Journal of Social Sciences and Humanities
Vol. 5, No. 3, 2019, pp. 108-116
http://www.aiscience.org/journal/jssh
ISSN: 2381-7763 (Print); ISSN: 2381-7771 (Online)

The Effect of Positive and Negative Reinforcement on Stress, Anxiety, Confidence, Mood and Short Term Memory Among Medical Students

Lim Yu Ern, Fathima Shamla Mohammed Ziyamdeen*, Sabryne bt Mohd Zeidi, Narmatha a/p Tamilselvan, Vicknesh Waren a/l Mohan

Faculty of Medicine, Melaka Manipal Medical College (Manipal Academy of Higher Education), Melaka, Malaysia

Abstract

The aim of this research is to study the effect of positive and negative reinforcement on stress, anxiety, confidence, mood and short term memory among MMMC students. In this study, 60 participants were randomly assigned into two groups, out of which 30 were assigned into the positive reinforcement group and the other 30 into the negative reinforcement group. The planned intervention specific to each group was applied and the participants were asked to read and answer a comprehensive text for assessment of short term memory. Upon completion of it, the participants were given the post–intervention questionnaire. Finally, the participants were asked to fill a feedback form before leaving the room. The mean score for each variable and mean % for memory score was calculated using Epi info version 7 and Graph pad and the results were compared between the positive and negative reinforcement group. After application of the intervention, mean anxiety score was significantly higher, in the negative reinforcement group and significantly lower in the positive reinforcement group, with a mean of 6.5 and 4.6, respectively. All other variables also showed an increase following negative reinforcement but was not significant. However all the variables showed a significant change following positive reinforcement, with the highest change seen in mood with a score of 7.0. In conclusion, positive reinforcement has reduced the stress and anxiety level, increased the confidence level and improved the mood significantly. Whereas, negative reinforcement has increased the stress level and anxiety, and had no significant changes in mood and confidence. Students also prefer positive reinforcement over negative reinforcement. In conclusion, positive reinforcement has a better effect on reducing stress, anxiety and improving mood, confidence and short term memory.

Keywords

Positive Reinforcement, Negative Reinforcement, Stress, Anxiety, Confidence, Mood, Short Term Memory, Medical Students

Received: January 24, 2019 / Accepted: March 26, 2019 / Published online: May 31, 2019

1. Introduction

Reinforcement is an operant conditioning term that refers to a process by which the likelihood of a behaviour occurring is increased either by giving a pleasant stimulus or by removing an unpleasant stimulus.[1] Reinforcement can be further divided into: Positive reinforcement and Negative reinforcement.

Positive reinforcement is when a desired stimulus results in the subject to increase their behaviour in order to repeat those reinforces. Negative Reinforcement is when a desired stimulus results in the subject to increase their behaviour in

* Corresponding author
E-mail address: lye.323@hotmail.com (L. Yu Ern), Shamla01@hotmail.com (F. S. M. Ziyamdeen), sabryne_zeidi@yahoo.com (S. bt M. Zeidi), narmathat96@gmail.com (N. a/p Tamilselvan), vicky9595@rocketmail.com (V. W. a/l Mohan)

order to avoid those reinforces. [1] Negative reinforcement strengthens, not weakens, behaviour. [2] Hence, both types of reinforcement aim to increase the rate of behaviour. A reinforcer is the stimulus that is involved in the process of reinforcement. [1]

Ever since the findings of reinforcement theory was published, it has been extensively studied and applied to decrease the frequency of undesired behaviour and increase the frequency of desired behaviour. It's been applied in treatment of escape maintained behaviour seen in Autistic children, [3] treatment of self-injurious behaviour [4] has shown positive results by improving cognition in children with ADHD [5] and in the treatment of anxiety and depression. [6]. Previous study has also been done on Nicotine addiction and withdrawal by applying positive reinforcement and transitioning it with negative reinforcement. [7] One other research has also been done by combining both positive and negative reinforcement, which showed an increased effect on decreasing problem behaviour and increasing task compliance. [8-10] Another research showed students of trained teachers, who learnt to implement reinforcement effectively, outperformed control students. [11] Several other studies also have been done to find out about the effect of reinforcement by teachers and their students' academic performances. [12-15] However, these studies have school going children as their population and it hasn't been extended in university students.

