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# Autism Project: Case Study Evaluating Behavioral Interventions for the Self-Injurious Behavior of Biting

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Autism Project: Case Study Evaluating Behavioral Interventions

For the Self-injurious Behavior of Biting

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### Abstract

Self-injurious (SIB) behavior is a common problem among the autism population, and often those who engage in SIB have done so since a very early age. There was a nine-year-old boy named Jack who was diagnosed with ASD and engaged in the self-injurious behavior of biting his hand. A functional analysis was conducted and it was found that the behavior was multiply controlled across three main conditions: alone/play, demand, and attention. The goal of this case study was to review previous interventions that did not eliminate the target behavior, analyze and revise the current protocols in place, and eliminate the problem behavior. There were four main protocols implemented during this case study using behavioral techniques such as DRI/DRA, blocking, and a FR1 break schedule. The average rate of bites per hour decreased dramatically during the case study, though the behavior was still ongoing when this case study came to a close. Interventions must be constantly revised and adapted to a particular individual and the situation they are in, and when the environment or the participant changes, the protocol has to change as well.

*Keywords:* autism, SIB, precursor behaviors

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A serious problem that is often faced in the field of behavioral analysis is that of self-injurious behavior (SIB) exhibited by individuals diagnosed with autism. Though there have been numerous studies on the subject and its different treatment methods, the problem still persists (Arzin, Gottlieb, Hughart, Wesolowski, Rahn, 1975). There are a lot of different people that have closely studied various treatments for self-injurious behavior, and it is their methods that have been used to treat the self-injurious behavior of biting in a nine-year-old boy diagnosed with autism. Khrystle Monallana (2013), a graduate student from the behavioral psychology program at Western Michigan University conducted a case study for this participant, which is where most of the participant information was retrieved from for this study. The participant, Jack, engaged in the self-injurious behavior of biting his left hand, and when a functional analysis was conducted in September of 2010, the results showed the behavior was multiply controlled (occurred during the demand, denied access to reinforcer, attention, and alone conditions) and could be explained as a generalized mand (Monallana, 2013). Jack has engaged in the self-injurious behavior of biting since he was diagnosed with autism spectrum disorder at age 2, and was a behavior that had been maintained through various functions for 7 years. The past interventions were referenced to analyze what techniques seemed to work best with Jack, and that information was used to guide new treatment and interventions according to what was effective. That being said, the ultimate goal of this study was to replace the self-injurious behavior of biting with a more appropriate behavior, while decreasing the frequency and ideally eliminating the occurrences of hand biting.

It was difficult finding a specific procedure that targeted all of the functions of biting at once, but there have been multiple different procedures used in attempt to target each condition individually. In 2010 at home, when the function of the SIB was to escape a demand or while he was crying, the protocol was to continue with the demand and ignore the problem behavior. If the condition was the absence of attention or removal of a tangible, others would react by turning the body away and waiting until he stopped biting or crying. They would also present the choices and activities available, redirect him to the activity, and refrain from asking “what do you want?” In 2011 the intervention for the escape function was to say “no bite”, prompt through the appropriate response, and to give minimal attention while prompting. For all other functions of biting, the protocol was to say “no bite” and turn head away for 10 seconds.

One procedure that has been used, though in a low severity, is a penalty procedure where all reinforcers are removed when he engaged in the problem behavior. The biting-contingent penalties used at home and at his school, the Kalamazoo Autism Center (KAC), took the form of time-out and response cost. The time out procedure consisted of removing a reinforcer (such as a preferred hat) until the biting had stopped for an interval of 10 seconds. If biting occurred during “play time” or while there was access to reinforcers, all reinforcers were removed and trials were ran (another form of time-out). The response cost contingency used at KAC in 2012 included a token economy, where the removal of tokens were contingent on the target behavior. If there were no tokens left at the end of the specified interval, there would be no access to highly preferred reinforcers. There are ethical concerns regarding punishment based contingencies, especially if the intervention includes the delivery of aversive stimulus contingent on the problem behavior. Minishaw et. al. (2014) states that punishment-based intervention strategies are a quick means to eliminate problem behaviors, and are often used as last resort methods in

cases where the reinforcing stimulus maintaining the behavior is either unknown or when the maintain variables are known but cannot be controlled for. Though it is known that Jack's biting was multiply controlled, it is very difficult to control for all the variables that maintain the reinforcing stimuli, especially at the same time. Another procedure that was implemented before this case study was the implementation of an aversive condition contingent upon the target behavior, otherwise known as punishment. This procedure involved applying "No-Bite" nail polish on the part of his hand that he bit to make the experience aversive, and however it did decrease the bites it increased the frequency of a separate problem behavior of spitting.

