

# Effects of a Treatment Package on the On Task Behavior of a Kindergartener with Autism Across Settings

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## Abstract

The inclusion of students with autism and other special needs into the general education setting has been an increasingly difficult task for schools both in and out of the United States. Although there is debate as to the appropriateness of this practice, the trend to include is increasing. Many students are observed to have behaviors that are "off task", meaning that they interfere with their own learning and in some cases, the learning of others. Off task behaviors may include stereotypy and must be reduced or replaced so that students are successful in school. Our treatment package included textual prompts, learn units, and contingent corrections to increase on task behaviors during one to one and group instruction in a general education setting. Overall, we observed educationally significant gains in on task behavior subsequent to the introduction of the treatment package in a kindergartener with autism across three school settings. A multiple baseline across settings experimental design was used in the present study. The present study represents the first educational application of a single case experimental design in the region. Maintenance of the behavior change was assessed through a probe session two weeks after the treatment package was removed. Limitations of the study are discussed.

## Keywords

textual prompts, learn units, on task behavior, stereotypy, autism

The inclusion of students with autism and other behavior disorders into the general education setting has been a controversial practice for many years (Repp, 1996; Stainback & Stainback, 1995). The arguments surrounding inclusion of students with special needs have been polarized, with some strongly opposing inclusion of any type and some in favor of inclusion for all students. Some who oppose inclusion may be the parents of typically developing children who fail to see the benefits for their children. Conversely, there are those advocates, special educators, and administrators who favor inclusive education for all students. They have been criticized for ignoring the individualized needs of the student with special needs. The field of special education has fought to advocate for students over the years and some of its constituents want to preserve the self-contained classroom model for those students who might be more appropriately educated separate from their peers and, in fact, the law provides for this (Wright & Wright, 1999). Outside of the United States, such as in Hong Kong, these issues are exacerbated by cultural challenges and programmatic factors, such as limited resources available to teachers and families (Wong & Hui, 2008).

Some of the critics of inclusion in any form would argue that the inappropriate behaviors that are observed for many children with special needs (i.e. disruptive, aggressive, stereotypic) affect the general education students in adverse ways such as by mod-

eling inappropriate behavior or monopolizing the teacher's attention. However, this is rarely the case. On the contrary, there is significant evidence of the benefits to students with and without special needs that result from inclusive classrooms (Feldman, 2002; Rea, McLaughlin, & Walther-Thomas, 2001).

Consequently, schools and Individualized Education Program (IEP) teams are increasingly confronted with the problem of treating the inappropriate behaviors of students so that they can successfully participate in the general education curriculum. The increase of on task behavior (i.e. attending and correct academic responding) as well as the reduction or replacement of off task behaviors (i.e. stereotypic behaviors) is necessary for students to succeed due to fact that the inappropriate behaviors are often incompatible with on task and appropriate academic and social responding.

Stereotypy has been defined as, "stereotyped and repetitive motor mannerisms (e.g. hand or finger flapping or twisting, complex whole-body movements) by the American Psychiatric Association (APA, DSM-IV-TR, 2000). Rapp & Vollmer (2005) provided a description of stereotypy from a neurobiological source (i.e. sensory or automatic reinforcement) as well as a review of the medical treatments that have shown some reduction in these behaviors.

Greer, Becker, Saxe, & Mirabella (1985) defined stereotypy as cycles of repetitive movements that have no apparent consequences for the individual who is emitting the responses beyond the movement itself. In the same study, five students with developmental disabilities were taught to choose toys instead of

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engaging in stereotypy behaviors in their free time. Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, (2002) successfully replicated the earlier Greer et al. (1985) study with four students with autism. After a conditioning (pairing) procedure using books and toys, the students were more likely to engage in appropriate looking at books or toy play and were observed to be less likely to have stereotypy behaviors. Both of these studies showed effective replacement skills, however, both were conducted during *free time* settings.