Reinforcement can be used to teach new skills, teach a replacement behaviour for an interfering behaviour, increase appropriate behaviours, or increase on-task behaviour. Furthermore, the application of reinforcement has brought about, several improvements in the classroom settings. According to a study, students who were positively enforced to keep up the good behaviour were the students who most likely learned to self-monitor themselves in their learning environments. Students, and teachers commented during a study that the students' behaviour was more acceptable when the 'wanted' behaviour was encouraged. [16]

In the setup of a medical college, it is evident that the students are under constant stress, anxiety, confidence issues, mood and problems in memory. They overcome the stress by adopting various methods of stress relief. However, we may assume that these can be further overcome, or dealt better with, if reinforcement towards desired behaviours are employed. To simply eliminate the undesirable behaviour, which is the stress, anxiety, decreased confidence, mood and low memory, is not sufficient unless reinforcement is provided for the desired behaviour. [17]

Previous research has been done to test the use of positive reinforcement training techniques to enhance the care, management and welfare of primates in the laboratory. It showed diminished stress on the primates, enhanced flexibility and reliability in data collection, and a reduction in the use of anesthesia as procedures were easier to perform on the animals as a result of their decreased stress following the reinforcement. [18]. Also previous research has been carried out to analyze the utility of reinforcement procedures in cross-species analysis of behavior to bridge the methodological gulf separating research with humans from that with other animals. [19] However, similar studies have not been experimented on humans as of recent.

Also, a previous study have shown that verbal reinforcement in an interview situation can produce a genuine effect upon attitude. [20] Essentially reinforcement can be applied in a variety of situations and conditions, which increases the scope for more research on it.

In our research, the desired behaviour we want to achieve would be the decrease in stress and anxiety, improvement in mood, increase in memory and confidence following the reinforcement intervention. Positive and negative reinforcement in the form of motivation and demotivation respectively could possibly alter the stress and anxiety that is associated with a cognitive task, and also have an impact on their confidence level and mood.

Studies have been conducted on the various behaviours of children with autistic spectrum disorders, ADHD (Attention deficit hyperactivity disorder), and other disabilities and, reinforcement has shown significant results in them such as by reducing their problem behaviour. [3, 4] However, there hasn't been sufficient research conducted on normal children or medical students specifically. Also, previous studies do not encompass all the factors we intend to study in a single research. Bulk of the literature and knowledge about reinforcement is derived from animal studies in simple task situations [21-23] and, from human studies but in which limited behavioural processes are studied. Therefore, we aim to explore this void, comprising all of the above mentioned factors and test the effect of reinforcement on medical students through our research study.

We aim to contribute to the body of literature by providing an improved understanding of how reinforcement affect the stress, anxiety, confidence, mood and short term memory. In this research we hypothesize, that positive reinforcement brings about a decrease in stress and anxiety, improvement in a student's mood and confidence and may consequently, positively influence short term memory. [24]

2. Methodology

This study was conducted with a pilot randomised controlled

trial design to study the effects of positive and negative reinforcement on stress, anxiety, confidence and short term memory among medical students.

The study was conducted at Melaka Manipal Medical College (MMMC), Muar Campus, Johor, Malaysia. The student population of 300 students comprised into 2 batches (Batch 38 and 37) of 3rd and 4th year MBBS students only. The duration of our study was from October to December 2018.

The inclusion criteria included students of any age, gender, ethnicity and those who were provided a written informed consent. The exclusion criteria omitted out students who had a depressive disorder, who slept for less than 5 hours the previous night, were on any medication that had a sedative property, and who had consumed 4 or more cups of caffeinated drinks in the past 24 hours.

This study was conducted with a pilot randomised controlled study in which a total sample size of 60 participants was decided upon. As these 60 participants were volunteers, the sampling method in our research study was the non-probability sampling method.

These 60 participants were randomized into 2 equal groups, by using the software Research Randomizer (https://www.randomizer.org). The type of randomization used was block randomization with block size 2, which helped to categorise 30 participants into group 1 (positive reinforcement group) and another 30 participants into group 2 (negative reinforcement group).

The positive and negative reinforcement group were gathered into two different classrooms. Initially, screening was carried out through the use of a questionnaire in order to apply the exclusion criteria. Following successful screening, a pre-intervention questionnaire was given to all the participants. Afterwards, the planned intervention specific to each group was applied and the participants were asked to read and answer a comprehensive text for assessment of short term memory. A total of 10 minutes was allocated, and upon completion of it, the participants were given the post –intervention questionnaire. Finally, the participants were asked to fill a feedback form before leaving the room.

For positive reinforcement, the actions carried out included verbal motivation prior to the memory test ("All the best and do well), reassurance by telling them about the simplicity of the test ("The questions are easy and high scores have been achieved by previous students") and a promise of a reward was made provided their memory test score exceeds 70% or more. These reinforcements were chosen due to their possible immediate effect and how much they would motivate students.

For negative reinforcement, the actions carried out included verbal demotivation prior to the test, briefing of the difficulty of the memory test ("The questions are really difficult and tricky to answer"), and they were informed of a potential consequence if they scored poorly (<70%), which was to stay back an additional 30 minutes to perform another test.

These reinforcements were chosen due to their possible immediate effect and how much they would motivate and demotivate the students.

Both groups were given the same amount of time (10 minutes) to complete the memory test, and were both given basic instructions prior to the test.

