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NAIL BITING BEHAVIOUR AND ITS TREATMENT THROUGH APPLIED BEHAVIOUR ANALYSIS: A CASE STUDY

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ABSTRACT

Objective: *The purpose of conducting this study was to establish whether nail biting behaviour could be reduced by applying various methods of Applied Behavioural Analysis. It was hypothesized that there would be a significant decrease in the number of nail biting responses after the application of Differential Reinforcement of Incompatible Behaviour in conjunction with Reinforcement and Punishment.*

Place of Study: *Karachi, Pakistan*

Research design: *Case Study*

Sample and Method: *This study was conducted on a 14 year old girl in a home environment who had started nail biting at the age of 8 years. The entire study was divided into three main phases; pre-intervention, intervention and post-intervention. These were pursued by follow-ups. Each session was observed for two hours, six days a week for 39 days. Differential Reinforcement of Incompatible Behaviour with reinforcement and punishment was used to modify the target behaviour.*

Results: *Results indicated a remarkable difference with nail biting frequency decreasing 50% in the intervention phase compared to the pre-intervention period. During the post-intervention phase, the average was higher than that of the intervention period, but it must also be noticed that the number of observed days was half the amount of that in the intervention phase. However, the post-intervention showed a positive change when compared with the baseline results. During the three follow-ups, the average nail biting occurrence decreased from 4.75 in the post-intervention, to 4.3 in the follow-ups.*

Conclusion*: The results revealed that the techniques used were successful in decreasing the target behaviour of the subject. The undesirable behaviour was modified in a home environment where the outcome supports the underlying construct of Applied Behaviour Analysis.*

Key words: *Nail biting; reinforcement; punishment; incompatible behaviour*

INTRODUCTION

Applied Behavioural Analysis (ABA) is a method used to generate socially significant improvements by means of observation, measurement and functional behaviour analysis of associations between the behaviour of an individual and his environment. It includes designing, implementing and evaluating environmental modification to help assist development. ABA focuses on the school of thought that behaviour is externally controlled rather than internally, hence, it can be changed by initially identifying the precursors of behaviour through functional analysis, then controlled accordingly[1].

Interventions of Applied Behaviour Analysis require manifestation of proceedings that certain occurrences or non-occurrences of behaviour are dependent on and examinations are done on how specific behaviours may be changed. Behaviours are evaluated within relevant settings such as home environments, school settings and the community[2].

To aid methods of ABA, certain measures are performed in order to modify behaviour. The substitution of a more appropriate behaviour in place of the target behaviour is known as Differential Reinforcement of Incompatible behaviour (DRI)[3].

Differential reinforcement (DR) is a special application of reinforcement designed to reduce the occurrence of interfering behaviors (e.g., tantrums, aggression, self-injury, stereotypic behavior).

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[1] Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behaviour analysis*. Columbus: Merrill.

[2] Baer, D., Wolf, M., & Risley, R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis, 1,* 91 - 97. Retrieved on 26th May, 2012 from http://seab.envmed.rochester.edu/jaba/articles/1968/jaba-01-01-0091.pdf

[3] Pearson, P. (1995). *Differential reinforcements.* Pearson Education. Retrieved on 25th May, 2012 from http://wps.prenhall.com/ chet_cooper _appliedbeh_ 2/73/18707 /4789 152.cw/index.html

The rationale for DR is that by reinforcing behaviors that are more functional than the interfering behavior or that is incompatible with the interfering behavior, the functional behavior will increase, and the interfering behavior will decrease[4].

Differential Reinforcements are normally applied in conjunction with other treatment programmes such as positive reinforcement, negative reinforcement, token economy and response cost. Reinforcement refers to any stimulus which strengthens or increases the probability of a specific response. Punishment refers to adding something aversive in order to decrease a behavior[5].

ABA procedures have shown effectiveness in the treatment of various problems including nail biting which according to former researches effects 28% to 33% of children ages 7-10 years old, 44% of adolescents, 19% to 29% of young adults, and 5% of later adults.

The most common trigger of this habit according to the study seems to be stress or anxiety. A study of a 32-year-old woman showed that anytime she felt overwhelmed, apprehensive, nervous, or worried because of her performance in graduate school or in relation to future goals, she bit her nails[6].

Other researches state that nail biting is due to extreme boredom and stress and those who persistently bite their nails could also suffer from poor self-image. Further than stress, boredom and anxiety; lack of self-esteem, attention-seeking, oral gratification and Obsessive-Compulsive disorder have also been identified by psychological and medical studies as nail biting prompters[7].