Other research has shown that there are effective tactics to increase “on task” academic behaviors involving self-management (Callahan & Rademacher, 1999; Stahmer & Schreibman, 1992), the reduction of inappropriate behavior (Tasky, Rudrud, Schulze, & Rapp, 2008; Machlicek, O’Reilly, Beretvas, Sigafos, & Lancioni, 2007), and improvements in verbal behavior and reducing palalalia behaviors in children with autism and behavior disorders (Greer & Ross, 2008; Karmali, Greer, Nuzzolo-Gomez, Ross, & Valdes, 2005; Mancina, Tankersley, Kamps, Kravits, & Parrett, 2000).

Conroy, Asmus, Sellers, & Ladwig (2005) successfully taught a six-year-old boy to discriminate times in the day at school where stereotypic behaviors were acceptable and not acceptable using an antecedent based intervention involving visual cue-cards. The procedure was then successfully generalized to the teacher’s assistant. This procedure was effective in helping one student with autism to discriminate the times where it was acceptable to have stereotypic behavior (i.e. not in math class). The advantage of this technique was that it was reasonable to expect the teacher of the class to be able to generalize the procedure and it was successfully applied in a general education setting.

In a research paper by Greer & Bruno (1997), a textual prompt procedure was found to be more effective when compared to a verbal prompt procedure in the treatment of echolalia behavior in a student with autism (Greer & Ross, 2008). Social Cue cards were found to be beneficial in another study using preschoolers with autism spectrum disorders (Caballero & Connell, 2010). Textual prompts as an antecedent based strategy can be used successfully to increase the on task behavior of children with special needs in school.

In the present study, we report on the effects of a treatment package on the on task behavior of a kindergartener across three school settings. The treatment package consisted of textual prompts, learn units, and contingent corrections. The three school settings were: a self-contained classroom, a general education classroom, and a physical education class. Since the student was observed in baseline conditions to be on task a majority of the time in all three settings, the treatment was applied to on task behavior viewed as a performance task rather than an acquisition task. It might be predicted, in that case, that smaller gains may be observed since we aimed at improving behaviors already observed to be in the student’s repertoire. Subsequent to the treatment condition, a single probe session was conducted two weeks afterwards to test for maintenance of the behavior change. Notable is that the student was enrolled in an inclusive school environment in the Hong Kong Special Administrative Region (HKSAR).

## ■ PROCEDURE

### EXPERIMENTAL DESIGN

The present study used a single case experimental design. A multiple baseline design across school settings was applied with a post treatment probe. Baseline data were initially collected across three school settings. The treatment package was systematically applied to the behaviors in the settings that were the most stable, and was subsequently applied to other settings based on the steady state strategy (Johnston & Pennypacker, 1993).

### STUDENT AND SETTING

The student, KL, was 6 years old, participated in the study. The student was diagnosed with autism prior to his attending the school program by an independent clinical psychologist based on the criteria set forth in the DSM IV-TR (APA, 2000). KL had been enrolled in The Children’s Institute of Hong Kong (TCI) full time for about two years at the time of the present study. TCI was established as a non-profit school in 2003 as the first school set up solely for the purpose of educating students with autism and to use Applied Behavior Analysis (ABA) in HK-SAR. TCI delivers one to one special instruction using ABA, Verbal Behavior Analysis (Greer & Ross, 2008), learn units (Albers & Greer, 1991; Greer & McDonough, 1999; Greer, 2002), daily graphing and data decision analysis, teacher training, and Board Certified Behavior Analysts conduct frequent Teacher Performance Rate Accuracy observations on teachers (TPRA, Ingham & Greer, 1992). The program was located along side of a primary and international school called The Harbour School (THS) that provides inclusion opportunities to TCI students, when appropriate.

KL’s verbal milestones included speaker and listener behaviors as well as emerging reader and writer responses (Greer & Ross, 2008). He was observed to be able to read and write albeit below grade level by about one year. An independent literacy assessment was conducted by the Learning Support Team at The Harbour School using the DIBELS® (Dynamic Indicators of Basic Early Literacy Skills, 2009) to determine literacy levels.

