

A Comparison of Classroom Interventions
For ADHD Children

By

Ann Vacheresse

Submitted in partial fulfilment of the requirements for
the degree of Master of Arts in School Psychology

at

Mount Saint Vincent University
Halifax, Nova Scotia
August, 1995

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0-612-23772-9

Abstract

Attention-Deficit/Hyperactivity Disorder is a common concern in today's classrooms. The purpose of this research was to examine intervention techniques that would be practical and easy to implement in the classroom. Attentional deficits can exist alone or in combination with hyperactivity and both forms of the disorder were studied. Color stimulation improved math achievement in Predominantly Inattentive children during the intervention but achievement scores dropped with the removal of the intervention. Color stimulation had no effect on the math test scores of students with Combined (Inattentive and Hyperactive-Impulsive) deficits. Self-monitoring was shown to improve math achievement for both Predominantly Inattentive children and Combined (Inattentive and Hyperactive-Impulsive) children. These achievement scores were maintained for Predominantly Inattentive children even after the intervention was removed. The effectiveness of these interventions is discussed.

Acknowledgements

I would like to express my thanks and gratitude to Jen McLaren, my thesis advisor, whose support and encouragement will never be forgotten. Thank-you to Rilda van Feggelen and Bill O'Leary, my committee members, who kept telling me I could do it, and really believed I could. Thank-you to Dean Tripp, whose humor and statistical advice was invaluable. To my friends and classmates at MSVU, thank-you for the memories and wonderful times. I'll miss you all.

My appreciation is extended to the Pictou County District School Board for their warm welcome and enthusiasm. To the grade three and four teachers and to all the students who participated, thank-you for your time and energy. Your effort was more than I could have hoped for.

To my roommates; Patti, Paula and Michelle and to the gang in Hopewell. Thank-you for listening patiently when I was frustrated and with enthusiasm when I was excited. You are my friends forever.

Finally, to my family; Mom, Dad and Carol. You have cheered me on for 25 years. You have seen all my ups and downs and still stand firmly behind me. Thank-you. I love each of you with all my heart.

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Classroom Interventions For ADHD Children

Approximately three percent of all school aged girls and eight percent of all school aged boys have been found to suffer from Attention-Deficit/Hyperactivity Disorder (ADHD; Schwean, Parkinson, Francis & Lee, 1993). In the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) ADHD is defined by three main subcharacteristics. These are inattention, impulsivity, and hyperactivity. Inattention is ADHD children's difficulty in sustaining attention during performance of a task (Hallahan, Kaufman, & Lloyd, 1985). Teachers often maintain that ADHD children have difficulty organizing schoolwork and completing assignments on time, are forgetful and easily distracted (American Psychiatric Association, 1994). This makes tasks more challenging and therefore it is less likely that they will be finished. When ADHD children receive individual attention, sustained attention can be facilitated (Abramowitz & O'Leary, 1991). The second characteristic of ADHD is impulsivity which means these children do not consider the consequences of their behavior (Hallahan,

Kauffman, & Lloyd, 1985). Some examples of such behavior include, blurting out in class and interrupting other children or adults (American Psychiatric Association, 1994). This characteristic has implications for the child's social acceptance. ADHD children often have difficulties initiating and maintaining friendships because they seem to lack inhibition and have poor control over their actions (Buchoff, 1990). The final characteristic associated with ADHD is hyperactivity. Children exhibiting this symptom are fidgety, always moving, overtalkative, and full of energy (Hallahan, Kaufman, & Lloyd, 1985). They find it hard to remain seated and this often makes individual seatwork very difficult and sometimes impossible.

The DSM-IV has divided Attention-Deficit/Hyperactivity Disorder into three subtypes. These are; Combined (Inattentive and Hyperactive-Impulsive) Type, Predominantly Inattentive Type, and Predominantly Hyperactive-Impulsive Type (American Psychiatric Association, 1994). ADHD children do not necessarily demonstrate all aspects of each of the characteristics. They may exhibit symptoms in varying degrees. The predominantly inattentive type may be hardest to identify

because they do not exhibit hyperactivity. Such children's inattention may be overlooked.

Children who have ADHD often have difficulty in school (Schwean et al., 1993). They may not perform as well as their peers despite the fact that many do not have a deficit in intelligence. Many teaching strategies used in the classroom do not seem to be as effective for ADHD children as for others (Schwean et al., 1993). This problem arises mainly from the fact that ADHD children find it hard to attend to a task for any length of time. ADHD children may also be disturbing to other students in the class because their behavior tends to be disruptive (e.g., moving around the room, interrupting and talking).