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[4] Bogin, J., & Sullivan, L. (2009). *Overview of differential reinforcement of other behaviors.* Sacramento, CA: The National Professional Development Center on Autism Spectrum Disorders, M.I.N.D. Institute, University of California at Davis School of Medicine.

[5] Skinner, B. F. (1953). *Science and human behavior.* New York: Macmillan.

[6] McClanahan, T. M. (1995). *Psychology of nail biting.* Retrieved on 25th May, 2012 from http://www.nailsmag.com/article/40814/Psychology-of-a-Nail-Biter

[7] Dahmes, R. (1996). *Psychology of nail biting.* Retrieved on 26th May, 2012 from http://www.nailsmag.com/article/40814/Psychology-of-a-Nail-Biter

A study was conducted on functional analysis and treatment of nail biting by using methods of Applied Behaviour Analysis on a 24 year old female graduate student. Results from functional analysis showed a variable difference in nail biting across multiple assessment conditions. Results of the programme showed that there was a remarkable decrease in the behaviour. This was proved by visible and consistent nail growth along with the subjects' self-recorded data[8].

Keeping the above mentioned literature review showing effectiveness of ABA methods for the treatment of nail biting; present study has been designed using an extensive approach to Applied Behaviour Analysis based on Differential Reinforcement of Incompatible Behaviour with Reinforcement and Punishment.

CASE STUDY

History and Presenting Complaints

SS is a 14 year old student. She is currently in class 10 and has 2 sisters. She was born a normal birth with no developmental disabilities and is the youngest of her siblings. Her milestones were age appropriate.

The subject reported that she has been biting her nails since the age of 8 years. She stated that she initially began to bite her nails under stressful circumstances. Now it has become a habit, she bites them unconsciously. She reported that her nail biting frequency increases during her exam period, submission of assignments and in public speaking events.

She stated that she is very annoyed by her nail biting habit. She tries very much to stop herself but has not been able to maintain her attempt. She has always wanted to grow her nails because she likes applying nail polish.

The subject's parents are also quite irritated by this habit and always stop her from biting her nails whenever she bites them in front of them.

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[8] Brad A. Dufrene, T. Steuart Watson & Jennifer S. Kazmerski. (1999). *Applied functional analysis methodology to nail biting.* Retrieved on 26th May, 2012 from http://bmo.sagepub.com/content/32/6/913.short

After evaluation of various aspects, it was concluded that the behaviour was significant enough for the application of behaviour modification.

This behaviour of the subject was of major concern to both parents as they stated that they believe her nail biting habit may perhaps be the reason behind her stomach upsets and other hygiene concerns. Also, biting of nails was reported by the mother as looking atrocious when done in social gatherings.

Due to the above mentioned reasons, this behaviour was chosen as the target behaviour.

Measures

A demographic information form was used to gather information from the subject with nail biting behaviour. The form covered demographic characteristics, such as name, age, date of birth, birth order, parental information etc. A consent form was used in order to acquire permission from the subject's parents to conduct this study. The reinforcers that were utilized in this study were evaluated using the reinforcement performa and various reinforcers were made use of. A chart was used by the therapist in order to record the number of nail biting responses of the subject.

Treatment Strategies

This study was carried out in a home setting where the therapist met the subject for 2 hours, six days a week, except Sunday's. All preparations were made from beforehand. Observational sessions were held from 6-8pm. These days and timings were communally decided between the therapist and the subjects' parents. The time was set constant in order to rule out any intervening confounding variable which may have an effect on the results of the study due to variation of time. The true rationale for the observation was hidden from the subject to avoid subject biasness. This would in turn cause errors, leading to misleading results.

Pre-Intervention
Identification and Measurement of Responses

Ten days were allocated for the pre-intervention phase where the baseline was set. The therapist observed the subject six days a week for two

hours. This observation was made so that the therapist could assess the target behaviour and establish the habit frequency level before applying any treatment programme. Another goal achieved through observation sessions was the identification of any controlling variables in the subjects' environment which could assist the behaviour that needed to be changed.

During this phase, the target behaviour being measured was nail biting. Nail biting, also known clinically as chronic Onychophagia, is a compulsive habit of biting ones fingernails or toenails[9]. In this study, the measurement was only restricted to fingernails. The method used to measure this behaviour was the number of times the subject bought her hands towards her mouth and bit her nails in the time duration of one observational session. Each observation was noted down by the therapist and the observations were totalled at the end of each observational session. At the end of the 10 days pre-intervention period, the average was taken out in order to distinguish how much the participant engaged in the target behaviour on average every day.

