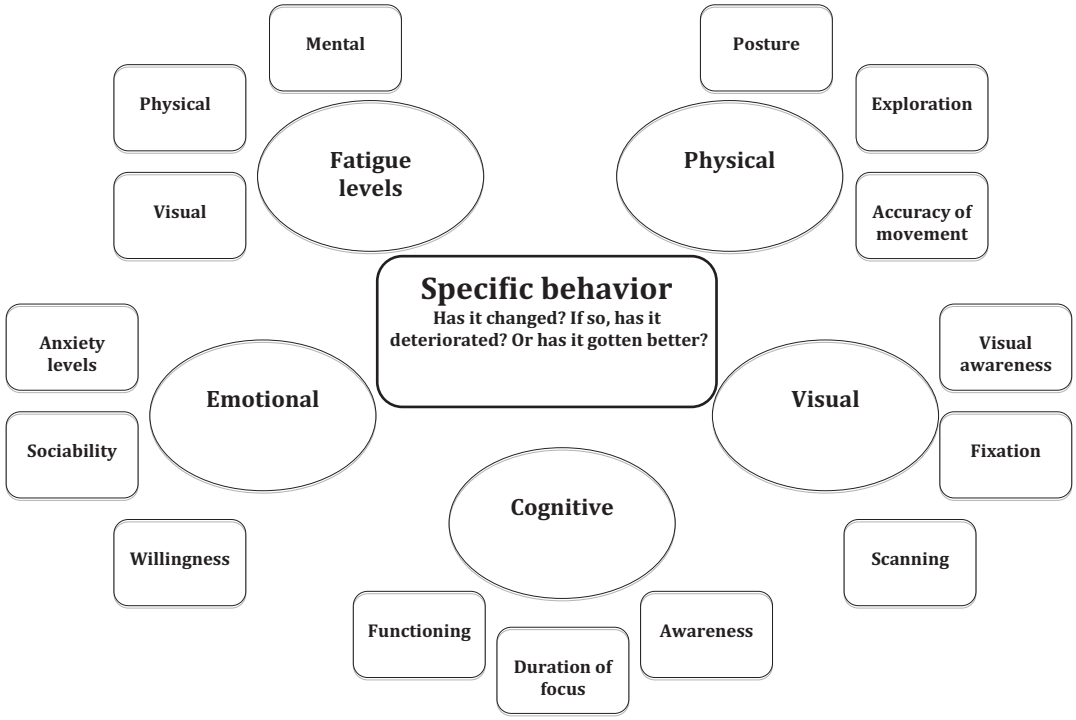

Figure 1. Diagram of behavioral characteristics.

routines and completing usual activities. Following this period, semi-structured interviews were conducted with the adult participants to discuss their observations. Each participant was interviewed separately, and the interview length ranged from 30 minutes to one hour. An interview schedule was prepared, with questions that focused on eliciting information on students' behaviors and outcomes before and after de-cluttering the classrooms. Also included were questions aimed at examining the participants' perspectives on the effectiveness of de-cluttering and their opinions about suitable classroom layout for students with CVI. All interviews were audio-recorded and transcribed. The transcripts were all verified by the participants.

Data analysis

The data were analyzed using analytic induction, drawing on the Miles and Huberman (1994) approach, which allowed for the continued reworking of the data by implementing the three stages of data reduction, data displays, and drawing and verifying conclusions. By using this method, the researcher was able to sort and categorize the data according to emergent themes around students' learning experiences and behavior, and the effectiveness of classroom layouts. These themes were compared and redefined as needed, allowing for the creation of three major themes: effect on students' learning and behavior, effect on adults, and remaining challenges. Minor themes included noticing changes, focus and attention, "black hubs" (areas around the glass

panels that were covered in black paper), distraction, feeling in the classroom, noise, and movement. Following the analysis of the data, the second author checked the themes that were developed and the overall conclusions of the research.

Findings

During the initial discussions with the teaching staff members, and also during the interviews, a number of participants reported that most of the students had very limited vision and many could only "see as far as the length of their wheelchair tray." For this reason, it was thought that the students would not be aware of the extent of the de-cluttering, and the feeling was that only small areas of the classroom would need to be de-cluttered. However, even when the classroom was being prepared, it became evident that the students were very aware of the changes to their familiar classroom environments. Two students, in particular, on separate occasions abruptly stopped interacting with the paraeducator and turned to the black paper.

Following the de-cluttering, a number of the participants reported that they felt there was less information for the students to process and that the external distraction disappeared, which allowed students to become more aware of their surroundings. When reporting their observations, the participants initially felt these were only small changes and not necessarily significant on their own. However, when all of these small changes were considered together, they concluded that, overall, the de-cluttering made a significant change in students' learning outcomes and behavior.