Various methods have been used to increase productivity in ADHD children. The most common of these is drug therapy (Henker & Whalen, 1989). Methylphenidate (Ritalin), Dexedrine or Cylert are the drugs most often used to treat ADHD (Buchhoff, 1990). These drugs are stimulants to adults, however they help to reduce the activity of children who exhibit hyperactive behavior. According to the Optimal Stimulation Theory, as described by Zentall and Zentall (1983), the reduction of activity occurs because ADHD children are neurologically

understimulated and tend to compensate through excess external activity. When the neurological systems are stimulated with the medication, the children no longer need to seek stimulation from external stimuli. Caution is required, however, when using drugs such as methylphenidate, dexedrine, and cyllert, as they have been found to cause various side effects such as sleeplessness, loss of appetite, moodiness or stomachaches (Buchoff, 1990). Therefore, the effects of the drug prescribed should be monitored closely and it is desirable to try other therapies which do not involve unwanted side effects.

Self-monitoring is a form of self-management which can be used in the classroom to teach children to control their off-task behavior (Cole & Bambara, 1992). It requires the student to self-examine their actions. It is possible that young children may find it difficult to use this form of self-evaluation because of the ambiguity of the terms on-task and off-task. However, research has shown that even when the student fails to accurately record their on and off-task behavior an increase in time on-task is shown (Skinner & Smith, 1992).

Self-monitoring is a technique which may help to

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increase the attention of ADHD children (Prater, Hogan, & Miller, 1992). Studies of this approach have found it to be successful in increasing these children's on-task behavior (Christie, Hiss, & Lozanoff, 1984; Osborne, Kosiewicz, Crumley & Lee, 1987; Prater, Hogan, & Muller, 1992; Thomas & Grimes, 1995). An advantage of this method is the children control their own behavior so the teacher has more time to teach (Cole, 1992). It is hoped the children will generalize this technique to other areas of their lives such as homework (Cole, 1992). In turn, it is believed an increase in appropriate behavior will help to increase the children's self-esteem because they do not receive as much negative feedback. Finally, self-monitoring benefits the children academically because if they increase their on-task behavior, they will be able to complete more school work.

A number of studies (Christie, Hiss & Lozanoff, 1984; Osborne, Kosiewicz, Crumley & Lee, 1987; Prater, Hogan, & Miller, 1992) have been conducted to investigate the technique of self-monitoring . In these studies participants were given a self-monitoring sheet and an audiocassette which elicited tones at random intervals. When the children heard a tone they were told to ask

themselves "Was I working?" and mark either a '+' (on-task) or a '-' (off-task) on the record sheet. In all three studies, during the baseline period both on-task behavior and productivity levels had been very low. However, disruptive behavior had decreased during the intervention phase and with the implementation of self-monitoring techniques, both on-task behavior and productivity increased rapidly and dramatically. Only Prater, Hogan and Miller (1992) used a follow-up check to monitor the results. The follow-up check, collected six to sixteen weeks following the removal of the intervention, revealed that the participant was still maintaining improvements with respect to on-task behavior and productivity. Although the audio prompts were removed, a visual prompt depicting various on-task behaviors had remained. It is suggested that this may have acted as a reinforcement for the self-monitoring behavior.

Overall, research in the area of self-monitoring has suggested improvement in both the behavior and academic productivity of hyperactive attentionally disordered children. The improvements across the studies discussed here were seen almost immediately after intervention was

implemented. The only study to include a follow-up check showed that self-monitoring had a lasting influence on the child's behavior (Prater, Hogan & Miller, 1992).

Color stimulation is another method which has been used to increase the on-task behavior of ADHD children (Zentall, Falkenberg, & Smith, 1985; Zentall & Kruczek, 1988). Researchers suggest that when color is added to relevant features of the children's work, this will help to produce the sensory stimulation that the ADHD children seek. Their hypothesis stems from the Optimal Stimulation Theory (Zentall, Falkenberg & Smith, 1985; Zentall & Kruczek, 1988; Zentall & Zentall, 1983). According to this theory ADHD children need an increased level of environmental sensory stimulation due to a neurological sensory stimulation deficit (Zentall, Falkenberg & Smith, 1985; Zentall & Kruczek, 1988; Zentall & Zentall, 1983). Most of the evidence suggests when ADHD children are presented with novel stimuli, even when the task at hand could be considered boring, these children are able to maintain their attention to the task (Zentall & Zentall, 1983). If, however, the stimulation is not novel and children are presented with repeated exposure to the same stimuli, attention will gradually

decrease (Zentall & Zentall, 1983). In addition, evidence suggests enhanced stimuli can be used in the children's work (Zentall & Zentall, 1983). One such enhancement would be color. Investigators in this field have hypothesized that colored ink in the children's classwork may produce the necessary increase in environmental stimulation (Zentall & Zentall, 1983).

