

## Behavior Modification Using the Differential Reinforcement of Low Rates Technique and Token Economy to Improve English Handwriting among Thai Students

Sovaritthon Chansaengsee, Mahidol University, Thailand

### Abstract

In this study, behavior modification was used to enhance students' English handwriting. Twelve Thai students were included in this study. The target behavior was their ability to write English neatly in order to be readable. Problem behaviors identified were writing too quickly, concentrating on other activities, and chatting with friends. A behavior modification technique was used (Differential Reinforcement of Low Rates – DRL) along with praise and a token economy. All subjects were asked to write an essay as per normal, but they would obtain a token when they accomplished the given task. Tokens could be exchanged for two provided gifts. Three months after the experiment commenced, subjects were retested by a rubric. The result of the behavior modification was quite satisfying since the students' handwriting could be read clearly and their writing skills had developed. The technique could be applied to other classes such as language, science, and history which involve handwritten work.

**Keywords:** Behavior modification, English handwriting, Differential Reinforcement of Low Rates, token economy

### Introduction

As English writing skill is necessary for secondary students to prepare themselves for higher levels of education, it is essential for this skill to be well-developed. Not only are ideas or content in written work valuable, but also the representation of this information in handwritten form. While many would argue that the availability of technology overrides the necessity to develop neat handwriting, most conventional evaluations across the world still require students to handwrite. According to Somprayoon (2010), there are three major factors affecting Thai students' handwriting. This includes organs, intellect, and environment. It is also advantageous to practice handwriting, as it promotes brain activation, improves performance across academic subjects, and provides a foundation for higher-order thinking skills.

While an essential skill, handwriting can be an indicator of communication problems, especially in contexts where English is not the primary mode of communication. Handwriting may affect a teacher's perception of his or her students' performance. For instance, it has been argued that proficient handwriting is predictive of the length and quality of written expression (Baker, Gersten, & Graham, 2003). On the other hand, messy handwriting may have a negative effect on an examiner's perception of the essay content. Messy handwriting distracts a teacher's focus from the content or the ability to decode what is written. This is especially crucial in high-stakes examinations such as IELTS or TOEFL, or any other entrance examinations which require an English writing ability. Recine (2017) reported that bad handwriting can frustrate examiners, even if the essay is well-organized or free from errors. Considering all these examples, handwriting is a predictor that may determine a student's success.

Having established the importance of neat handwriting, and observing problems with student handwriting in my own class, I was prompted to take action to improve students' handwriting. I aimed to achieve this through behavioral modification, wherein students' attention and control over their handwriting may be improved. Specifically, Differential Reinforcement of Low Rates (DRL) was utilized along with praise and token economy. Not only can the findings provide insights into how handwriting of non-English speaking students can be improved, it may also provide avenues for consideration by teachers and policymakers. Other benefits can also be applied to modify other classroom-related behaviors such as coping with stress or developing learning discipline.

### ***Behavioral Modification***

Behavioral modification is the application of learning theories and any other findings from psychological experiments, which can be employed to change an individual's behavior (O'Leary & Wilson, 1987). From the definition, it can be inferred that the behavior of an individual can be changed and modified based on the premise that there are interrelationships among feelings, cognitive processes, and behaviors. Nonetheless, it must be noted that behavior modification must not be a complex combination of interventions, involving both positive and negative reinforcement and punishment. Additionally, the group whose behavior is targeted for change needs to develop regulatory skills to control themselves and manage their day-to-day living.

To conduct behavior modification, proper techniques need to be selected. There are various techniques available, such as Cognitive Behavioral Therapy (CBT), Emotional Freedom Technique (EFT), and Neuro-Linguistic Programming (NLP). The most popular techniques utilized are reinforcement and punishment.