The protocol that was in place right before our case study began was a differential reinforcement of alternative behavior procedure, where he was redirected to squeezing a stress ball, which was thought to have the same aggression reinforcer as biting his hand. An intervention was successful if it had decreased bites for two consecutive weeks, and if not it was modified or dropped completely. The bite rate going into this case study was five bites per hour, and the ultimate goal was to decrease the frequency to two per hour, and eventually eliminated completely.

The treatment package that was created during this case study was a compilation of different empirically supported preventative strategies, along with information of what procedures have worked to decrease frequency of biting for Jack specifically. Overall, this is a case study that identifies precursor behaviors, researches the applied research to see what other methods have been used, and troubleshooting when procedures or interventions are not working for greater than or equal to about two weeks. Self-injurious behavior greatly impedes on a child's access to happiness, and this research is important in order to increase the quality of life for this nine-year-old boy. This study has been recorded in hopes that this research can be applied in similar cases, and may increase the quality of life for other individuals as well.

## **Methods**

### **Settings/Materials**

This study took place at the Kalamazoo Autism Center (KAC), which is a room inside the Childhood Development Center (CDC) in Kalamazoo, Michigan. KAC not only focused on decreasing inappropriate behavior but also using other procedures to increase appropriate and typical behaviors. Inside the classroom there were “booths” that were separate spaces for each of the kids and their tutors to run trials that contained a table and two chairs, reinforcers, and procedure materials. The classroom contained a bathroom for the students, play area, lunch/snack table and chairs, sink station, lockers, and there was also a door that lead to a fenced in playground. Data was recorded in all of the areas at KAC where bites occurred, and the procedure for this behavior was in place during every activity he engaged in while at KAC.

The materials used for this study included a clicker counter, video camera, necklace bite bar, bite count book, necklace bite data sheet, hour glass, timer, and an ACE bandage.

### **Procedure**

The procedure targeting the problem behavior of biting was in place during the whole duration of Jack’s day at KAC, which is five days a week (Monday through Friday); four hours a day during the summer and eight hours a day during the fall and spring. There were four different protocols that were implemented during this case study. The first procedure was the “bite necklace” protocol that was implemented in June of 2014. To set up, the tutor would get out all of the materials for his other procedures and would put the clicker counter in his/her apron, and would make the data sheets readily available to record the data. Every time Jack would engage in the problem behavior, the tutor would count the bite on the thumb counter, and record the number of bites in a journal at the end of his/her shift. Phase 1 of the procedure was

the introduction of the necklace using full physical prompts (putting the necklace in his mouth) and once he started engaging in spontaneous necklace bites, they would be reinforced by attention and the next phase would be put in place. The second phase involved the redirection from biting his hand to biting his necklace using a partial physical prompt (lifting the necklace to his mouth and saying “bite necklace”) and eventually giving only the verbal prompt “bite necklace”. Once he became more compliant and less resistant to the redirection, his behavior met the criteria to move onto Phase 3 of the procedure, which targeted redirecting the precursor behavior. Precursor behavior is the behavior that often precedes the target behaviors, and Jack’s precursor behaviors included non-compliance in addition to leaning on the tutors or table, rubbing his face with both hands, sucking his thumb while covering his face, and/or whining. When Jack complied to the verbal prompt “bite necklace” while engaging in precursor behavior, the criteria was met to move to Phase 4, and instead of using a verbal prompt to redirect precursor behavior, it was changed to a gestural prompt of just pointing to the necklace. Because the time that elapsed between the precursor behavior and the problem behavior was so minimal and it was hard to redirect quickly with a gestural prompt, Phase 5 was implemented. Phase 5 of the “bite necklace” protocol was the incorporation of antecedent stimuli, which involved training the tutors to recognize antecedent events that typically preceded problem behavior, such as transitions from a reinforcing activity to a less reinforcing activity or denial of reinforcement. When the tutors were train to recognize antecedent stimuli, they would then prompt to “bite necklace” in an effort to redirect the precursor behavior as well. The next protocol introduced included the “bite necklace” protocol in addition to an ACE hand wrap to block the reinforcing stimulus of the contact between his teeth and his skin. Necklace bites, defined as bites that