Intervention

Intervention was the dynamic phase of the study. In this phase, the therapist began implementation of the treatment programme.

The therapist arbitrated in the target behaviour and tried to bring a noticeable change in the subjects' undesirable conduct.

The technique that was chosen in order to modify the subjects' behaviour encompassed differential reinforcement of incompatible behaviour (DRI) with reinforcement and punishment. The purpose of using DRI was to reduce the nail biting behaviour of the subject and reinforcement along with punishment was used for the stipulation of the consequences.

Before beginning the treatment programme, the subject was given a very simple explanation on how the reinforcements would be used. The subject was told that for every two days, if a decrease of five or more in the number of nail bites was seen, she would be granted a reward. If however, there was no reduction in the habit, she would receive something dislikeable.

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[9] Pacan, P., Grzesiak, M., Reich, A. & Szepietowski, J. C. (2009). Onichophagia as a spectrum of obsessive-compulsive disorder. *Acta Derm Veneral, 89,* 278-280.

Competing Response Training

The following DRI activities were included in the treatment plan in order to help the subject in controlling her inclination towards nail biting. Incompatible hand gestures were identified by the subject herself. The mother and sisters of the subject accommodated the DRI in the absence of the therapist.

DRI Activities
▪ Twiddling fingers in circles every time she would have an urge to bite her nails. ▪ Playing with objects such as bangles, rings and rubber bands when sitting idle or when watching television. ▪ Cutting vegetables while watching television. ▪ Having lunch while watching television**.**

DRI was done on a fixed ratio schedule, where the DRI time would increase every three days. At the end of each three-day observation, if the subject managed to refrain from biting her nails in the given time, she would be rewarded with a reinforcer. As per the following table:

Days	**Minutes Increased**
1-3	5
4-6	10
7-9	15
10-12	20
13-15	25
16-18	30

Reinforcement and Punishment

The subject labelled herself as a movie devotee which is why this was chosen as a reinforcer in her treatment programme. According to the subject and her parents, she dislikes documentaries and finds them extremely boring, which

is why it was chosen as a punishment. Which were decided to be given after every two days observation.

Behaviour	Consequences
Decrease in nail biting	Reinforcements ▪ Movies (of her choice) ▪ Nail Polish ▪ Positive words and statements ("*good girl*", "*I'm so proud of you*" and "*very good*") ▪ Movie at the cinema (at the end of the treatment program)
No change or increase in nail biting	Punishments ▪ Documentaries ▪ Summary of Documentaries

Post Intervention

The post-intervention phase lasted for a period of 8 days. During this phase, the therapist reverted back into her observation mode like in the pre intervention phase, where the subject was being observed for two hours every day. This observation was done in order to monitor the improvements achieved through the treatment programme and to distinguish whether those changes were being maintained or not after the procedure had been terminated.

Follow-ups

After a gap subsequent to the post-intervention period, three follow-up sessions were done by the therapist. The first follow-up was done on the fourth day after post-intervention, the second follow-up was done on the seventh day and the third one was done on the tenth day. These were done to observe whether the results of the subjects' behaviour have been generalized after the treatment programme had been concluded.

RESULTS

Table 1
Baseline Observations
Total number of days the subject was observed and the total number of nail biting responses per day

Days	*Nail Biting Responses*
1	13
2	11
3	6
4	10
5	12
6	7
7	5
8	10
9	14
10	8
Average	9.6

Table 2
Intervention
Table showing the number of nail biting responses during the intervention phase of the study

Days	*Number of Nail-Biting Responses*
1-2	4
3-4	7
5-6	6
7-8	10
9-10	5
11-12	2
13-14	0
15-16	2
17-18	2
Average	2.1

Table 3
Post-Intervention
Table showing the number of nail biting responses in the post-intervention phase

Days	***Number of times nails were bitten***
1	5
2	4
3	4
4	6
5	4
6	5
7	7
8	3
Average	4.75

Table 4
Follow-ups
Table showing the number of nail biting responses during follow-up sessions

Days	***Number of times nail bitten***
1	4
2	3
3	6
Average	4.3

DISCUSSION

The purpose of this study was to eliminate or reduce an undesirable behaviour; which in this context is nail biting. It used competency of different techniques based on Applied Behavioural Analysis to decrease the target behaviour. After a complete treatment programme, the results proved to be highly successful.