A theory that postulates a possible change in behavior is the Differential Reinforcement of Low Rates of Behavior, or DRL. This technique aims to change behavior through giving reinforcement and withdrawing reinforcement. The withdrawal of reinforcement, however, shouldn't be misunderstood as only referring to punishment. In DRL, withdrawing reinforcement may be instanced through the removal of satisfying rewards. Cooper, Heron, and Heward (2007) state that DRL is a procedure that involves reinforcing rates of behavior that occur below a preset level. This technique for modifying behavior may be useful and effective because differential reinforcement is less intrusive than any other behavioral intervention (Cowdery, Iwata, & Pace, 1990). In other words, DRL is a technique where a person may obtain a positive result at the end of a certain interval, but after a target behavior occurs at a set criterion rate. The purposes of DRL are to decrease a behavioral excess to a more acceptable rate and to establish and sustain an adaptive behavior at or below an exact rate (O'Donahue, Fisher, & Hayes, 2003). Numerous research had been conducted by employing DRL technique (e.g., Deitz & Rep, 1973; Austin & Bevan, 2011). The former researchers applied the technique to one Trainable Mentally Retarded (TMR) student, an entire TMR class, and an entire high school business class to reduce talking-out behavior. They discovered that the DRL procedure proved manageable for the teacher and effective to decrease misbehavior.

The DRL procedure can be further categorized into three sub-types. This can be seen in the study by Deitz (1977) which utilized Spaced Responding DRL, Full Session DRL, and Interval DRL. The finding revealed that these three DRL methods were successful, not only for school children, but also for disorderly children. In the study of Epstein, Repp, and Cullinan (1978), it was discovered that the DRL approach helped reduce inappropriate language in disorderly children. What can be seen here is the availability of reinforcement could decrease the misbehavior of such children. From previous research on DRL, it can be seen that DRL may be an effective method to eliminate distractive behavior and modify target behaviors.

Closely linked with DRL is the notion of Token Economy. This notion is a well-known method that involves a person obtaining or achieving a state (of thought or action) in order to gain a chance to receive a prize or do a favorite activity. In a classroom setting, a teacher may set a criterion as a token, such as a point, a star, or a sticker. When a student accomplishes the set criterion (e.g., if he or she can sit at the desk without chatting with others), he or she will receive a reward that – when accumulated – result in a prize being given. To ensure the process has a more significant bearing, the prize should be one that he or she values very much.

In the classroom setting, there are numerous learning behaviors that teachers may consider modifying or developing in order to complement the teaching approach employed. As mentioned, one of the learning behaviors that students need to be skillful in is handwriting. As stated earlier, handwriting is one of the most significant elements for the completion of essay-type tasks. Furthermore, handwriting has been shown to be related to students' academic achievement (Medwell & Wray, 2007). As such, handwriting should be a focus in the curriculum because it can be a predictive factor in determining the length and quality of compositions (Baker, Gersten, & Graham, 2003).

Research on handwriting indicates that improving handwriting can predict better writing skills and other literacy skills such as reading. Research has shown that handwriting affects people's brain functions. Seen through Functional Magnetic Resonance Imaging (fMRI), the brains of writers with poor handwriting required more oxygen to burn glucose for fuel, which leads to the assumption that students who struggle with handwriting may be less efficient in expressing themselves through writing (James, 2012). On the contrary, those who focus on producing neat handwriting may train their brains through sequential finger movements, which may provoke brain capacities responsible for thinking, language, and memory (Bounds, 2010).

Given the necessity and benefits of neat handwriting, this study aims to examine how behavior modification can be of use in a Thai English language classroom. The behavior modification process is explained in the next section.

### **Research Methodology**

This research implemented a Full Session DRL, meaning that a person will obtain the 'reinforcer' when less than specified responses have occurred. The technique has been implemented to reduce the particular behavior that occurs at too high a rate, such as stereotyping, disruptive classroom behavior, and lack of concentration during a lesson (Kostinas, Scandlen, & Luisellie, 2001). In the study, a DRL treatment is warranted to eliminate distractive behaviors of students in English class as these negatively affect their attention on writing. The researcher utilized token economy as a powerful 'reinforcer' for grade 9 students. This research also implemented token economy as an intervention to reduce the target behavior, lack of concentration during writing essays. This process reinforced their attention to write English essays leading to better handwriting, since this method can be used to enhance expected behaviors by the magnitude of reinforcement (Ayllon, Milan, Roberts, & McKee, 1979).

Specific steps were taken to support the behavior modification process. These steps were modeled after Lamsupasit (1998), who stated that there are six important steps for operating behavioral modification. These steps are shaped by the Operant Conditioning Theory. They are:

1. Defining the target behavior: it should be specific, measurable, and not be labelled.
2. Collecting and recording baseline data: the target behavior is collected and recorded in order to ascertain that it is a real problem. This step is significant to evaluate a behavioral modification program and provide feedback to assess the efficiency of the program.
3. Behavior analysis.
4. Identifying potential reinforcer: because of different needs, suitable reinforcement must be served to each individual.
5. Planning and implementing the intervention: a plan must rely on conditions of the target behavior.
6. Evaluating the effects of intervention: this is the step of collecting data after operating the behavioral modification.