The pre and post intervention questionnaire which consisted of scales to assess their current stress, anxiety, and confidence level was collected. It comprised of questions to which the answer chosen was on a Likert scale that ranged from 0-10. Following the intervention, the memory test was conducted in which the participants had to read through a comprehensive text and answer 8 MCQ questions within a total of 10 minutes. Each question carried a score of 1 mark. The answer sheets were then collected, and afterwards, the post intervention questionnaire was handed out, for assessment of the after effect of intervention and the data was collected. Whilst the participants completed their questionnaires, the memory test answers were marked by 5 of the examiners conducting this study. Finally, feedback forms were given and collected as well.

Data collected from the questionnaire was keyed in to Microsoft Excel. All the data was reviewed and analysed using Epi Info™ version 7 from Centres for disease control and prevention website (CDC). For the dependent variables (Stress, anxiety and confidence), the mean score and standard deviation was calculated. For short term memory, also another dependent variable, the mean % score and it's standard deviation was obtained. The dependent variables such as stress, anxiety and confidence will be compared before and after intervention using paired t-test. Unpaired t-test was used to compare between positive and negative reinforcement for all the outcome measures (Stress, anxiety, confidence, and short term memory score).

All participants in this study were involved, as a result of voluntary participation. Prior to the intervention, all participants were given a written informed consent form which explained all the pertinent details of the study. It also guaranteed their confidentiality and provided them with the freedom of choice to leave the study whenever they wish to. This study was approved by the Research Ethics committee, Faculty of Medicine, MMMC.

3. Results

Table 1. Characteristics between positive (n=30) and negative reinforcement (n=30).

Variables		Frequency (%)	
		Positive reinforcement (n=30)	Negative reinforcement (n=30)
Gender	Male	14 (46.7%)	16 (53.3%)
	Female	16 (53.3%)	14 (46.7%)
Ethnicity	Chinese	12 (40.0%)	10 (33.3%)
	Indian	9 (30.0%)	15 (50.0%)
	Malay	3 (10.0%)	4 (13.3%)
	Others	6 (20.0%)	1 (3.3%)
Age[a]		22.3 (0.9)	22.3 (0.6)

[a]Mean (SD)

Interpretation:

There were a total of 60 participants who took part in our study. Out of 60, there was a total of 14 (46.7%) males in the positive reinforcement group and 16 (53.3%) in the negative reinforcement group. Whilst, there was a total of 16 (53.3%) females in positive reinforcement and 14 (46.7%) in the negative reinforcement. For ethnicity, the highest number of participants in the positive reinforcement were Chinese with 12 (40%) of them, followed by 9 Indians (30%), 6 other nationalities (20%) and 3 Malays (10%). The negative reinforcement group had the highest number of Indians with 15 (50%) of them, followed by 10 (33.3%) of Chinese, 4 (13.3%) Malays, and 1 (3.3%) of other nationalities. The mean age of the participants was 22.3.

Table 2. Pre intervention of stress, anxiety, confidence and mood between positive (n=30) and negative (n=30) reinforcement.

Variables	Mean (SD)		Mean differences (95% CI)	t-Statistic (df)	P-value
	Positive (n=30)	Negative (n=30)			
Stress	5.4 (1.9)	6.3 (2.4)	-0.8 (-2.0, 0.3)	-1.5 (58)	0.142
Anxiety	4.8 (2.2)	4.6 (2.9)	0.2 (-1.1, 1.5)	0.3 (58)	0.764
Confidence	5.7 (1.7)	5.4 (1.9)	0.3 (-0.6, 1.2)	0.7 (58)	0.520
Mood	6.2 (1.8)	5.9 (2.1)	0.2 (-0.8, 1.2)	0.5 (58)	0.644

Interpretation:

Unpaired T-Test

Before intervention the mean stress score in negative reinforcement group which is 6.3 was higher compared to the positive reinforcement group which is 5.4 with a non-significant P-value of 0.142. The mean anxiety score in the positive reinforcement group is higher which is 4.8 compared to negative reinforcement group which is 4.6 with a non-significant P-value of 0.764. The mean confidence score is higher in the positive reinforcement group which is 5.7 compared to negative reinforcement group which is 5.4 with an insignificant P-value of 0.520. The mean mood score is higher in the positive reinforcement group which is 6.2 compared to negative reinforcement group which is 5.9 with an insignificant P-value of 0.644.

Table 3. Post intervention of stress, anxiety, confidence, mood and memory between positive and negative reinforcement.