Prior to the study, KL had spent a majority of his time receiving one to one special instruction using ABA in the TCI self-contained classroom. At the start of the school year when this study began, KL’s IEP team decided to include KL into a kindergarten class for about half of each day with his one to one teacher for support. This decision was based, in part, on KL’s performance on a screening instrument used by TCI to determine inclusion eligibility called the Checklist for Inclusion Class Screening (CLICS).

The IEP team was able to customize a weekly schedule for KL that consisted of about half of each day in the TCI self-contained classroom where KL could receive individualized learn unit instruction with one of two teachers. During the other half of his day, KL participated in a kindergarten and primary 1 (P1) class of about 16 students with one head teacher and two teacher assistants. When KL would go to the P1 class, his teacher would go with him to “shadow” and facilitate his participation in academic subjects such as literacy and numeracy, lunch, playtime, and physical education (PE). The intervention took place in the

TCI one to one classroom, the P1 classroom, and in the PE environment which was either in the school's playground area, or in a gymnasium. Fewer sessions were observed in the PE condition due to the fact that PE was only scheduled to occur twice a week while participation in the other settings was daily (Monday through Friday).

The two teachers assigned to work with KL alternated days. Each had completed undergraduate degrees in education and psychology and had at least one year of supervised experience working with young children with special needs. Each had also completed about 15 hours of applied behavior analysis formal instruction by a doctoral level Board Certified Behavior Analyst. Regular supervision and TPRA observations included written feedback. The TPRA observations included interobserver agreement measures to calibrate the data collection procedures of the teachers and the delivery of in-tact learn units. Learn unit rates were also measured through the TPRA procedure and occurred in a range of 3 – 6 correct learn units per minute or higher.

### MATERIALS

The student's on task behavior consisted of attending to group instruction, various verbal behavior responses (i.e. listener behavior, intraverbals), academic, and social skill programs during the present study. Age-appropriate instructional materials such as math worksheets, phonic reading materials, toys, games, pens, data sheets, and classroom furniture was present during the conditions. In the PE condition, which generally took place in a playground or gymnasium, various gym equipment such as soccer balls were used.

Due to the nature of the data collection procedure, a special timer that would vibrate on programmed intervals (i.e. 10 seconds or 2 minutes) was used. For this purpose, the Invisible Clock II® (Time Now Inc., 2004) served as a precise and invaluable timing device for both of the teachers who implemented the intervention, and the researchers who observed and recorded the data on the student's on task responses.

The textual stimuli were small sentence strips with black print on regular white office paper. The sentence strips were about 5 cm long by 1 cm wide and were laminated for durability. The strips were used as both prompts and corrections throughout the treatment condition. The strips would read "Look at the *Teacher*", "Hands Down", "Be Quiet", or "Listen to *Teacher*". The actual teacher's name was printed on the sentence strip. For example:

Look at Ms. Lee

Hands Down

### DEFINITIONS OF BEHAVIOR

There was one response class observed throughout the study, on task behaviors. On task behaviors included appropriate affect and attending skills, social responses, verbal behaviors, and correct academic responses to teacher presented learn units (Albers & Greer, 1991; Greer & McDonough, 1999; Greer, 2002). Learn units were presented by the TCI teachers and/or the K/P1 THS teacher in the classes or the PE teacher. The student needed to be looking, oriented towards, appearing to listen, or respond-

ing to the learn units presented by the teacher for the instruction to be observed to be "on task". The student also needed to be responding to or attempting to respond to instructional directions and teacher generated antecedents (learn units).

On task also was defined as an absence of the following responses: stereotypic behaviors such as rubbing hands together, clapping, hand flapping, rocking, body posturing, toe walking, rubbing his chin with his hand, tensing, and staring up or away from the teacher or instructional materials. Stereotypic behaviors were targeted because they interfered with the student's responding in both one to one and group instructional environments. If the student was not observed to be on task, but did not engage in stereotypy, the behavior was recorded as off task.