In this research, each step was conducted where the researcher employed DRL techniques, which utilized token economy to enhance the target behavior. This was to encourage more concentration on writing, leading to readable and neat handwriting.

### **Sample Group**

The sample of this study consisted of twelve students of grade 9 in one international school. The sample was selected by their English teacher. This study used purposive sampling based on evaluating the quality of their handwriting. In particular, the teacher determined students' handwriting by asking five other English teachers, who had taught in this school, to mark a handwritten essay of each student in his or her class. Consequently, twelve out of thirty-three students were selected because they received a lower than average mark in handwriting, which was five out of the full score of ten. The rubric of marking the students' handwriting consisted of five aspects, which were

line usage, spacing, letter formation, readability, and neatness. The handwritten essays were also compared, and the five agreed that these twelve students had to improve their English handwriting. The sample would go through a behavior modification process, after which their handwriting would be observed again to ascertain if improvement has occurred, compared with the initial evaluation.

### ***Duration***

The range of time used for this study was about four months for the DRL procedure: reinforcement intervention since the beginning of the semester, including in an intensive course, from September to December. To examine the durability of the target behavior, after three months their concentration on writing leading to improved handwriting was checked again.

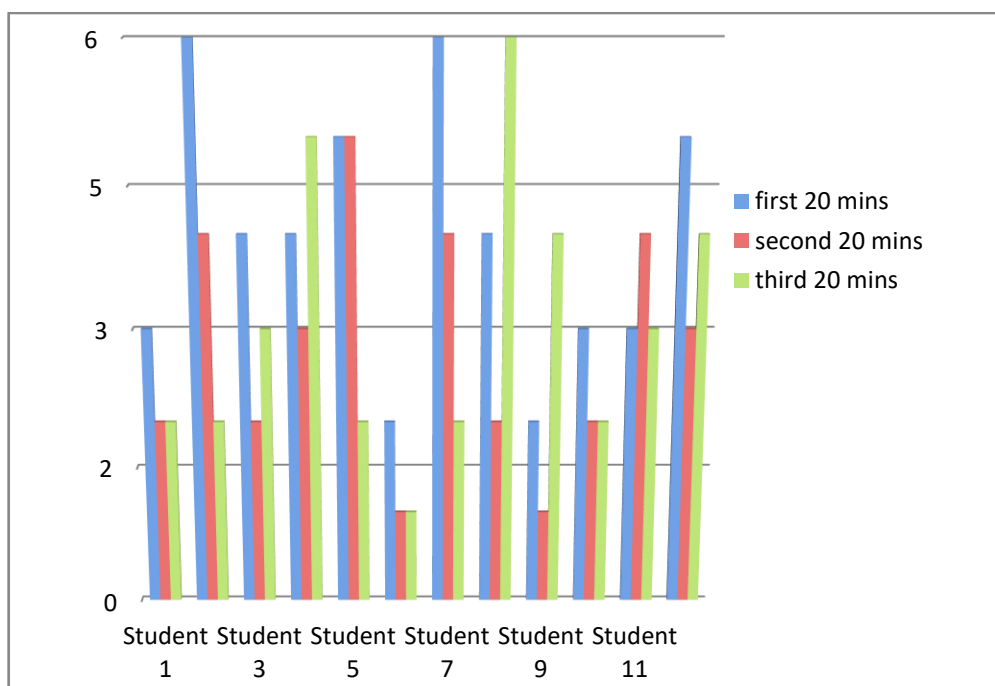
### **Research Process**

#### ***Defining Target Behavior***

Before the target behavior was defined, the researcher needed to address the problem behavior. The teacher conducted an observation of all 33 students to discover the distractive factors causing messy handwriting in those whose handwriting seemed unreadable, especially those twelve students whose English handwriting was measured by five English teachers. From close observation, the problem behavior was writing without concentration, meaning writing very quickly without fully paying attention, or writing while doing other activities like chatting on a smartphone. Hence, the target behavior was readable or neat handwriting. The expected outcomes were writing more slowly and not engaging in other activities.