Zentall, Falkenberg and Smith (1985), and Zentall and Kruczek (1988) presented participants with a copying task. Their subjects were given a task in which colored ink was added to the letters. After two weeks, subjects were given the same task but the letters were written with black ink. The number of pages completed was used as a measure of productivity. Results of both studies showed an initial decrease in the number of errors for attentionally disordered adolescents. However, Zentall, Falkenberg & Smith (1985) found that the effect of the novel stimulus faded over time. They suggested that perhaps the stimuli were habituated by the students and therefore less effective. Zentall & Kruczek, (1988), on the other hand, found no decrease in the performance of the participants over time, productivity remained high. In the experiment by Zentall, Falkenberg & Smith (1985),

color was only added to particular sections of the work important for legibility. They suggested that these changes helped to keep the subjects stimulated and thus decreased the chances of boredom.

In the present study attentionally disordered children both with and without hyperactivity are studied. Both self-monitoring and color stimulation which have been found to decrease off-task behavior and increase productivity in hyperactive attentionally disordered children (Christie, Hiss, & Lozanoff, 1984; Osborne, Kosiewicz, Crumley & Lee, 1987; Prater, Hogan, & Miller, 1992; Zentall, Falkenberg & Smith, 1985; Zentall & Kruczek, 1988) are implemented. The purpose of the present research is to discover if similar results are obtained for both interventions for nonhyperactive attentionally disordered children as well as for hyperactive attentionally disordered children. Barkley, Dupaul, and McMurray (1990), reported that recent studies show no significant differences between ADHD children with and without hyperactivity on measures of academic achievement and neuropsychological functions. It has been suggested, however that there may be some other differences in the characteristics of these disorders.

For example, it has been found that children exhibiting ADHD with hyperactivity are also more prone to oppositional behavior (Barkley, DuPaul & McMurray, 1990). They are more likely to be aggressive and disliked by their peers than ADHD children without hyperactivity. There has also been a question of their attentional problems. Researchers have proposed the idea that these two groups of children may be exhibiting two very different types of inattention. Barkley, DuPaul, & McMurray (1990) suggest that ADHD children with hyperactivity show a pattern of inattention that implies disinhibition and behavioral chaos. These children seem to have their minds on many different things. They are distracted by happenings that are normally overlooked by most children. On the other hand, ADHD children without hyperactivity seem to be inwardly immersed and absorbed. Their inattentive behavior seems to be due to internal rather than external activity. It is proposed that although there may be some behavioral differences in ADHD children with and without hyperactivity, similar attentional prompting strategies within the classroom may be effective for both groups. This speculation is derived from the notion that ADHD children need to learn

some effective strategies to control their behavior. It may not matter if the sources of their inattention difficulties are not exactly the same. What is important is the fact that neither group can control these difficulties. It is suggested that both self-monitoring and color stimulation will be effective strategies for both groups of children. Self-monitoring will teach the children to become aware of their inattentiveness. Color stimulation, on the other hand, will provide both groups with sensory stimulation.

ADHD children do not usually perform as well as their peers because they can not sustain attention and may be hyperactive and impulsive (Schwean et al., 1993). These behavioral deficits will increase off-task behavior and often result in poor academic achievement. Barkley, Dupaul, & McMurray (1990) suggested that there does not seem to be any difference between attentionally disordered children with and without hyperactivity on measures of neuropsychological functions. If self-monitoring and color stimulation methods are found to be effective in increasing on-task behavior, then both types of attentionally disordered children will complete more work. If more work is completed, it is hypothesized that

the student's academic achievement will improve. The longer they are able to focus on the work, the better they will understand the concepts being taught.

In the present study, participants are selected using the ADD-H Comprehensive Teacher's Rating Scale (ACTeRS; Ullmann, Sleator & Sprague, 1991). This instrument is a screening device which is sensitive to children who exhibit hyperactivity, poor levels of attention and oppositional behavior (Ullmann, Sleator, & Sprague, 1991). Researchers have argued on various grounds that teachers are the best respondents to rate the child's behavior (Parsons, 1994). The teacher sees the child almost daily and in a number of situations, such as individual and group work in the classroom, and on the playground. The teacher is also in an excellent position to rate the child's behavior in the context of his or her peers (Parsons, 1994).

The ACTeRS was chosen for the purposes of this study because it differentiates between children with mainly attention difficulties and children with both attention and hyperactivity difficulties. The instrument has been shown to identify more students with pure attentional deficits than the Conner's Teachers Rating Scale and the

IOWA Teachers Rating Scale because it identifies each of the characteristics separately by subscales (Parsons, 1994). Parsons (1994) found that a larger number of students were identified by the ACTeRS as having only an attentional problem rather than attentional problems in combination with hyperactivity and impulsivity problems. It has been indicated that hyperactively attentionally disordered children usually tend to be more aggressive and show oppositional behaviors (Barkley, DuPaul, & McMurray, 1990), hence those children who are rated significantly high (ie. below the 20th percentile) on both attentional difficulties and oppositional behaviors will be considered Combined Inattention and Hyperactivity Type for the purposes of this study.