seemed to serve similar function and had similar topography to the target behavior, were recorded; tutors recorded aggressive necklace bites vs. total necklace bites.

The third protocol added a fixed-ratio 1 (FR1) break protocol in addition to the bite necklace protocol. Every time Jack manded for a break, he received one immediately; the break time was set for 1-2 minutes if he had just had a break and 2-5 minutes if it was a break he worked for. When the break was over the tutor would say “time to go back to booth” and run trials as usual until he manded for another break.

The fourth protocol removed the chew necklace and reintroduced the ACE hand wrap while keeping Jack on the FR1 schedule.

### **Results**

Jack wore his chew necklace and his hand wrap while at KAC, but sometimes he would take the necklace and arm wrap home with him and forget to bring it back. Data is collected whether or not he has the necklace and arm wrap on. During this case study, several conditions were manipulated as a part of the treatment package designed to decrease the average rate of the problem behavior per hour. The results will show the effectiveness of each treatment used from June 2014 to December 2014, as well as when and why each treatment was implemented. The first protocol of this study (Phase 1) was implemented in June 2014. Prior to the beginning of this case study, the average rate of bites per hour was 4.763 as a product of a stress-ball intervention previously implemented in May 2014. The ultimate goal of this case study was to assess what interventions have been used in the past, and create a treatment package that will decrease the frequency of hand-biting to ideally zero instances per hour. Appendix A includes a graph of the average bites per day from September 2013 to June 2014. Before this case study

began the data portrays significant variability in the behavior. Bites commonly ranged from one to eight bites per hour before the first protocol of this intervention.

Phase 1 of this case study was the “bite necklace” protocol that was implemented in June, and it reduced the average bites per hour down to 4.425. However that was still not a low enough frequency and Jack continued to engage in SIB. The “bite necklace” protocol was left in place because it aided in the decrease of bites, but in July-August Phase 2 was implemented and an ACE bandage was wrapped around his hand and sore spot to block biting and possibly block the reinforcing texture of his hand on his teeth (and introduce the aversive texture of the ACE bandage). In July Jack’s bite frequency increased at first to 8.845 bites per hour, but then decreased in August to 4.068 bites per hour. Tutors recorded the amount of aggressive necklace bites in comparison to the total necklace bites, and it was observed that aggressive necklace bites typically only occurred when prompted; otherwise the necklace was just used to self-stimulate (Appendix B). Also, because the average behavior was decreasing but did not yet reach the threshold value of zero to two bites per hour, the treatment package had to continue to be altered accordingly.

In mid-September, a completely new protocol was introduced that was implemented based on the notion that his problem behavior was mostly escape maintained. The wrist band was removed and a Fixed-Ratio 1 (FR1) schedule was added to the bite necklace protocol which allowed Jack to take a break after every mand for one. This protocol was implemented from September 22<sup>nd</sup> to October 10<sup>th</sup> and dropped the average bite rate down to 1.34 bites per hour.

The bite necklace was taken out due to its ineffectiveness as an alternative behavior and the addition of the break schedule seemed to be an effective protocol. Researchers wanted to remove the necklace as it was being used for self-stimulation mainly, so the fourth protocol kept

the FR1 break schedule and added the hand wrap back in. Due to the increase in amount of breaks taken, there was a concern that the FR1 break schedule would impede on Jack's progress in his other procedures. Researchers then went through the data sheets of his other procedures and recorded how many trials he was able to get through both before and after the FR1 break schedule (as seen in Appendix C). The graph includes the trial data from September 8<sup>th</sup>, 2014 to October 17<sup>th</sup> 2014, and there is a phase line on September 22<sup>nd</sup> when the FR1 schedule was implemented. There was no major decrease in amount of trials completed and therefore the FR1 schedule did not seem to affect Jack's learning opportunities. However, the ACE wrist band began to evoke the target behavior if it wasn't fitted right, which lead to an increase in the average bite rate to 3.275 bites per hour.