#### ***Collection Baseline***

From the target behavior mentioned above, the second step of behavioral modification was collecting a baseline of the problem behavior – writing without concentration, to make sure that this was the relevant problem leading to messy handwriting. The messy handwriting was determined by the score five teachers had given to each student — five or less out of a total score of 10 points. The teachers and the researcher collected the data from the 12 selected students by observing the frequency of students' lack of concentration during writing a 250-word essay. When signs of a lack of



**Figure 1.** Baseline Data of the Frequent of Other Activities while Writing an Essay

concentration were noticeable, the teachers and the researcher would keep a record on how many times the students paid attention to other activities every 20 minutes. If other actions were observed, such as writing too quickly without paying attention, notes were also made. Data was collected over five days. A graph illustrating the baseline is shown in Figure 1.

According to Figure 1, it is seen that all students had problems with distractions while writing essay such as chatting with friends, listening to music, doing something on a mobile phone, and walking to the toilet. Each student was observed every 20 minutes; the baseline demonstrated these disturbing activities occurred at a high rate and disrupted the attention and concentration of the students when writing a 250-word essay, leading to messy handwriting.

**Table 1.** Record of Students' Writing Too Fast without Concentration and Attention to Topic

Student	1 <sup>st</sup> Day	2 <sup>nd</sup> Day	3 <sup>rd</sup> Day	4 <sup>th</sup> Day	5 <sup>th</sup> Day
1	✓	X	✓	✓	✓
2	X	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	X	✓	✓
5	✓	✓	✓	✓	X
6	✓	X	✓	✓	✓
7	✓	✓	X	X	✓
8	✓	✓	✓	✓	✓
9	X	✓	✓	✓	✓
10	✓	✓	X	✓	✓
11	✓	✓	✓	X	✓
12	✓	✓	✓	✓	X

As shown in Table 1, five days of observation was embarked upon. The baseline reflected that all of the students wrote essays very quickly and the handwriting could not be read (measured by the rubric mentioned—if the essays were written too quickly, they would be marked by a ✓, but if not, an X was marked). Mostly, they wrote very quickly almost every day of the observation. Hence, their distractive behavior during writing class should be rectified.

The data from the baseline demonstrates the problem behaviors that caused messy handwriting. That is to say, the trend seemed constant, so these problems had to be solved by behavior modification technique.

### ***Procedure and Experimental Design***

The DRL technique of behavior modification was employed. The purpose of this technique is to decrease unsatisfactory behavior. The major procedure is offering positive reinforcement, such as social reinforcement and token economy, together with elimination of the unsatisfactory behavior. When individuals cease to manifest the specific problem behavior within a set time, they will be encouraged with positive reinforcement. In contrast, if the problem behavior was exhibited within the set time, the positive reinforcement was discontinued.

The experimental design was established and approved, as all subjects (students) must accept all proposed conditions by signing their names. Five conditions were put in place as follows:

1. If the students finished one essay paper (250 words), they would obtain five stars. Their performance would be measured by improved handwriting and behavior during writing.
2. If two written papers were continually unreadable, the teacher would take back two stars.
3. The students would be offered a prize of their choice if they collected 50 stars in total.
4. When they reached 150 stars, they could choose a big prize, which must be reasonable.
5. However if their English handwriting had not markedly improved after three months of behavior modification, they would get nothing from the teacher.

The criteria used by the researcher coincided with those associated with the DRL technique. To clarify, the researcher clearly addressed the problem behavior that needed to be rectified.

The first step was to observe if the students could perform another activity such as chatting with friends or doing something on a mobile phone while writing, but this must not be more than five times within 30 minutes. Within that time, they must not write too quickly without concentration. The behavior was observed by the teachers and the researcher. If they could pass this step, they would be given two more stars; however, they would get five stars more if they never showed any problem behavior (they actually obtained 5 stars from one essay).

In case the students still presented the problem behaviors, the teacher would give nothing to them. The process continued, but the criterion mentioned above would be changed to be 4 times, 3 times, 2 times, and 1 time until no distracting activity occurred. The desired outcome, English handwriting, was assessed by the attention given to the 250-word essay.

### ***Durability of the Target Behavior***

Three months after the program commenced, the students' English handwriting was examined again in order to check the durability of the target behavior.