Variables	Mean (SD)		Mean differences (95% CI)	t-Statistic (df)	P-value
	Positive (n=30)	Negative (n=30)			
Stress	4.6 (2.4)	6.5 (2.5)	-1.9 (-3.2, -0.6)	-3.0 (58)	0.004
Anxiety	4.1 (2.2)	5.3 (3.0)	-1.3 (-2.6, 0.1)	-1.9 (58)	0.066
Confidence	6.6 (2.0)	5.7 (2.2)	0.8 (-0.3, 1.9)	1.5 (58)	0.135
Mood	7.0 (2.0)	6.3 (2.2)	0.6 (-0.4, 1.7)	1.2 (58)	0.234
Memory	77.1 (20.3)	73.8 (20.3)	3.3 (-7.2, 13.8)	0.6 (58)	0.527

Interpretation:

Unpaired T-Test

After intervention the mean stress score in negative reinforcement is higher which is 6.5 compared to positive reinforcement which is 4.6 with a significant p value which is 0.004. The mean anxiety score in negative reinforcement group is higher which is 5.3 compared to the positive reinforcement group which is 4.1 with an insignificant p value of 0.066. The mean confidence score in positive reinforcement is higher which is 6.6 compared to negative reinforcement which is 5.7 with an insignificant p value of 0.135. The mean mood score in positive reinforcement is higher which is 7.0 compared to negative reinforcement which is 6.3 with an insignificant p value of 0.234. The mean percentage of memory score in positive reinforcement is higher which is 77.1 compared to negative reinforcement which is 73.8 with an insignificant p value of 0.527.

Table 4. Effect of positive reinforcement on stress, anxiety, confidence and mood pre and post intervention.

Variables	Mean (SD)		Mean differences (95% CI)	t-Statistic (df)	P-value
	Pre-intervention (n=30)	Post-intervention (n=30)			
Stress	5.4 (1.9)	4.6 (2.4)	0.9 (0.2, 1.5)	2.8 (29)	0.009
Anxiety	4.8 (2.2)	4.1 (2.2)	0.7 (0.1, 1.4)	2.5 (29)	0.018
Confidence	5.7 (1.7)	6.6 (2.0)	-0.8 (-1.3, -0.4)	3.7 (29)	<0.001
Mood	6.2 (1.8)	7.0 (1.9)	-0.8 (-1.2,-0.4)	4.0 (29)	<0.001

Interpretation:

Paired T-Test

In positive reinforcement the mean stress score was significantly decrease following intervention. The mean stress score pre-intervention was 5.4 and post-intervention was 4.6 with a significant p-value of 0.009. The mean anxiety score also significantly decrease following intervention with a mean value of 4.8 in pre-intervention and mean value of 4.1 in post-intervention with a p-value of 0.018. Post-intervention showed an improvement in both confidence and mood score. The mean confidence score following positive reinforcement was higher (6.6) compared to pre-intervention (5.7) with a p-value <0.001. The mean mood score following intervention was higher (7.0) compared to pre-intervention (6.2) with a p-value <0.001.

Table 5. Effect of negative reinforcement on stress, anxiety, confidence and mood pre and post intervention.

Variables	Mean (SD)		Mean differences (95% CI)	t-Statistic (df)	P-value
	Pre-intervention (n=30)	Post-intervention (n=30)			
Stress	6.3 (2.4)	6.5 (2.5)	-0.2 (-0.8, 0.4)	0.7 (29)	0.483
Anxiety	4.6 (2.9)	5.3 (3.0)	-0.7 (-1.3, -0.1)	2.2 (29)	0.032
Confidence	5.4 (1.9)	5.7 (2.2)	-0.3 (-1.1, 0.5)	0.8 (29)	0.445
Positive Mood	5.9 (2.1)	6.3 (2.2)	-0.4 (-1.0, 0.2)	1.4 (29)	0.184

Interpretation:

Paired T-Test

In negative reinforcement group, all the variables showed an increase following intervention. The mean stress score was higher post-intervention (6.5) compared to pre-intervention (6.3) with an insignificant p-value of 0.483. The mean anxiety score was higher post-intervention (5.3) compared to pre-intervention (4.6) with a significant p-value of 0.032. The mean confidence score was higher post-intervention (5.7) compared to pre-intervention (5.4) with an insignificant p-value of 0.445. The mean mood score was higher post-intervention (6.3) compared to pre-intervention (5.9) with an insignificant p-value of 0.184.

Feedback Analysis

Table 6. Performance level.

	Positive Group (%)	Negative Group (%)	X^2	P Value
Very Poor	1 (3.33)	1 (3.33)		
Poor	4 (13.33)	5 (16.67)		
Well	18 (60.0)	16 (53.33)	0.295	0.961
Very Well	7 (23.33)	8 (26.67)		

Interpretation:

According to the feedback by the participants, in positive group, 1 (3.33%) person thought they did very poorly, 4 (13.33%) of them thought they did poorly, 18 (60.0%) of them thought they did well and lastly 7 (23.33%) of them thought they did very well in the short term memory test. On the other hand in negative group 1 (3.33%) person thought they did very poorly, 5 (16.67%) thought they did poorly, 16 (53.33%) of them thought they did well and finally 8 (26.67%) of them thought they did very well in the short memory test. The Chi-square value is 0.295 which is less than 3.841 and the p value is 0.961 which is more than 0.05, hence this shows that there is no significant association between reinforcement and the performance level.