Due to the increase in average bite rate, the fourth protocol was removed and the final protocol of this case study reverted back to the FR1 break schedule in addition to the chew necklace in late October, which is where this case study ended. The average bite rate during each protocol of this case study can be observed in Appendix D. The overall average bite rate data from both before and during this case study can be seen in Appendix E. When the ACE wrist band was removed, the bite rate increased at first to an average of 4 bites per hour, but in early November it was on a decreasing trend to an average of 2.375 bites per hour, as can be observed more clearly in Appendix F.

### **Discussion**

The results of this case study provide significant evidence that behavioral interventions can reduce the frequency of problem behavior. What behavioral interventions are best for different individuals depends entirely on the person's past contingencies and which behaviors have been reinforced in the past. Though there was a decrease in the target behavior during this case study,

the average rate of problem behavior did not decrease to zero bites per hour. There are many possible limitations in the current case study due to lack of resources available, such as internal validity because the relationship between the independent variable (what protocol was in place) and the dependent variable (rate of behavior) wasn't always clear due to other possible variables that could affect bite counts (such as sleep deprivation or environmental factors). Multiple tutors implemented bite protocols while Jack was at KAC, and though tutors were trained and educated in the protocols, multiple tutors implementing behavioral interventions poses some risks when it comes to treatment fidelity. Another limitation is that the protocols in place were not implemented at home, which may also explain the variability in the rate of behavior from day to day. This intervention was conducted his natural environment, and though tutors tried their best to ensure internal validity, there were extraneous variables that could not be controlled for.

The results obtained from this study brings light to the fact that when interventions are implemented in more contrived environments results may differ when the same interventions are put to use in applied settings. Outside of a contrived and experimental environment, there may not be enough resources to ensure complete validity of procedure implementation, and also the first protocol chosen to decrease a problem behavior may not be as effective as the researcher had hoped. This study was conducted out of concern of child diagnosed with autism, and rather than choosing one particular intervention and sticking with it, the researchers changed their intervention and methods until they found what was most effective for Jack and adjusted the protocol according to his behavioral progress.

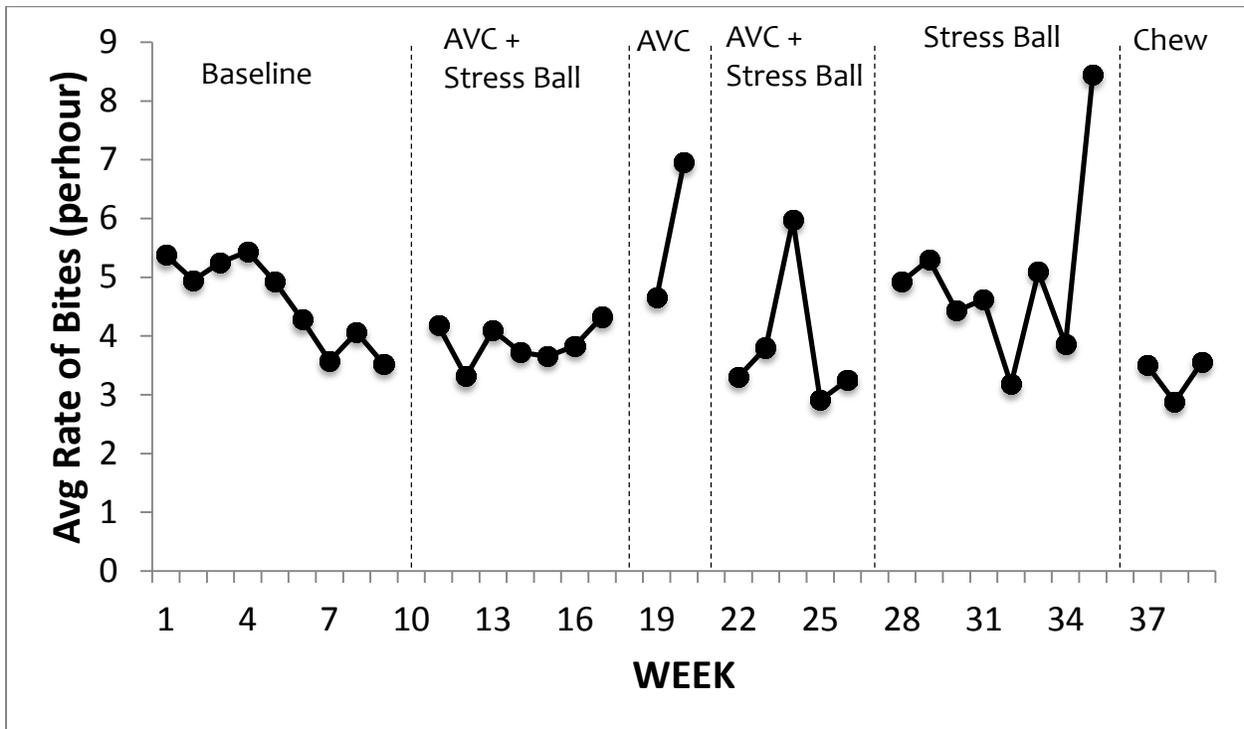
An extension of this research could include a study of why some interventions worked better than others for this particular participant, or if there is a more generalized reason for the massive amount of times the research protocol had to be adjusted. Any replications of this study