Method

Subjects

The ADD-H Comprehensive Teacher Rating Scales (ACTeRS) (Ullmann, Sleator, & Sprague, 1991) was used to select twenty participants from grades three and four from a rural community school in Nova Scotia. The subjects ranged in age from eight years, seven months to eleven years, seven months. Ten of the students were defined as Combined (Inattentive and Hyperactive-

Impulsive) Type because they scored below the 20th percentile on the hyperactivity subscale, the oppositional defiant subscale and the attention subscale. The other ten students were defined as Predominantly Inattentive Type because they scored below the 20th percentile on the attention subscale and above the 30th percentile on the hyperactivity subscale and the oppositional defiant subscale.

To ensure the two groups did not differ on attention scores on the ACTeRS a one-way ANOVA was performed (see Table 1). Results indicated no significant difference on attention scores between participants within the Combined (Inattentive and Hyperactive-Impulsive) group and those within the Predominantly Inattentive group. Further analysis indicated there was no significant difference on attention scores across type of intervention groups. Table 1 shows that all groups were equal with respect to the degree of the attention deficit.

A one-way ANOVA was also performed for hyperactivity scores of the subjects on the ACTeRS (see Table 1). Results indicated participants within the Combined (Inattentive and Hyperactive-Impulsive) group scored significantly higher than participants within the

Predominantly Inattentive group. Across intervention, no significant difference in hyperactivity scores were found (see Table 1). The two pre-test scores were averaged to create one pre-test score. A one-way ANOVA was performed for pre-test scores. This was done to ensure that subjects did not differ on achievement. Table 1 shows that no significant differences were found for the groups with respect to pre-test scores.

Procedure

Math test scores were used as a measure of academic achievement. For each participant, their last two math scores prior to intervention (which were averaged for one score), one math score during the intervention phase and one math score after the interventions were removed were obtained. To ensure that any changes in marks were due to the interventions and not some other factor within the class, such as the difficulty of the material, class averages for these math tests were also be obtained and differences between the subject's scores and the class average was calculated. Each of the participants was assigned to one of the two interventions.

One intervention was self-monitoring. Four students from the Combined (Inattentive and Hyperactive-Impulsive)

Table 1

Analysis of Variance Comparing Group ACTeRS' Percentile Scores and Pretest Scores

	Hyperactivity Score	Attention Score	Pretest Score
Group	F = 62.93 ** p = 0.0001	F = 1.89 p = 0.1886	F = 0.92 p = 0.3538
Intervention	F = 0.09 p = 0.7687	F = 2.65 p = 0.1228	F = 0.03 p = 0.8714
Group by Intervention	F = 1.84 p = 0.1937	F = 0.70 p = 0.4153	F = 0.25 p = 0.6260

** = significance at the .05 level

group and five students from the Predominantly Inattentive group received this intervention. The nine students who were instructed to use this technique were given walkman and a recording sheet. The walkman elicited tones at random intervals ranging from one to two minutes. When the children heard the tone they stopped working and asked themselves if they were doing their work or not. They recorded a 'Y' (yes- was working) or a 'N' (no- was not working) on their recording sheet.

The other intervention was color stimulation. Six students from the Combined (Inattentive and Hyperactive-Impulsive) group and five students from the Predominantly Inattentive group received this intervention. This method was implemented by randomly adding colored ink to the student's worksheets. Instead of the child's independent work sheet being written in black, each worksheet had math problems, including both numbers and mathematical signs, written in red, green and blue ink.

All students received instruction prior to the implementation of the interventions. The subjects were removed from the class in two groups. They were introduced to the researcher and given explicit detail

protaining to their role as participants. Role plays and discussions were used to explain the concept of 'on-task' and 'off task' to the students. The interventions were then implemented in math class for approximately half an hour a day for two weeks. The researcher monitored the process. After the two week period was over both interventions were removed.

Results

The mean difference scores for the groups by intervention are shown in Figure 1 and Figure 2. A two way ANOVA, Group (2) by Intervention (2) with repeated measures, Test Scores (3) was calculated. No significant main effects of Group ($F(1,11) = 0.01, p > 0.05$) and Intervention ($F(1,11) = 0.59, p > 0.05$) were found. There was a significant main effect of Test scores (Pre-intervention = -14.13, During intervention = -1.80, Post-intervention = -9.62; $F(2,10) = 10.6565, p < 0.05$). The three overall means were compared using a planned t-test (see Table 2). Pre-intervention scores differed from those during intervention which, in turn, differed from post-intervention scores.