### DATA COLLECTION

Data were collected on one response class, on task behaviors. The data were collected using the whole interval recording procedure (Cooper, Heron, & Heward 2007). Intervals were set at 10 seconds. One observational period was defined as one 10-minute session using direct observation and recording in real time. The observational periods occurred on successive days. During the observational sessions using whole interval recording, if on task behaviors were observed across the entire 10 second interval, a "+" was recorded on a data sheet with 60 boxes. If any of the stereotypic behaviors were observed, for one second or more within any given 10 second interval, a "-" was recorded on the data sheet. If there was no on task behavior observed, and no stereotypy observed in any given 10 second interval, a "-" was recorded on the data sheet. After each observational session, the number of on task intervals (+) were added and divided by 60, then multiplied by 100. The resulting number (percentage) was graphed on a percentage graph for each setting, respectively.

All data were collected by any one of the three authors of the study as well as the two teachers who worked with KL one to one. About 30% of the observation sessions, interobserver agreement was calculated. Interobserver agreement is reported below.

### BASELINE CONDITION

In the baseline condition of P1 there were few learn units occurring due to the nature of large group instruction (i.e. fewer than one every five minutes). The consequence for stereotypy during the baseline condition across all settings was a simple correction procedure, described below. In the TCI setting, there was one to one instruction occurring where the student would receive learn units across verbal behavior, academic, and social skill programs. The baseline condition in the PE setting was similar to that of the P1 setting in that there were few opportunities to respond.

### TREATMENT PACKAGE

During the treatment condition of the experiment, the treatment package was implemented across all settings. Learn units between the teacher and student were presented every two minutes. Learn units are interlocking three-term-contingency trials between the student and the teacher (Albers & Greer, 1991; Greer & McDonough, 1999; Greer, 2002; Greer & Ross, 2008). The treatment provided a significant increase in the opportunity to respond in both group settings (i.e. P1 and PE) but did not

**Table 1. Summary of results from the multiple baseline across three settings**

	Baseline	Treatment	Probe
	Setting 1 (P1 Group)		
Number of instructional sessions	14	9	1
Mean on task behavior	44%	67%	(63%)
Range	(0%, 70%)	(35%, 87%)	–
Difference in range	70%	52%	–
Difference between conditions	–	23%	–
Setting 2 (TCI 1:1)			
Number of instructional sessions	17	15	1
Mean on task behavior	76%	79%	(93%)
Range	(52%, 95%)	(60%, 92%)	–
Difference in range	43%	32%	–
Difference between conditions	–	3%	–
Setting 3 (PE Group)			
Number of instructional sessions	10	6	1
Mean on task behavior	37%	70%	(78%)
Range	(12%, 60%)	(62%, 92%)	–
Difference in range	48%	30%	–
Difference between conditions	–	33%	–

add a significant number of additional learn units to the TCI one to one setting since there were already learn units occurring at a fast rate (i.e. three learn units or more per minute). The Invisible Clock II® worn by the one to one teacher, would vibrate every two minutes, the teacher working with KL would show him a sentence strip that was aimed at prompting his attending (i.e. looking, listening, and orienting his head and eyes towards the teacher presenting the lesson or to the instructional materials).

Textual prompts were applied as antecedents to learn units and as corrections for stereotypy and other off task behaviors. Positive reinforcement for correct responding to the teacher was provided consistently for on task responses on an FR1 schedule of reinforcement. Reinforcement was delivered in the form of social praise that included verbal praise (i.e. “keep up the great work”, “Excellent looking at the teacher”, “Nice following directions”) or nonverbal praise (i.e. pats on the back, smiles).

The consequences for off task behavior throughout the study was the simple correction. Corrections were provided immediately after and contingent on incorrect responses in the baseline setting. In the TCI condition, the immediate presentation of additional learn units followed the correction procedure. Sentence strips were used as corrections and would read “Hands down”, or “Be quiet”. These served as corrections because they functioned to prompt his on task and correct attending behavior.

One advantage of the sentence strips, and the rationale for using them in the general education classroom, was that they were non-intrusive and discrete. Discretion of the intervention was a major factor in the group settings where general education students were in close quarters. A brief assessment was conducted prior the treatment condition to establish that the prerequisite

behavior (reading) was in the student’s repertoire. The teachers observed that the student could read and reliably follow the written instructions on the sentence strips.