could be more controlled and take into account other interventions or activities that are ongoing, as such extraneous variables during the session may greatly impact the rate of bites. Another change to this intervention would be to use a third resource that is dedicated to strictly recording the amount of bites per hour and their possible function. It is hard to obtain accurate data when the tutors are responsible for recording the number of bites he engages in as well as why, while also implementing his school procedures and recording the results for those.

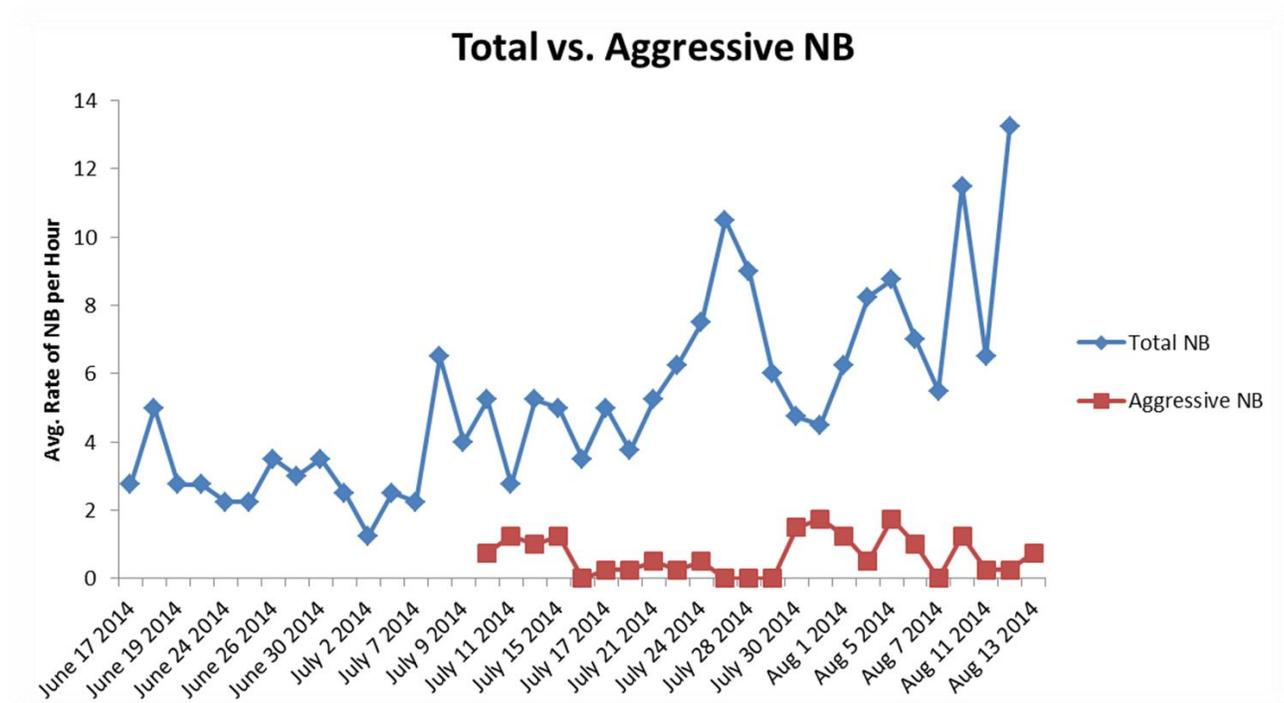
Future research for participants with similar self-injurious behavior that is multiply controlled or the function is unclear could include the addition of punishment or penalty contingencies such as time-out or the loss of a reinforcing stimulus. This would allow scholars to compare positive reinforcement contingencies, blocking, and differential reinforcement to punishment contingencies and which would be more effective. It would also be interesting to see if the variability of the rate of behavior would decrease if the environment was more consistent (this could be done by having the same person implementing the procedures and recording the data every day). This study shows that behavioral intervention can work outside of a controlled lab environment, though not as effectively as if extraneous variables were controlled for.