No significant interactions between Group by Test ($F(2,10) = 3.1283, p > 0.05$) or Intervention by Test (F

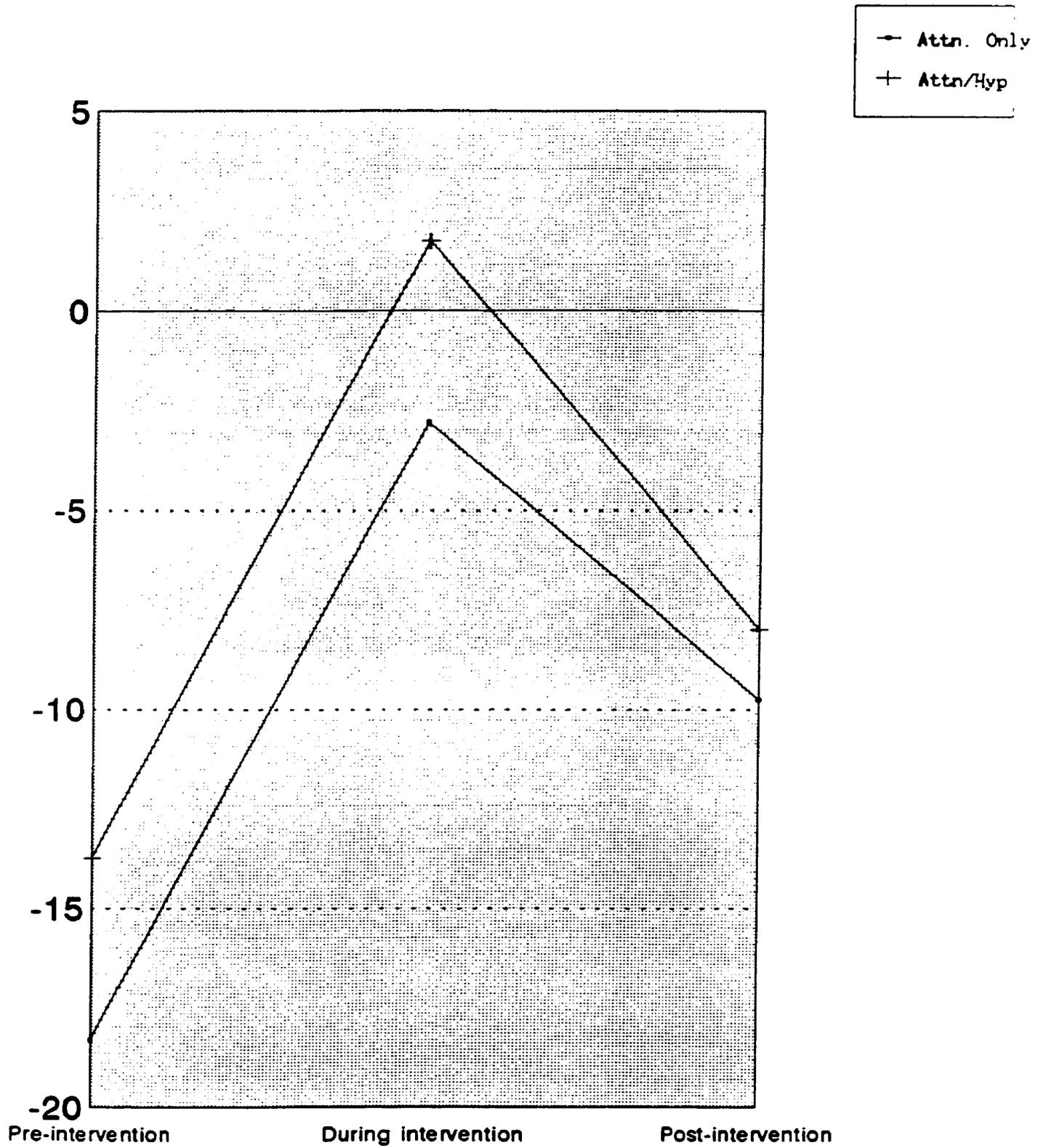


Figure 1
Self-Monitoring: Mean Differences in Achievement Scores for pre, during and post intervention