### **Research Findings**

Twelve students participated in this study. The results were impressive. However, only one student presented unpleasant English handwriting after three months of ongoing examination.

**Table 2.** *Students' Achievement of Target Behavior*

<b>Student</b>	<b>Achieved 50 Stars</b>	<b>Achieved 150 Stars</b>	<b>Improved Their English Handwriting</b>	<b>Durability of Target Behavior</b>
1	✓	✓	✓	✓
2	✓	✓	✓	✓
3	✓	X	✓	✓
4	✓	✓	✓	✓
5	✓	✓	✓	✓
6	✓	✓	✓	✓
7	✓	✓	✓	✓
8	✓	X	✓	✓
9	✓	X	✓	✓
10	✓	✓	✓	✓
11	✓	X	✓	X
12	✓	✓	✓	✓

From the table, all students were able to obtain 50 stars from the token economy. This indicated a decrease in problematic behaviors. In addition, even though some did not reach 150 stars, their English handwriting had nonetheless improved. All students reached 50 stars twice, thus attaining two choices of prizes, which were a movie ticket, a small globe, a novel, a package of chocolates, a cactus, and earphones. Nevertheless, four students did not reach 150 stars, which meant that they did not receive the big prizes. Most of those who achieved 150 stars chose twenty-four colored pens as a big prize, whilst others' choices varied from an iPhone case, a humidifier, and a t-shirt. This result indicated the efficiency of the behavior modification program. However, after examination of the durability of improvements in English handwriting, one student did not pass the set criteria provided by six English teachers; he still wrote essays with messy handwriting. Overall, the results seemed satisfactory, because the students' target behavior was stable when it was examined three months later.

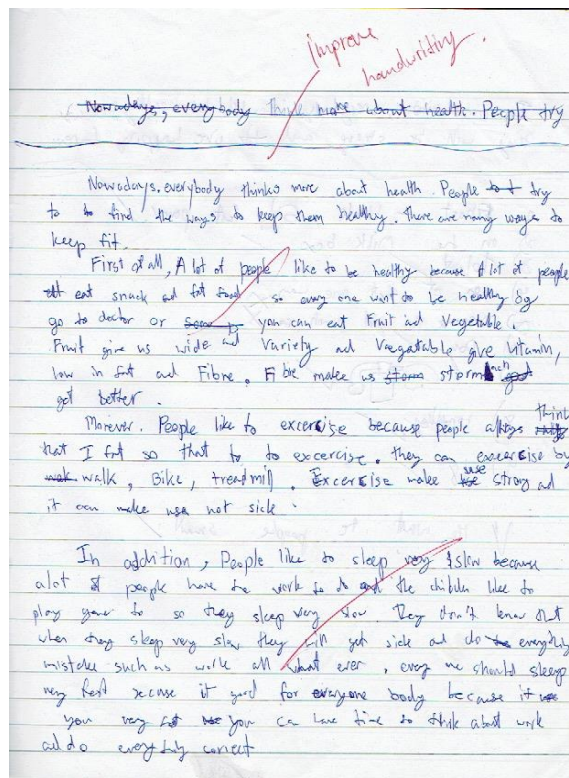


Figure 2. A Photographic Example of One Student's Messy Handwriting Collected for the Baseline