Appendices

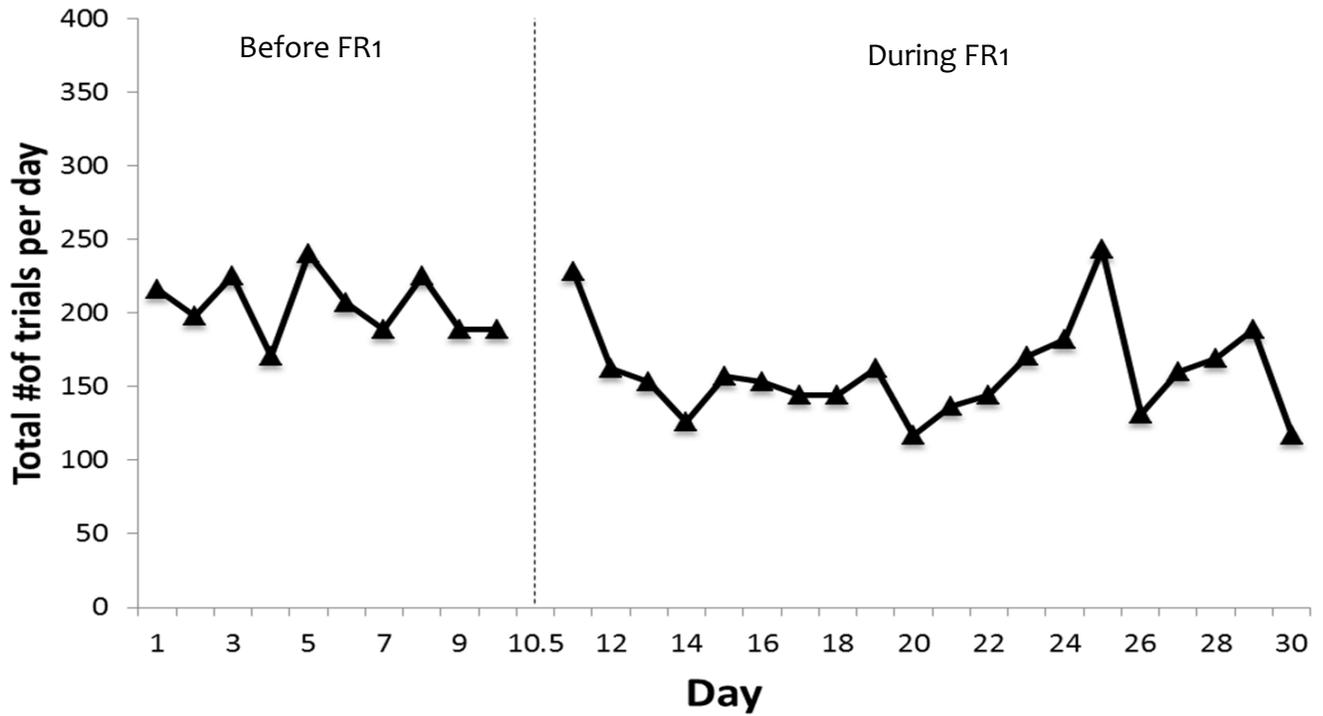
Appendix A: Graph of average bites per hour from September 2013-June 2014