Table 7. Difficulty Level.

	Positive Group (%)	Negative Group (%)
Very Difficult	0 (0.00)	2 (6.67)
Difficult	4 (13.33)	3 (10.00)
Moderate	13 (43.33)	13 (43.33)
Easy	5 (16.67)	8 (26.67)
Very Easy	7 (23.33)	4 (13.33)

Interpretation:

Based on the feedback given by the participants, in the positive group there was 0 (0.00%) person found that the questions were very difficult, 4 (13.33%) of them found that the questions were difficult, 13 (43.33%) of them found the questions were moderate, 5 (16.67%) of them found the questions were easy and 7 (23.33%) of them found that the questions were very easy to answer. Besides on the negative reinforcement group, there were 2 (6.67%) person found that the questions were very difficult to answer, while 3 (10.00%) found that the questions were difficult, 13 (43.33%) of them found that the questions were moderate which means it was moderate, 8 (26.67%) of them found the questions were easy and finally 4 (13.33%) of them found the questions were very easy to answer.

Table 8. Time sufficiency.

	Positive Group (%)	Negative Group (%)
Insufficient	3 (10.00)	6 (20.00)
Sufficient	27 (90.00)	24 (80.00)

Interpretation:

Based on the feedback received from the participants, in the positive reinforcement group 3 (10.00%) of them found that there was insufficient time to read the text and answer the questions. However the majority of them which is 27 (90.00%) of the participants found that the time given to read and answer the questions was sufficient. On the other hand, in the negative reinforcement group, 6 (20.00%) of them found that the time given to read and answer the questions was insufficient which appears to be higher than the positive reinforcement group. Besides 24 (80.00%) of them found that the time given to read the text and answer the questions was sufficient.

Table 9. Opinion Towards Investigator.

	Positive Group (%)	Negative Group (%)
Demotivating	0 (0.00)	8 (26.67)
Motivating	30 (100.0)	22 (73.33)

Interpretation:

Based on the feedback received in the positive reinforcement group, there was 0 (0.00%) person felt the investigator was demotivating and 30 (100.00%) of them found that the investigator was motivating. On the other hand, in the negative reinforcement group it was found that 8 (26.67%) of them felt the investigator was demotivating towards them and 22 (73.33%) of them felt that the investigator was motivating.

Table 10. Text quality.

	Positive Group (%)	Negative Group (%)
Unsatisfactory	1 (3.33)	1 (3.33)
Satisfactory	4 (13.33)	4 (13.33)
Good	13 (43.33)	15 (50.00)
Excellent	12 (40.00)	10 (33.33)

Interpretation:

According to the feedback received from the participants, in the positive reinforcement group there were 1 (3.33%) person rated the text quality was unsatisfactory, 4 (13.33%) of them found that the text quality was satisfactory, 13 (43.33%) of them found that the text quality was good and finally 12 (40.00%) of them rated the text quality was excellent. Besides in the negative reinforcement group, 1 (3.33%) person found that the text quality was unsatisfactory, 4 (13.33%) of them found the text quality was satisfactory, and majority of them which is 15 (50.00%) of them rated the text quality was good and finally 10 (33.33%) of them rated the text quality was excellent.

Table 11. Preffered Reinforcement.

	Positive Group (%)	Negative Group (%)
Negative Reinforcement	0 (0.00)	0 (0.00)
Positive Reinforcement	30 (100.00)	30 (100.00)

Interpretation:

Based on the feedback given by the participants, 30 (100.00%) of them from positive reinforcement group prefers positive reinforcement and same goes to the negative reinforcement group in which 30 (100.00%) of them prefers positive reinforcement too.

4. Discussion

The purpose of our research project was to study the effects of reinforcement on stress, anxiety, confidence, mood and short term memory. The aim was to determine if the use of positive or negative reinforcement was an effective method for teaching and encouraging students to perform better academically, and carry lesser stress and anxiety with more confidence and positive mood. Conclusions about the effectiveness of positive and negative reinforcement were drawn.

The results suggest that utilizing reinforcement in a classroom setting can influence students' stress, anxiety, confidence, mood and short term memory in a desired manner. Prior to the intervention, none of the variables were significant in both positive and negative reinforcement groups. After application of the intervention, only the mean anxiety score was significantly higher, in the negative reinforcement group. However there was an increase in stress, mood and confidence as well. All the variables showed a significant change following positive reinforcement, with the highest change seen in mean mood score but was not significant when compared to the negative reinforcement group.