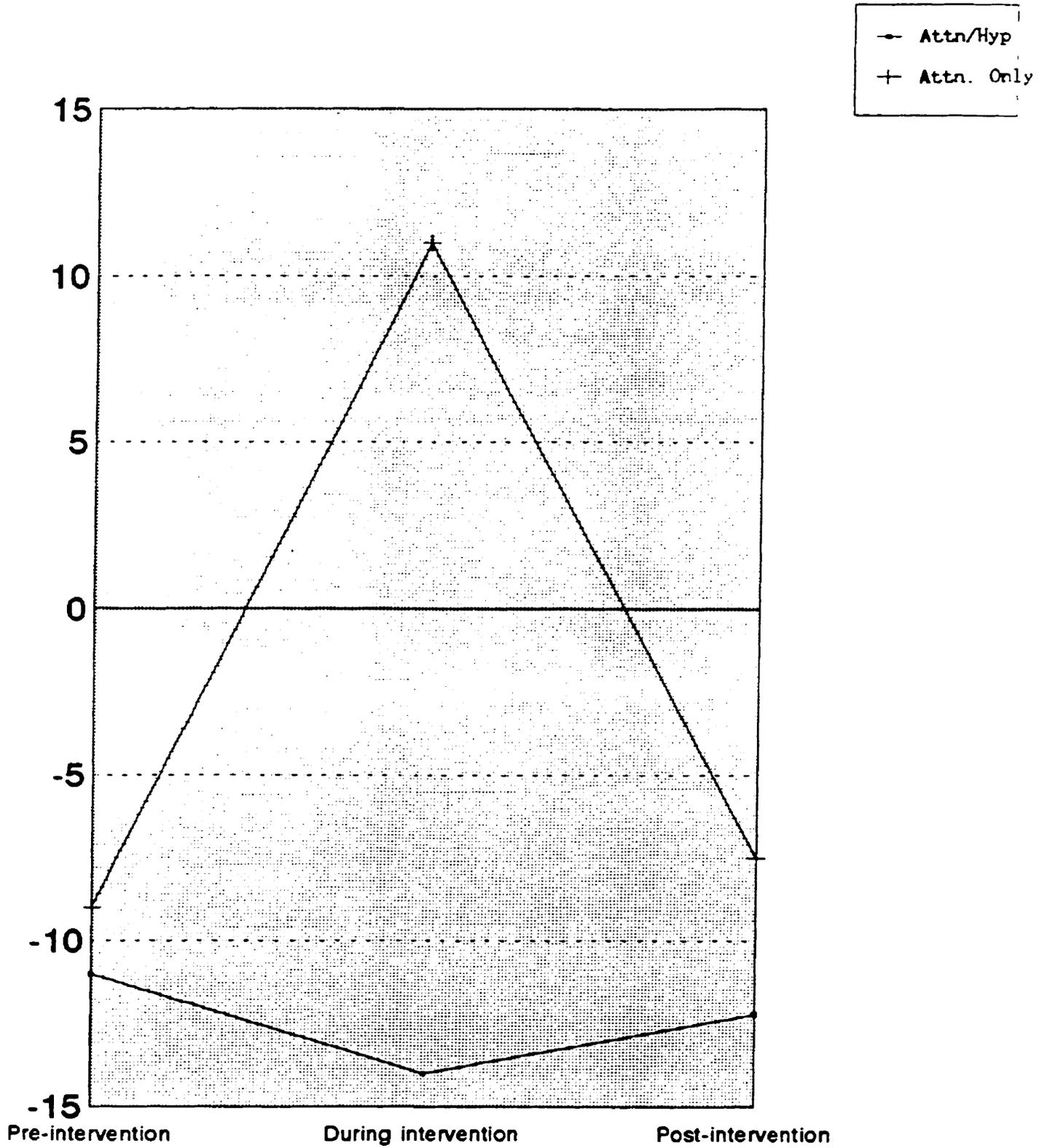


Figure 2
Color Stimulation: Mean Differences in Achievement Scores for pre, during, and post intervention

Table 2

T-tests for Overall Mean Differences for Test Scores

	Mean	T	Prob> T
Pre-intervention vs During intervention	-10.710	-3.1722 **	0.0053
During intervention vs Post intervention	10.250	3.3573 **	0.0043

** significant at the .01 level

(2,10) = 0.6182 , $p > 0.05$) were found. However, there was a significant interaction for Test by Intervention by Group, $F(2,10) = 4.5998$, $p < 0.05$. Further investigations using planned t-tests were carried out to discover the origin of this effect (see Table 3).

For each Group t-tests were used to compare pre-intervention scores with during intervention scores relative to the class average and during intervention scores with post intervention scores relative to the class average(see Table 3).

For the Predominantly Inattentive Group who received color stimulation a t-test showed that the mean of the pretest scores was significantly lower than the mean of scores during intervention, $t(5) = -6.231$ $p < .05$. The mean of the post test scores was found to be significantly lower than the mean of scores during intervention $t(4) = 5.430$ $p < .05$ (see Table 3).

For the Combined (Inattentive and Hyperactive-Impulsive) Group who received color stimulation t-tests comparing pre-intervention scores to during intervention scores showed no significant effect $t(5) = 0.957$ $p > 0.05$. No significant differences were found between during intervention scores and post intervention scores either

Table 3

Analysis of Variance Summaries for Contrast Variables

	Pre-intervention vs During intervention	During intervention vs Post intervention
Attention Only with Color Stimulation	t= -6.231** p= 0.0034	t= 5.430** p= 0.0123
Attention Only with Self-Monitoring	t= -4.678** p= 0.0095	t= 1.367 p= 0.2649
Attention/Hyperactivity with Color Stimulation	t= 0.957 p= 0.3925	t= 0.810 p= 0.4633
Attention/Hyperactivity with Self-Monitoring	t= -5.356** p= 0.0127	t= 3.601 p= 0.0692

** significance at the .05 level

$t(5) = 0.810$ $p > 0.05$ (see Table 3).

For the Predominantly Inattentive Group who participated in self-monitoring t-tests showed that the mean of pre-intervention scores was significantly lower than the mean of test scores during intervention, $t(5) = -4.678$ $p < .05$. No significant differences were found between test scores during intervention and post-intervention test scores $t(4) = 1.367$ $p > .05$ (see Table 3).