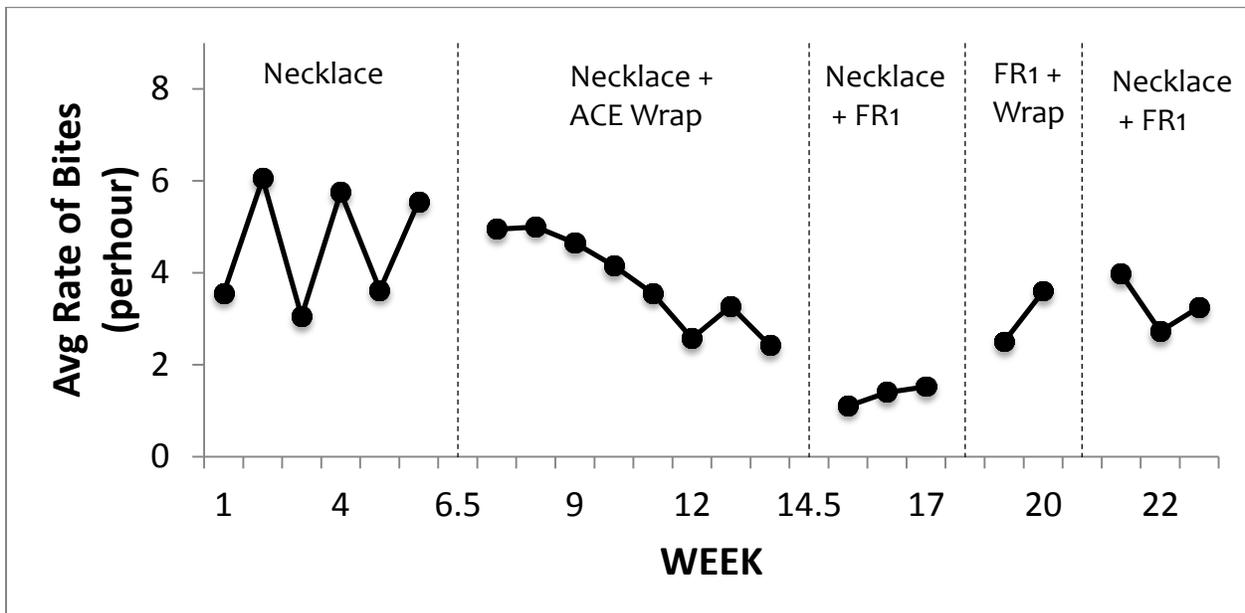
Appendix B: Total necklace bites vs. aggressive necklace bites chart