Effect on students' learning and behavior

Following the de-cluttering period, the participants had some interesting perspectives about the effect it had on the students with CVI. All of them mentioned observing an improvement in the students' learning and behavior when working in the area surrounding the black paper. Improvements included prolongation of attention and greater degree of focus. A general theme of having a black hub work station that was used for focused, concentrated work emerged. It was also considered that the changes to the environment helped the students, since it meant they had less information to process, which resulted in less sensory overload and reduced frustration. For example, one participant stated:

> I think there is increased attention and awareness of visual information and being able to decipher what's going on, from . . . it's not a cacophony of visual stuff there, it's a blank background there.

From comparing observations of routine activities before and after the de-cluttering of the classrooms, the participants reported an overall improvement in the students' behavior and functioning. Specific changes that were noted included: an increase in student focus, visual awareness, visual attention and general attention, and observations of better concentration and less distraction. It was also reported that the students seemed more relaxed and that there was less tension in the room. A common theme related to increased

focus when working in front of the black paper:

> I moved the table over to where the black paper was, and we sat there, and we did the same activity. . . . [S]he seemed to focus a lot better, just from her attention span on [the task].

Another teacher also reported a change of body posture when working with a student in this area, compared with attempting to complete the same task away from the black paper:

> Students worked and focused better in the area by the black paper. I think awareness [was] increased by the student due to the black paper, as it had an effect on her visual response[.] . . . [She was] holding her head up, looking forward.

One participant also gave an example of the increased engagement of the students when describing in detail the desired student behaviors they look for when assessing learner outcomes:

> You might get smiling, you might get a response, you might get them pressing the switch on time, you might get a real sense of them actually looking and focusing on something. Or they might be transferring their gaze between objects, depending on what the activity is. They might be looking towards the person whose next turn it is if you are having a group session.

When further questioned about whether these behaviors increased when the classrooms were de-cluttered, the participant responded, "Yes! I felt I observed this [behavior] more in the de-cluttered environment."

There was also a noticeable change in students' visually guided movement when they were in motion. For instance, one student identified a doorway that she would typically walk straight past. After the intervention, she was able to visually locate and move toward the door.

In summary, all the participants identified benefits from specific de-cluttering strategies, such as covering open shelving, blocking large glass areas, and removing excess items. They also described a range of improvements in the behavior, learning, and overall functioning of their students in the de-cluttered environment. A number of participants also reported that these changes were noticeable within a couple of days; however, they did feel they would be able to observe more improvements over a longer period of time.

Effect on adults

An outcome that surprised many of the participants was the effect the de-cluttering had on their own behavior and functioning. A number of participants reported that the de-cluttered environment had a calming effect, and that it created a more peaceful classroom for them. They also described being able to see more easily without the clutter, having better focus, and being less distracted throughout the day. One participant commented that she had anticipated that the de-cluttering would be good for the students,

but she had not expected it would have an influence on her as well:

> When I first walked into the classrooms and I hadn't seen how it was with all the de-cluttering, I went in and it wasn't a thought, I didn't think about it, I just felt, "Oh, this is so calm and peaceful." That was my first initial response to the whole thing, and I thought, "I like this."

To sum up, the participants recognized the benefits of the de-cluttering for their own functioning within the classroom environment and felt that the benefits would be even more significant for the students.

Remaining challenges

Noise was a concern that was raised repeatedly by the participants. Everyone felt that noise significantly affected the students' learning outcomes and behaviors. It was also reported that the students were easily distracted by sounds coming from other rooms and that when it was quiet they noticed more positive change in the students' behavior:

> The students are affected a lot by noise when you are doing something with them, but they keep turning their ears to listen to what's going on around them . . . all the time. But when it was quiet there was less of this turning around and they focused on the activities better.

There was also some discussion concerning the effect of the constant movement of people causing distraction for the students, as stated by one participant who commented:

> Students are easily distracted by people coming in through the classroom, walking past and talking in the classroom.

A number of participants suggested creating specific areas for different learning activities, such as completely de-cluttered areas for focused work. They felt creating such an area would help reduce the negative effect of movement and noise distractions. However, they also acknowledged that to make such a layout effective, specific guidelines about noise and movement within these spaces would need to be implemented.

In summary, the participants felt that the visual de-cluttering made a positive difference in the students' overall functioning. However, they all felt that noise and movement were still major concerns that affected the students' learning and behavior.

Discussion

In this research, by putting the spotlight on classroom environments and reducing the amount of visual distraction, it was possible to evaluate changes in a group of students' responses to their usual activities. This evaluation included a consideration of whether teachers and paraeducators at a special school thought de-cluttered classrooms improved the learning experiences and behaviors of children with CVI. Although it can be difficult to ascertain the true extent of the effect of the de-cluttering on the children in this study, the general theme of increased focus and alertness (both visually

and generally), and the feeling of less tension in the room, suggest that there may be a link between the clutter in the classroom and the students' functioning and behavior. This finding further supports the work of Fisher et al. (2014) and Godwin and Fisher (2011), who found that cluttered learning environments affected the ability of children with typical visual skills to focus on what was being taught throughout the day.