A previous study shows that social reinforcement, which is a gesture or sign used to communicate positive regard has been effective in increasing time-on-task behaviour in children with ASD. [25] Another study [4] which utilised both positive and negative reinforcement to analyse attention-maintained self-injurious behaviour to self-injury showed results where there were significant reductions in self injury. This shows how reinforcement is used to achieve desired behaviour. Similarly, stress and anxiety which can contribute to the behaviour of a student was controlled through positive and negative reinforcement as seen in our study.

A study by Wheatley et al. (2009) which attempted to increase the intrinsic motivation for students to behave appropriately, yielded results that showed a sizeable reduction in inappropriate student behaviors. [26] Another study showed a significant positive correlation and association between verbal motivation and the students' response to academic requests and opportunities. [27] This tells us that motivating the students helps to achieve a desired

behavior. In our study, verbal motivation may have led to the significant increase in the mean confidence score among the students who received positive intervention, which in turn was reflected by a significant increase in mood and an increase in their mean memory score, although not significant. From analysis of the feedback, there were majority of the students in both groups, thought they performed "very well" in the test. Even though there is a difference in the mean memory score, this goes on to show that there is no association between the perception of the student's performance and the reinforcement. Also, 40% of the students in both groups agreed that the questions in the test were between "easy" to "very easy", with majority in both groups agreeing the questions were "moderate" in difficulty. Regardless of their opinion towards the questions, the students in the positive reinforcement group had a higher mean memory score.

Promising a reward for a particular grade in their memory test motivated the participants to perform well in their test. This concept can be applied to drive students towards higher achievements both academically and in extracurricular activities.

A previous study done to find out what rewards student's wanted, had ranked praise very low, which led to our study employing both verbal motivation and the giving of a reward under positive reinforcement because praise alone may not have been sufficient for effective reinforcement.[28] A previous study conducted on 3rd grade, showed that there was significant improvement in the students' grades in their Friday spelling test when they received positive reinforcements in the form of rewards as compared to those who didn't. [29] In the same study [29], the mean heart rate during an oral exam was measured and the result was that, the positive reinforcement group had a significantly lower average heart rate than did the control and the negative-reinforcement groups. Average heart rates for the groups were found to be statistically significantly. This suggests that positive reinforcement is able to lower the heart rate, and as result contribute to minimising stress and anxiety levels. This finding is in accord with the result from our study, which shows that the mean stress and anxiety score is significantly lower following positive reinforcement.

From feedback analysis, we found that 20% of the students following negative reinforcement and 10% of the students following positive reinforcement thought that they had insufficient amount of time to answer the questions in the test. The greater percentage in the negative reinforcement group suggests that the increased stress and anxiety post intervention may have led to this particular feedback. Nevertheless, majority of the students in both groups agreed they had sufficient time to complete the questions.

In a previous study [30] conducted at a juvenile institution, where positive reinforcement was employed for several contracts such as behaviour change, journaling, exercise, and contract homework showed that all students expressed positive personal feelings such as confident, smart, happy, and optimistic when asked to indicate personal feelings about positive reinforcement and negative reinforcement.

Also, all of the students expressed a positive personal feeling towards their teacher who gave them an award, mentioning emotions as joyful, special, determined, happy, and satisfied. The success in their positive reinforcement program has promoted confidence and has encouraged personal growth. In essence, positive reinforcement helps people to have a better attitude about the situation they are in, as seen in a previous study. [20] Similarly, whilst the increase in positive mood was seen following both interventions, the mean mood score following positive reinforcement showed a significant increase. Also, we gathered from our study, when asked for the preferred reinforcement, all of the students from both groups chose "positive reinforcement". Therefore, this helps us to deduce that reinforcement does play a role in the mood of students with positive reinforcement having a greater preference.

From feedback analysis, it was seen that 100% of the students in the positive reinforcement group believed that the investigator was motivating whilst 73.33% of the students in the negative group believed that the investigator was motivating and 23.67% believed the investigator was demotivating. This divided opinion in the negative reinforcement group suggests that the students may have used the demotivation to drive themselves to do better and pass the test somehow.

The comparison between both interventions depict that positive reinforcement is able to decrease the stress and anxiety in a student and improve their mood and confidence which thereby, reflects as an increase in their short term memory. Even though the results weren't significant, short term memory score was higher amongst students who were given the positive reinforcement. This leads to suggest that the increase in short term memory, which is the desired behaviour in our study, can be achieved greater with integration of positive reinforcement.

As previous studies show that teachers who are trained to effectively implement reinforcement, produced students who outperformed their controls [11], and our study also showed improvement in the students' short term memory, this study can be used for further exploration of ways to exercise reinforcement in a school or educational environment.