For the Combined (Inattentive and Hyperactive-Impulsive) Group who participated in self-monitoring a t-test showed that the mean of pre-intervention test scores was significantly lower than the mean of test scores during intervention, $t(4) = -5.356$, $p < .05$. No significant differences were found between test scores during intervention and post-intervention test scores, $t(3) = 3.601$, $p > .05$ (see Table 3).

Discussion

In today's schools, teachers are often faced with dealing with a large number of students in their classroom. These students come with a wide range of abilities and personal concerns. Teachers spend a great deal of time dealing with these problems. Professionals

need to find practical, effective strategies for behavioral concerns that are easy to implement in the classroom and do not require a lot of a teacher's time.

A major concern in classrooms is children's attention. As previously stated, approximately three percent of school aged girls and eight percent of school aged boys suffer from Attention-Deficit/Hyperactivity Disorder. Although the DSM-IV breaks this disorder down into three categories, only two were examined in this study. Because attention was the main focus of the research only Combined (Inattentive and Hyperactive-Impulsive) Type and Predominantly Inattentive Type were considered.

Students were selected for the study using the ACTeRS scale. Using criteria rating scores, subjects were selected for one of the two groups. Analysis of the ACTeRS percentile scores suggested there was no difference in attention scores between the two groups. This meant that teachers rated both groups, Combined (Inattentive and Hyperactive-Impulsive) and Predominantly Inattentive as having the same degree of attentional deficit. However, one must be aware that this result does not suggest that the type of inattention is the

same. As suggested by Barkley, Dupaul & McMurray (1990) it is possible that students with Combined (Inattentive and Hyperactive-Impulsive) may be distracted by external stimuli or disinhibition. Predominantly Inattentive students, on the other hand, may be distracted by internal activity rather than external, therefore seeming inwardly absorbed. Although the source of the inattention is unclear, the fact that the degree of inattention is the same is important. It suggests that all groups began the study with approximately the same amount of attentional deficit.

Analysis of the ACTeRS rating scores also showed that the Combined (Inattentive and Hyperactive-Impulsive) group was rated significantly higher on hyperactivity than the Predominantly Inattentive group. This result suggests that the Combined (Inattentive and Hyperactive-Impulsive) group exhibited more hyperactivity characteristics than those in the Predominantly Inattentive group.

Self-Monitoring and Color Stimulation are both interventions which are easy to implement in the classroom. They are practical and do not require a lot of time by the teacher once they have been put in place.

Self-Monitoring requires more active involvement from the student than Color Stimulation. While the intervention is in place the student is recording whether or not they were paying attention. Over time, it is hypothesized that with this intervention the child will become more aware of times when he/she is not working. In turn, he/she will begin to learn to refocus his/her attention back to the schoolwork. Color Stimulation is more passive and requires less active involvement by the student. The child simply receives a colored worksheet. It is hypothesized that the color will stimulate the child's attention and therefore he/she will remain focused on the work.

Earlier research suggested that students with Combined (Inattentive and Hyperactive-Impulsive) and Predominantly Inattentive deficits may exhibit slightly different forms of inattention (Barkley, Dupaul, & McMurray, 1990). As well, the interventions chosen for this study stem from different theoretical backgrounds. One cues students and requires active effort on their part to learn to focus his/her attention. The other is more passive and does not require conscious effort on the part of the student. External stimuli (i.e., color) is

believed to maintain the child's attention. The question addressed here is whether the interventions are equally effective for both types of attentionally disordered children.

When Color Stimulation was provided to the Predominantly Inattentive children significant increases in achievement scores relative to the class average were seen. However, the achievement scores significantly decreased when the intervention was removed. Therefore, the intervention did not have a lasting effect on these students. It suggests that attention only improved when the intervention was in place.

According to earlier research, it has been suggested that students with Predominantly Inattentive characteristics may have difficulty with attention because they are being stimulated internally. They may seem inwardly immersed. Color stimulation is an external stimuli. Something is changed in the student's environment. According to the Optimal Stimulation Theory, an external stimulus can be a novel stimulus for the child. A novel stimulus will help to decrease the internal activity by focusing the child's attention externally.

While the external stimuli was in place the students were able to focus better on their work. However, when the external stimuli was removed the inattentiveness returned. The students did not seem to learn to control their inattentiveness with this technique. This may have occurred because Color Stimulation did not require a conscious effort on the part of the student to focus on the work. This suggests that the child may not have learned to take control of his/her inattentiveness because it was being controlled externally. It is also possible that since the intervention was only in place for two weeks this was not enough time for it to be effective.

No improvements were found for students with Combined (Inattentive and Hyperactive-Impulsive) when Color Stimulation was provided. Studies have suggested that this group of children are highly stimulated externally due to their excess activity. As suggested earlier, Color Stimulation provides the student with external stimulation due to the fact that the color acts as a novel stimulus. It is possible that this intervention provided unnecessary external stimulation for this group. It did not provide the calming element

needed to help these students attend to their work.