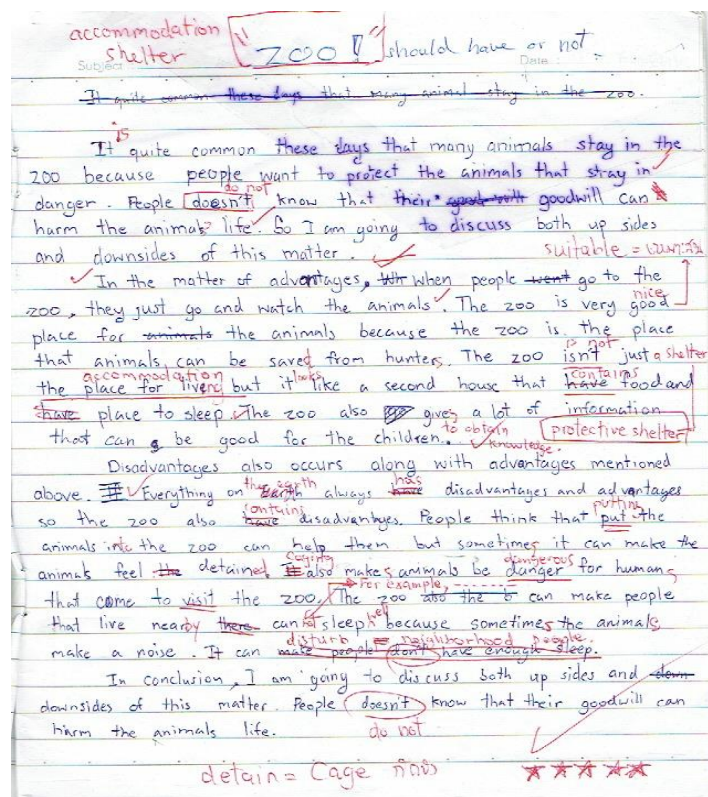


Figure 3. A Photographic Example of the Same Student's Improved Handwriting during the Program

The result of this research study was positive. Before the program of behavior modification was launched, the students' handwriting was very unsatisfactory as shown in Figure 2.

During the program, the students' English handwriting improved when they gave full attention to their performance. Moreover, their writing quality, quantity, and speed improved.

According to six English teachers including the researcher, all 12 students' English handwriting passed the criterion, which was scoring higher than five out of ten on most essays. This improvement can be seen in Figures 2 and 3, which illustrate before and after applying the intervention. The students' problem behavior was rectified due to the results demonstrated in Table 2, which represent achievement in reducing distractive behaviors and improvement of their English handwriting. The results of the experimental program were effective in solving the problem.

## **Discussion**

It is crucial for all students to have readable handwriting. It not only helps maintain the attention of the examiners, but also helps examiners to be reliable in marking students' work. Sometimes, handwriting in English class seems an unimportant skill that most teachers overlook. Typically, this skill must be required when students take an international English test for the purpose of gaining admission into international programs in universities. Enhancing English handwriting thus sounds reasonable for Grade 9 students, whose handwriting may not have been emphasized since they studied at the primary level. However, it is still very necessary in primary years as Graham et al. (1997) stated that the practice of handwriting could facilitate high-order composing processes, and automatic letter writing is an efficient predictor of length and quality of written composition in the primary years. This behavior modification study reflects some potential for a program shaping students' English handwriting and – as illustrated – it was not too difficult to enhance their writing performance.

Interestingly, the handwriting speed of the students continued to increase. As a result of the program intervention, the 12 students improved their handwriting and writing speed, and the quality of their handwriting seemed to be at a higher standard. Henceforth, students' handwriting and the quality of their writing must be focused on together.

The advantages of DRL in this study were prominent. Prior to the program of presenting tokens to all participants, their observed writing behaviors had been continually declining. The first factor causing the effectiveness of the program was that the problem behaviors were properly diagnosed. The researcher and other school teachers helped observe and discuss the real distractive factors that were impeding their concentration, leading to neater handwriting. All teachers agreed that the problem behaviors were writing too quickly, and chatting with friends or on their smartphones during the writing period. Also, these problems seemed more obvious during the collection of baseline data. Hence, the program established to reduce these problem behaviors was successful due to focusing on the right issues.

The second factor leading to the success of the intervention program was the design of the program. Combining the use of tokens, the students were willing to achieve the target behavior of improved handwriting, as measured by comparing former and current written papers. According to McLaughlin and Malaby (1972), token economies can be used to control improper behaviors, including talking out. The tokens and big prizes seemed influential because they were items that the students really wanted.

The third important factor making this program effective was the frequency of the treatments given to the students. To illustrate, they were given a writing task at least three times a week in order to collect the tokens. As the problem behaviors were continually addressed, their handwriting also improved. It is obvious that offering them a chance to practice writing could help develop not only their concentration on writing, but also their quality of handwriting.

The last factor leading to successful application of DRL in this study was the co-operation among teachers who had the same goal of enhancing students' quality of handwriting, since most English teachers perceived its significance in leading to higher achievements on writing tests. Without the



assistance of these teachers, the experimental process would not have gone smoothly. Moreover, all of these teachers comprehended the techniques used to change students' behaviors. They provided the researcher with ideas and resources, which had an impact on the behavioral modification process.

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