5. Conclusion

In conclusion, the findings on positive reinforcement were statistically significant, and therefore can be concluded that positive reinforcement has a better effect in comparison to negative reinforcement, especially in decreasing stress and anxiety. Both reinforcements showed an increase in short term memory with positive group showing a higher effect than the negative group even though, not significant. This shows that both negative and positive reinforcement are able to increase the desired behaviour which is the short term memory in this study. This trend found matches previous experiments and may indicate how reinforcement can affect the academic performance of a student. Also, both groups seemed to show an increase in mood and confidence post intervention which in the positive reinforcement group could be explained due to the verbal motivation and reward and, in the negative reinforcement group, most likely as a result of the test being easy and that they believed they wouldn't have to stay back longer. Lastly, among the medical students in both groups, positive reinforcement was the preferred reinforcement. These results could be used by teachers or administrators in classroom lectures and daily assessments to possibly increase students' motivation and academic performance and aid them to live their lives with decreased to controlled stress and anxiety as much as possible.

Acknowledgements

The accomplishment of this study would not have been possible without the guidance from our lecturers, Prof Adinegara Lutfi Abas (Dean of Faculty of Medicine & Head of department of Community Medicine) and Prof. Dr. Htoo Htoo Kyaw Soe (Department of Community Medicine MMMC) for patiently guiding us throughout this study. Moreover, we would like to express our sincere gratitude towards all the participants that have been willingly participated in our study. We would also like to thank the Research Ethics Committee, Faculty of Medicine, Melaka Manipal Medical College (MMMC) for approving our research.

References

[1] Reinforcement. (n.d.). In Alleydog.com's online glossary. Retrieved from: https://www.alleydog.com/glossary/definition-cit.php?term=Reinforcement

[2] McLeod, S. (2018). B. F. Skinner | Operant Conditioning | Simply Psychology. [online] Simplypsychology.org. Available at https://www.simplypsychology.org/operant-conditioning.html [Accessed 8 Nov. 2018].

[3] R. Butler, Laura & Luiselli, James. (2007). Escape-Maintained Problem Behavior in a Child With Autism. Journal of Positive Behavior Interventions - J POSIT BEHAV INTERV. 9. 195-202. 10.1177/10983007070090040201.

[4] Steege, M. W., Wacker, D. P., Cigrand, K. C., Berg, W. K., Novak, C. G., Reimers, T. M., Sasso, G. M. and DeRaad, A. (1990), USE OF NEGATIVE REINFORCEMENT IN THE TREATMENT OF SELF ‐ INJURIOUS BEHAVIOR. Journal of Applied Behavior Analysis, 23: 459-467. doi: 10.1901/jab990.23-459

[5] Fosco WD, Hawk LW, Rosch KS, Bubnik MG. Evaluating cognitive and motivational accounts of greater reinforcement effects among children with attention-deficit/hyperactivity disorder. Behav Brain Funct. 2015; 11: 20. Published 2015 Apr 29. doi: 10.1186/s12993-015-0065-9

[6] Reisinger, J. J. (1972), THE TREATMENT OF "ANXIETY ‐ DEPRESSION" VIA POSITIVE REINFORCEMENT AND RESPONSE COST1. Journal of Applied Behavior Analysis, 5: 125-130.

[7] Olivier George, Chapter 12 - Negative Reinforcement Mechanisms in Addiction, Editor(s): Mary Torregrossa, Neural Mechanisms of Addiction, Academic Press, 2019, Pages 179-188, ISBN 9780128122020

[8] Bouxsein KJ, Roane HS, Harper T. Evaluating the separate and combined effects of positive and negative reinforcement on task compliance. J Appl Behav Anal. 2011; 44 (1): 175-9.

[9] Miltenberger, R. G., Romaniuk, C., & Tiffany Kodak. (2013, February 27). THE EFFECTS OF DIFFERENTIAL NEGATIVE REINFORCEMENT OF OTHER BEHAVIOR AND NONCONTINGENT ESCAPE ON COMPLIANCE. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1901/jaba.2003.36-379

[10] Effects of Positive and Negative Reinforcement in a Concurrent Operants Arrangement on Compliance and Problem Behavior. (2015, January 21). Retrieved from https://www.sciencedirect.com/science/article/pii/S2007471914709780#sec0015

[11] Stallings, J. A. CHANGING TEACHER BEHAVIOR: A CHALLENGE FOR THE 1980'S. Paper presented at the Annual Meeting of the American Educational Research Association, Los Angeles, CA, 1981. (ED 200 596)

[12] Lujan, J. HOW TEACHER BEHAVIOR RELATES TO STUDENT EFFORT IN CLASSROOMS FOR LOW AND HIGH STATUS STUDENTS.

[13] Martin, J.; Veldman, D. J.; and Anderson, L. M. "Within Class Relationships Between Student Achievement and Teacher Behaviors." American Educational Research Journal 17 (1980): 479- 490.

[14] Medley, D. M. TEACHER COMPETENCE AND TEACHER EFFECTIVENESS: A REVIEW OF PROCESS-PRODUCT RESEARCH. Washington, D. C.: American Association of Colleges for Teacher Education, 1977. (ED 143 629).