#### INTEROBSERVER AGREEMENT

Interobserver agreement was calculated using the formula: agreements divided by agreements plus disagreements multiplied by 100 as described by Cooper, Heron, & Heward (2007). There were 30% of the total sessions observed with interobserver agreement. In setting 1 (P1 Group) the mean was 90% with a range of (72%, 98%) across five observations. In setting 2 (TCI 1:1) the mean was 92% with a range of (87%, 100%) across 10 sessions. In setting 3 (PE Group) there was an interobserver agreement mean of 91% with a range of (42%, 98%) across 8 sessions.

#### RESULTS

The first intervention was conducted in a Primary (P1) mainstream classroom. There were 14 sessions of baseline data collected. The percentage of on task appropriate behavior was ranged between 0% and 70%, and the mean was 44%. The trend was highly variable and the data were low. In the treatment condition, a total of 9 sessions were observed. The percentage of appropriate behavior increased to 67% on average and ranged from 35% to 87%. There was an educationally significant 23 % increase in on task and appropriate behavior after the treatment package had been implemented. Figures 1 and 2 show visual graphic displays of the data.

The second intervention was conducted in the TCI classroom during one to one instructional learn unit sessions. Baseline data was taken for 17 sessions and the result was variable with

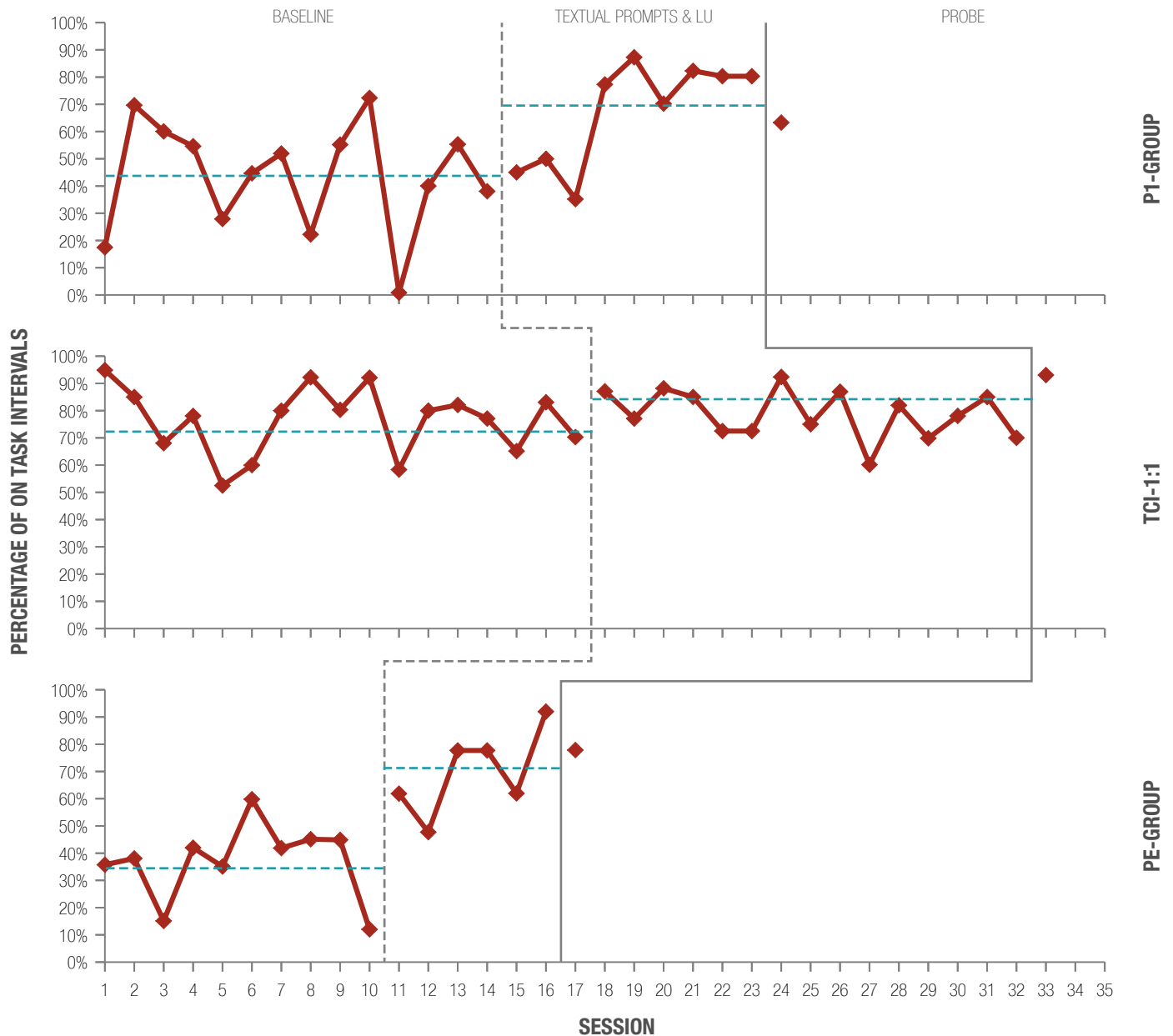


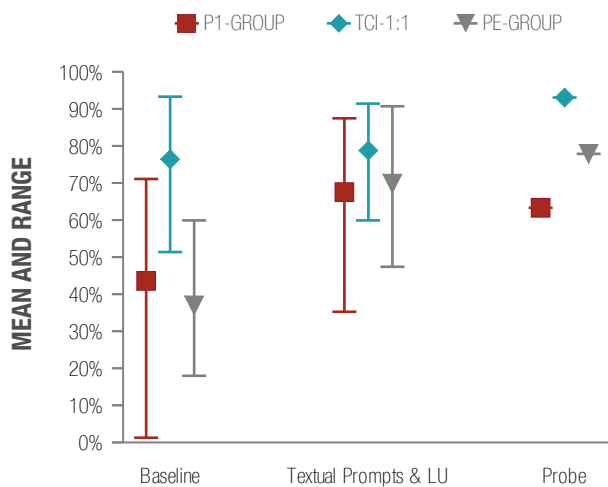
Figure 1. Percentage of on task behaviors of KL across three settings for three conditions: baseline, treatment condition, and post-treatment probe with mean level lines