Interestingly, when Predominantly Inattentive students were given the Self-Monitoring intervention their achievement scores rose significantly, relative to the class average, and remained high even after the intervention was removed. Following the Optimal Stimulation theory, these students who may be highly stimulated internally, were better able to focus their attention because of external stimuli, (the random tones) which required an effortful response. This intervention provides the advantage of teaching the student to become conscious of their attention. This may help to explain the longer lasting effect.

As with the Predominantly Inattentive group, when Self-Monitoring was provided for the Combined (Inattentive and Hyperactive-Impulsive) group significant improvements in math test scores relative to the class average were seen during the intervention phase and there was a trend suggesting that this continued following the intervention's removal. The tones would be considered to be external stimulation, however, they may have helped to block out excess external activity. The children had earphones covering their ears. Although,

they could still hear, excess noise would have been reduced somewhat. As with the students defined as Predominantly Inattentive, this group may also have learned to become more conscious of, and active in, controlling their attention.

From the results, it seems that color stimulation is not as effective as self-monitoring in controlling inattentive behavior. Previous research, has shown that subjects tend to habituate to the novel stimulus (ie., color). It is possible that after using colored worksheets for two weeks the novelty of the stimulus became less effective. This might explain why the intervention did not have lasting effects once it was removed.

Self-monitoring seemed to be a stronger intervention technique. Significant effects suggested that the technique improved math achievement scores. There was a trend suggesting that this technique had some lasting effects even after the intervention was removed. It is possible that, had the intervention been in place for a longer time or been provided intermittently, achievement scores may have remained higher. This hypothesis might be tested in future research.

APPENDIX B



Mount Saint Vincent University

Halifax, Nova Scotia, Canada B3M 2J6

Phone 902 457-6178 FAX 902 445-3960

Classroom Interventions

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Department of Education

Dear Parent(s)/Guardian(s):

We are requesting consent for your child to participate in a study to be conducted at your child's school. This study will be conducted by Ann Vacheresse under the supervision of Dr. Jen McLaren from Mount Saint Vincent University. The purpose of this study is to introduce teaching strategies to children in grades three and four that we hope will help them with their school work. There will be two strategies. Some children will use a walkman which will produce tones at various intervals. The tones remind the children to keep working. Other children will use colored worksheets to attract their attention. The study will only require the child to be removed from the classroom for a few minutes in order to explain the strategies. Within the classroom, I only be with the child a couple minutes each day for approximately two weeks. Should any child wish to withdraw from the study, they may do so at any time. All information collected will remain confidential and will be examined in groups. No individual feedback will be given and all results reported will concern only groups. If you are interested in the results of the study, I would be happy to provide a general overview of the results.

If you have any questions regarding this study, please feel free to contact myself (752-8797) or Dr. Jen McLaren (457-6374). If you would like to speak with someone not directly involved in this study please call Rilda VanFeggelen (457-6329). I would like to thank-you for taking the time to consider this very critical educational issue.

Yours Sincerely,

Ann Vacheresse

Ann Vacheresse
BSc., Graduate Education Student

Jen McLaren
Dr. Jen McLaren
PhD., Chair, Psychology Dept.

LETTER OF CONSENT

I, _____, give permission for _____ to participate in the research study being conducted by Ann Vacheresse, from Mount Saint Vincent University. I understand that all information collected remains confidential.

Signature: _____ Date: _____

I am interested in receiving group feedback about the results of the study. I understand that no information concerning any individual child will be provided.

Signature: _____ Date: _____



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Department of Education

Dear Principal / Teacher:

My name is Ann Vacheresse. I am a graduate student of school psychology at Mount Saint Vincent University, and am presently conducting research in the field of classroom interventions and their effectiveness on attention and performance. I am working under the supervision of Dr. Jen McLaren.

A number of children in our schools today are finding it harder and harder to stay focused on the task at hand. Some of these children may seem inwardly immersed or absorbed. Teachers may describe them as daydreamers. Other children may be very active. They may find it hard to sit still and may be frequently found throughout the classroom moving and talking to other students. It is difficult to come up with effective strategies to help these children. Teachers often feel frustrated and find that they spend a great deal of class time trying to focus these children.

I have chosen to look at two possible intervention to help these children focus on their work and therefore produce mor academically. Both interventions are easy to implement in the classroom. They are both practical and have been shown to be effective.

I realize that it is often intrusive to have external personnel in a classroom. Please be assured that I will try to remain as unobtrusive as possible. My presence will only be required for a few minutes each day to ensure that the interventions are in place. I have enclosed with this letter a short description of my proposal. If you have any questions, please feel free to contact me at 752-8797. Thank you for taking the time to review my proposal.

Sincerely,

Ann Vacheresse

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