[15] Michaels, J. W. "Classroom Reward Structures and Academic Performance." REVIEW OF EDUCATIONAL RESEARCH 47 (1977): 87-98.

[16] -Quest, K., L., Bloomington, I., Bloomington, I. and University, I. (2018). Reinforcement in the Classroom. [online] Iidc.indiana.edu. Available at: https://www.iidc.indiana.edu/pages/reinforcement-in-the-classroom [Accessed 8 Nov. 2018].

[17] Diedrich, Jennifer L., "Motivating Students Using Positive Reinforcement" (2010). Education and Human Development Master's Theses. 9.

[18] E. Laule, G., A. Bloomsmith, M. and J. Schapiro, S. (2010). The Use of Positive Reinforcement Training Techniques to Enhance the Care, Management, and Welfare of Primates in the Laboratory. [online] Tandfonline.com. Available at: https://www.tandfonline.com/doi/abs/10.1207/S15327604JAWS0603_02 [Accessed 9 Nov. 2018].

[19] Hackenberg T. D. (2009). Token reinforcement: a review and analysis. Journal of the experimental analysis of behavior, 91 (2), 257-86.

[20] Insko, C. A. (1965). Verbal reinforcement of attitude. Journal of Personality and Social Psychology, 2 (4), 621-623. http://dx.doi.org/10.1037/h0022485

[21] Sankey, C., Richard-Yris, MA., Henry, S. et al. Anim Cogn (2010) 13: 753. https://doi.org/10.1007/s10071-010-0326-9

[22] Wilson, F., & Rolls, E. (1990, April 01). Learning and memory is reflected in the responses of reinforcement- related neurons in the primate basal forebrain. Retrieved from https://doi.org/10.1523/JNEUROSCI.10-04-01254.1990

[23] Lloyd K, Becker N, Jones MW and Bogacz R (2012) Learning to use working memory: a reinforcement learning gating model of rule acquisition in rats. Front. Comput. Neurosci. 6: 87. doi: 10.3389/fncom.2012.00087

[24] Glaser, E. (2018). The Nature of Reinforcement: Part I. (Volume I), Part II. (Volume II)... [Online] Eric.ed.gov. Available at: https://eric.ed.gov/?id=ED040595 [Accessed 8 Nov. 2018].

[25] A. Abel, E., Gadomski, M. and T. Brodhead, M. (2016). EBSCOhost | 117856157 | A Brief Report of Time-on-Task Behavior in a Child With Autism: Comparing Material and Social Reinforcement in the Home Environment.. [online] Web.a.ebscohost.com. Availableat: https://web.a.ebscohost.com/abstract?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=21648204&AN=117856157&h=ta6wZBTTi%2fgAUUda%2fH%2bL8x5JyMuu4VehofHE0bCJALinjkfbkCNYnagS7OoQ%2bFWHHvibI6%2b3yRuiAPzLhqQVkg%3d%3d&crl=c&resultNs=AdminWebAuth&resultLocal=ErrCrlNotAuth&crlhashurl=login.aspx%3fdirect%3dtrue%26profile%3dehost%26scope%3dsite%26authtype%3dcrawler%26jrnl%3d21648204%26AN%3d117856157 [Accessed 6 Dec. 2018].

[26] Wheatley, R. K., West, R. P., Charlton, C. T., Sanders, R. B., Smith, T. G., & Taylor, ~v1. J. (2009). Improving behavior through differential reinforcement: A praise note system for elementary school students. Education and Treatment of Children, 32, 551-571. Retrieved March 11, 2010, from ERIC database

[27] Sutherland, K. S., Wehby, J. H. and Yoder, P. J. (2002) 'Examination of the Relationship Between Teacher Praise and Opportunities for Students with EBD to Respond to Academic Requests', Journal of Emotional and Behavioral Disorders, 10 (1), pp. 5–13. doi: 10.1177/106342660201000102

[28] Ware, B. "What Rewards Do Students Want?" PHI DELTA KAPPAN 59 (1978): 355-356.

[29] Pintel, L. (2006). The effect of positive reinforcement on the achievement of 3rd grade students' spelling. [online] Rdw.rowan.edu. Available at: http://rdw.rowan.edu/cgi/viewcontent.cgi?article=1923&context=etd [Accessed 6 Dec. 2018]..

[30] Putra Zebua, K. (2017). THE USE OF VERBAL REINFORCEMENT TO MOTIVATE THE 11th GRADE STUDENTS OF SMA BUDYA WACANA YOGYAKARTA TO SPEAK ENGLISH. [ebook] Yogyakarta. Available at: https://core.ac.uk/download/pdf/127701756.pdf [Accessed 6 Dec. 2018].

[31] Nights of the Pufflings By: Bruce McMillan https://www.bc.edu/research/intasc/researchprojects/enhanced_assessment/PDF/Paper_td.pdf