a slightly descending trend. The range was from 52% to 95%, averaging 76%. Follow up with the 15 treatment sessions, the data showed a stable and slightly descending trend. The mean was slightly above the baseline level at 79%, and ranged between 60% and 92%. On task behavior was increased 3% from baseline to treatment, a modest increase, but improvement was observed as a performance task

The intervention was applied to the third setting during the group PE lesson. The data collected from the 10 baseline sessions resulted in a highly variable trend with high rates of stereotypy observed. The range was 12% to 60%, averaging 37%. During the 6 sessions of treatment, the average on task interval had increased to 70%, and ranged from 62% to 92%. An increase in on task behavior of 33% resulted from the intervention. The change in on task behavior was greatest in this PE condition.

Post-treatment probe sessions were conducted across each of the three experimental settings. On task probe data in the PE condition was 63%, in the TCI settings was 93%, and in the P1 setting was 78%, respectively. Probe were conducted two weeks after the intervention condition. On task behaviors were observed to be higher than that of the mean in the treatment condition for all condition with the exception of in PE.

The data show an educationally significant increase in all three conditions as a function of the treatment package. The on task behaviors increased the most in the PE condition and they increased the least during the TCI setting. There was an observed decrease in the variability in the on task behaviors was reduced in all of the three settings after the treatment package had been introduced. The results of the three different settings are summarized in Table 1.