Teaching staff members in this study felt that their students were more alert and better able to move through the classrooms' surroundings, and that the students could concentrate on learning tasks for longer periods of time. This finding supports the views of Buultjens et al. (2010), Dutton (2015a), and Macintyre-Beon et al. (2012) that a reduction of visual information improves visual functioning in children with CVI. This finding also highlights there being a possible link between clutter and student outcomes, again reinforcing Dutton's (2015c) contention that children with CVI—more specifically, those with simultanagnosia, optic ataxia, visual field impairments, or apraxia of gaze—do not see the world in the same way as those without these difficulties. It is also interesting to note that the teaching staff members noticed the changes in the students' behaviors within the first few days of the de-cluttered period, which could indicate that the clutter negatively affected the students' visual skills as soon as they entered the setting prior to the research. This finding supports the work of Little and Dutton (2014) and Jan et al. (2013), highlighting their findings that, when visual clutter is obscured from view for specific learning tasks, students with CVI demonstrate increased visual awareness and attention almost immediately. To extend this finding, further research that includes an analysis of specific student behaviors and engagements in learning activities is needed to explore the effects of class-wide decluttering on the overall functioning of students.

The finding that the de-cluttering had an immediate effect is also significant, since it suggests that the entire classroom environment may not need to be decluttered to support children with CVI. Instead, it may be possible to simply create specific learning areas within the classroom for different learning activities. The increased engagement of the students in both individual and group work when working in front of the black paper (the black hub) further reinforces this perspective. One suggestion is that students could transition between different environments throughout the day, moving from a less focused activity in a semi-de-cluttered environment to a clutter-free black hub where they can use their visual skills effectively when full concentration and focus are required. By creating various environments, the whole classroom would not need to be de-cluttered, and important equipment, such as items that are used for therapy-based sessions, would be allowed to stay in the classroom for ease of access. The idea of having these specific areas designated for different learning activities is consistent with the recommendations of Scheuermann and Webber (2002) for creating inclusive, effective learning environments for all students.

From these findings, one can further support the need for fundamental changes to classroom environments that include: reducing the amount of information that

is displayed on walls and windows, avoiding hanging items from the ceiling, ensuring that all open shelves can be covered, keeping classroom furniture to a minimum, and improving sound insulation. These suggestions are also consistent with the views of Simonsen et al. (2008) that considered overall functional requirements of a classroom and the idea of reducing visual displays to lessen student distraction and improve overall concentration. The fact that the de-cluttered environment also affected the ability of the teaching staff members to focus and function further supports Fisher et al. (2014) and Godwin and Fisher's (2011) research by again emphasizing the effect a cluttered environment can have.

The significant effect that noise and movement had on the students throughout the inquiry period is concerning. Although it was recognized that competing input, especially noise, can affect children's visual skills (Buultjens et al., 2010), reduction of auditory information and movement in the classrooms was not included in the de-cluttering process. For this reason, the students were still affected by noise and movement within the two classrooms, and these distractions may have had an impact on the effectiveness of the classroom changes. These findings, on the effect noise and movement have on children with CVI, are also consistent with the literature relating to the interactions between visual and auditory processing and the difficulties these children have in this area (Dutton, 2015a; Little & Dutton, 2014). It also highlights the importance of the recommendation of Buultjens et al. (2010) that auditory and movement distractions should be minimized and that classrooms need to be designed to be able to accommodate this guideline.

Conclusion

This inquiry has revealed that the teaching staff members felt that de-cluttering the classroom environment for their students with multiple disabilities that include CVI was effective. This finding suggests that by reducing the amount of visual information the students had to process, they were able to use their intact visual abilities and lessen the amount of distraction they were experiencing. This hypothesis needs to be further examined, since the small size of this pilot study and the reliance on the perspectives of the classroom teachers and paraeducators potentially limits the overall conclusions that can be drawn. This research, does, however, create a useful foundation from which to initiate further investigation into the relationship between classroom clutter and the learning experiences and behavior of not only students with multiple disabilities that include CVI in special schools, but also for students with CVI in mainstream classrooms around New Zealand and the world. Further research could explore the relationship between de-cluttering environments and student behavior, using experimental methods to further corroborate the potential link. Future research will also need to address the issues of noise and movement and how to effectively control movement and distraction, as well as auditory information travelling between different learning spaces, when developing suitable learning environments for students with CVI.

Overall, the positive outcomes for the students in this research, including

increased levels of concentration and focus, less tension, and an increased awareness of their surroundings, help to provide specific recommendations for practitioners working with children with multiple disabilities that include CVI. These include creating black hubs by removing all information from the walls in a specific area of the classroom and making these walls black; adding covers to open shelving to reduce the clutter distraction; removing all unnecessary furniture, objects, and materials from windows; and removing hangings from the ceiling. Careful placement of the students with CVI during learning activities also needs to be considered. Once implemented in a classroom environment, these changes could potentially make a considerable positive difference for students with multiple disabilities that include CVI.

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