Throughout the pre-intervention phase, it was noted that the subject indulged in nail biting very regularly. This occurred mainly when she was anxious or bored. While watching television, her target behaviour continued

through automatic reinforcement and was done repeatedly on an unconscious level. Whilst bored, the subject behaviour was perhaps maintained for self-stimulation or perfectionism. When interviewed by the therapist, the subject revealed that whilst she would love long nails, upon which she could apply nail polish, she is irritated by uneven nails. She continues to bite them to maintain their uniformity. This behaviour needed correcting as it had resulted in the subject being socially criticized and embarrassed in public. Also, subsequent health problems became an issue for both the subject and her parents.

Recurring digestive problems became a great concern to the subject's parents, who referred her to several doctors and specialists. The nail biting habit was cited as the main cause. The parents tried to stop the habit in several ways, including the application of a bitter nail varnish on the subject's nails. They also tried covering the subject's nails with band-aid plasters; which initially worked but soon became ineffective.

After analyzing this entire case, it was concluded that her attempts at not biting her nails would be strengthened through reinforcement and punishment.

The baseline results show that the subject bit her nails frequently. Daily observation showed her nail biting activity was very high. The highest responses of nail biting were observed on the ninth day, due perhaps to increased anxiety for a math test to be given the following day. The least responses were observed on day seven. This day was a Saturday and the subject was excited about attending a family dinner. As she happily narrated the evening plans to her therapist, the subject bit her nails very little due to excitement and an automatic role of incompatible behaviour i.e. talking.

On completion of the pre-intervention period and analysis of the results, a fixed interval DRI schedule was followed as a part of the treatment intervention programme. DRI is used to increase appropriate behaviour[10] which in this case was not biting nails.

It also allows one to exert maximum amount of control over the undesired target behaviour without intervening directly on the undesired

[10] Kerr, M. M., & Nelson, C. M. (1998). *Strategies for managing behavior problems in the classroom*. Upper Saddle River, NJ: Prentice-Hall.

behaviour[11]. This technique was successful. Nail polish as a reward strengthened appropriate behaviour and decreased the target behaviour.

To obtain maximum results, reinforcement and punishment was used in correlation with DRI. Since the parents did not allow a movie every day, it was

agreed that the subject could watch one every other day, provided a decrease is seen in the target behaviour.

DRI was applied during breaks where the subject was reinforced with one nail polish every three days if she attained the desired result. No reinforcement was given if no positive change was seen.

Having selected and applied DRI, the results showed a significant decrease in the target behaviour, by over 50%, in comparison to the pre-intervention phase. The reinforcers used throughout the treatment programme had proved stronger than the target behaviour.

The parents were extremely happy with the results. Constant positive reinforcement from the family played an important part in the treatment plan, and the incentive of receiving nail polish and movies significantly decreased the target behaviour. The subject acquired better self esteem as well as positive responses from friends and family. She took better care of her nails and enjoyed applying nail polish.

Results showed double the average in the post-intervention than the intervention phases. It should be noted that observation days were cut by half in the latter phase. However, in comparison to the baseline average, the post-intervention shows a decrease in the target behaviour by approximately half. Although the subject still struggles to resist the habit, she is keen to maintain the positive change.

On completion of treatment, the fixed schedule reinforcement DRI was discontinued. The parents continued to reward the subject on a variable schedule. Positive responses from friends and family encouraged further positive outcomes. Follow-up sessions with the therapist revealed a substantial decrease in the target

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[11] LaVigna, G. W., & Donnellan, A. M. (1986). *Alternatives to punishment: Solving behavior problems with non-aversive strategies*. New York: Irvington Press.

behaviour. The parents had maintained reinforcement on a variable schedule with rewards and positive statements.

The implications of these techniques for similar maladaptive behaviours encompass not just tangible positive reinforcements and incentives, but also promote encouragement and support to the subject when they are NOT engaging in the undesirable behaviour. Further implications could include highlighting the subject's achievements in public rather than focusing on the bad habits.

The results have exposed the effectiveness of the techniques as a method of Applied Behaviour Analysis.

Limitations

In this case study there is low generalizability of the research due to its nature. Since the study was conducted in a home setting, there may be a probability of confounding variables like lack of control over extraneous variables.

Although parental involvement is positive for the success of the therapy, it can also be a disadvantage. As the therapist is not present the entire time, the parents may show negligence in observation and DRI. This could lead to manipulated results.

Conclusion

The 39 days treatment programme was designed to decrease nail biting responses of a 14 year old girl, using differential reinforcement of incompatible behaviour with reinforcement and punishment. The results in this study reveal that these techniques were successful in decreasing the target behaviour of the subject. The undesirable behaviour was modified in a home environment where the outcome supports the underlying construct of Applied Behaviour Analysis and successfully reveals the efficacy of the techniques.