**Figure 2.** Data on mean and range of on task behavior for KL across three settings and three conditions: baseline, treatment, and post-treatment probe

## DISCUSSION

The results show that on task behaviors were increased through the application of the treatment package. These effects were maintained at least two weeks after the termination of the intervention. Results were educational significant for two reasons. First, KL's on task behaviors were increased and therefore he was off task and doing stereotypy less of the time. On task behaviors were directly measured. Second, the results were educationally significant due to the collateral benefit to KL. Those benefits include KL's correct responding to group instruction in the general education setting. Target behaviors were tied to the general education curriculum in the THS K/P1 class. KL was learning with his peers in the least restrictive environment. The collateral benefits such as number of correct responses to learn units or educational (IEP) objectives met were not measured directly, although they could be measured through future research.

In the Conroy et al. (2005) study, the researchers successfully taught one 6-year old boy with special needs to discriminate where it was appropriate to engage in stereotypic behaviors (i.e. not in math class). Our results expand on their findings and demonstrate that on task behavior can be shaped across multiple instructional settings using the same intervention. Another important aspect of both studies is that the treatment package was implemented in a relatively discrete manner in a general education classroom without distracting other students. The probe session has shown that it is likely that the behavior change will occur over time.

This satisfies an important aspect of the generality of behavior change as described in the seminal article, *Some Current Dimensions of Applied Behavior Analysis* by Baer, Wolf, & Risley (1968).

The positive outcome was especially pronounced in the PE Group condition where a 33% increase in on task behavior was observed. This is likely due to PE having the fewest or slowest rate of naturally occurring learn units. Future research can count the learn units occurring across settings to make a more accurate comparison. Post-treatment probes showed that behavior change levels were maintained after the treatment package was removed for at least two weeks.

The trend of the data in the self-contained classroom setting, TCI, did not appear to be improved as much as the other group settings, however, the variability was reduced in all settings (see Figure 2). We argue that the increased number of opportunities to respond (learn units) that was characteristic of the TCI one to one instructional format was responsible for the observed higher rate of on task behavior in the baseline condition. Therefore, there was less downtime and significantly more opportunities for reinforcement of appropriate on-task behaviors in the TCI setting as compared to the P1 and PE general education group settings. Since the level of the baseline data was already relatively high in this setting (Mean=72%), the room for improvement was limited and the change was not as dramatic as in the other settings.

There are many studies in the research literature that have treated off task behavior as such as stereotypy (Ahrens, Lerman, Kodak, Worsdell, & Keegan, 2011; Callahan & Rademacher, 1999; Greer & Ross, 2008; Karmali, Greer, Nuzzolo-Gomez, Ross, & Valdes, 2005; Mancina, Tankersley, Kamps, Kravits, & Parrett, 2000; Stahmer & Schreibman, 1992) and improved on task behavior (Tasky, Rudrud, Schulze, & Rapp, 2008; Machlicek, O'Reilly, Beretvas, Sigafos, & Lancioni, 2007). The intervention that was applied in our study joins those that are free from medical prescriptions or punitive contingencies, both of which carry a significant risk of undesirable side effects.

To date, few have applied treatments in situ to students with special needs while attending general education classes. Even fewer have applied behavior analytic techniques in inclusive schools environments outside of the United States. We expect that this will change slowly but surely as the field and its affiliated chapters expand to all continents and countries.

## LIMITATIONS OF STUDY

The variability of the data could be attributed to a number of confounding variables within the settings. In future studies, we suggest that data collection be carried out only under the same conditions in each setting to improve on the internal validity. For example, the time of day, instructional lesson or activity, materials used, and teacher could have been controlled for. KL had two TCI teachers who rotated daily. The experimenters assessed treatment integrity during the observation sessions, but there were no controls for which of the two teachers worked with the student throughout the study. Slight inconsistencies between the teachers might be one of the factors that had influenced the outcome measures. These effects might have been compounded in the TCI condition. TPRS observations prior to this study confirmed that each teacher could successfully present learn units, however, procedural drift could have affected the learn unit presentation through the duration of this research.

Additional research should compare the use of various techniques to improve students' with special needs on task behaviors in the general education setting. Other populations of student with special needs but not autism, per se, should be exposed to various treatments in the mainstream. Furthermore, inclusive school communities could communicate about which treatments for inclusion are most effective and ensure that those behavior changes can be generalized to other environments.

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