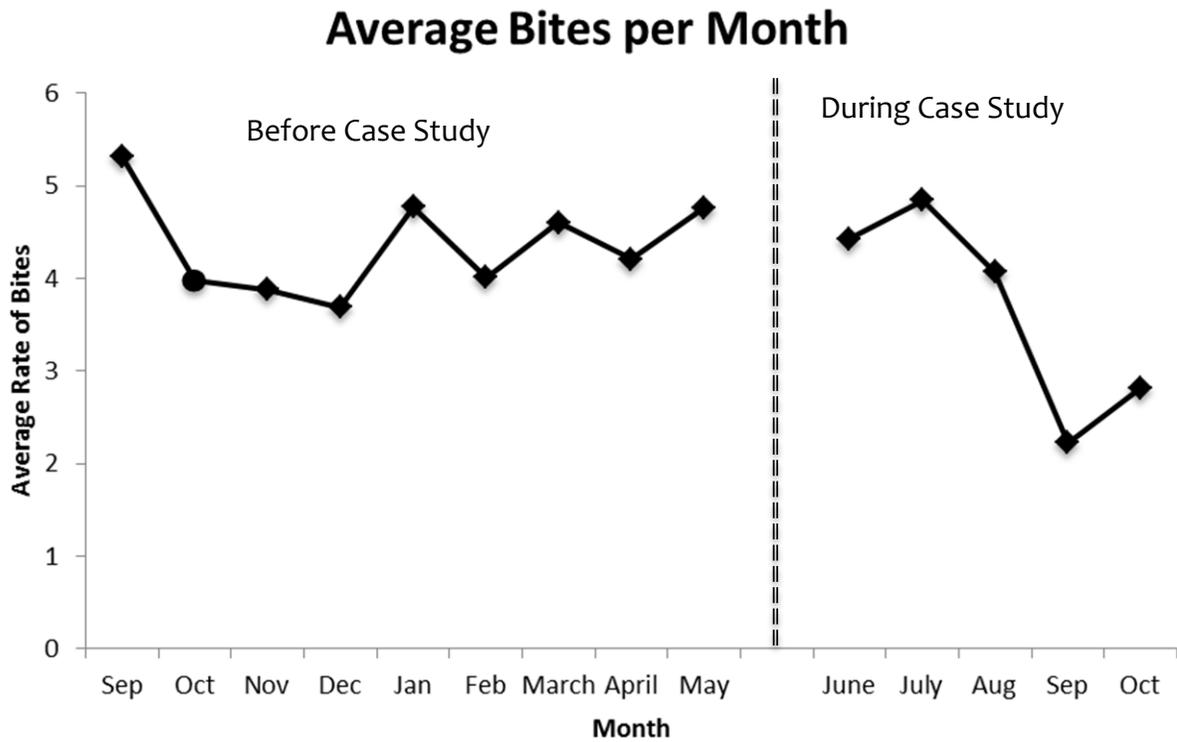
Appendix C: Graph a total trials completed per day from September 8<sup>th</sup> to October 17<sup>th</sup>



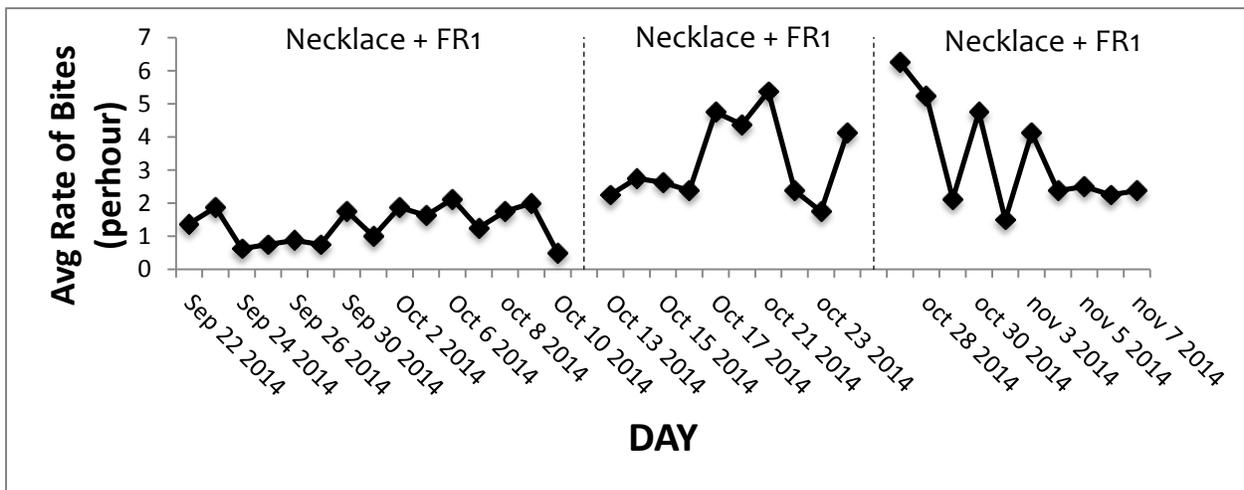
Appendix D: Average rate of bites per hour weekly for each protocol



Appendix E: Average rate of bites per month before and after this case study



Appendix F: Average rate of bites per hour during the last three protocols



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