

Impact of Reward Anticipation on Performance among Pre-adolescent Indian Children- An Experimental Study

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Abstract

This study investigated the impact of anticipation and reinforcement mechanisms on cognitive performance across three experimental conditions: Tangible, Social, and Control. A total of 90 participants were randomly assigned to the three conditions and were made to complete multiple-choice question (MCQ) tests before and after an anticipation phase over the course of 5 consecutive days. SPSS 16 was used to perform test of significance for group differences in-terms of Independent Sample –t test, Paired sample t test and one-way ANOVA. Results indicated no significant differences in performance between groups before anticipation. However, after anticipation, significant disparities emerged, with the Tangible and Social groups demonstrating higher mean scores compared to the Control group. Within-group analyses revealed significant improvements in performance from before to after anticipation within the Tangible and Social groups. These findings put forward that expectancy of reinforcement interventions is sufficient enough to enhance cognitive performance and have implications for educational, training, and behavioral interventions. Further research is warranted to explore underlying mechanisms and long-term effects.

Keywords: Anticipation, Reinforcement, Performance, Pre-Adolescent Children

Introduction

In the realms of psychology and child development, the anticipation of reinforcement plays a pivotal role in shaping behaviors and responses (DeNike et al., 1969). Tangible reinforcement, such as rewards or prizes, offers a concrete and immediate incentive for desired behaviors ((O’Leary et al., 1972), while social reinforcement, encompassing praise and approval, provides a more abstract form of motivation (Isbell et al., 2001).

Anticipation, defined as the period preceding an event, is associated with emotional states like anxiousness or foreboding (Poli, R. 2017). Expectation, on the other hand, refers to the most likely event in a situation of uncertainty and anticipation, often involving a realistic assumption about a future occurrence (Constantino et al., 2011). The effect of anticipation on behavior, as noted by sociologist Robert K. Merton, is closely linked to the concept of self-fulfilling prophecy, where belief in an outcome influences its realization, regardless of its actual veracity (Merton, R. K., 1996).

This phenomenon underscores the significance of understanding how anticipation shapes behavior, predominantly amid kids who are highly susceptible to suggestions from authority figures like parents

and teachers (Coll, G., & Harnick, M. A., 1980). However, the implications of unfulfilled expectations on self-confidence warrant careful consideration, as unrealistic expectations may lead to detrimental effects on one's self-esteem (Polivy et al., 2000).

The concept of tangible reinforcement serves as a valuable tool in behavior modification techniques, especially in children's development and learning. By substituting tangible rewards with token reinforcers, individuals can be motivated to progress towards their objectives (Bonfonte et al., 2020). These token reinforcers visually represent continuous effort, offering a tangible cue of achievement and encouraging further advancement (Hackenberg, T. D., 2009).

Evertson, Emmer, Clements, and Worsham (1994) define tangible reinforcers as tangible incentives, including items such as games, toys, books, pencils, and erasers. The implementation of a behavior modification system utilizing tangible reinforcers requires moderate time and effort from the teacher. The method of delivering tangible reinforcement is a critical consideration (Martin et al., 2015). Tangible reinforcers can be distributed in various ways, with teachers responsible for choosing the item to be delivered. Additionally, offering multiple reinforcers can enhance motivation and interest (Dunn, J.K.C., 2003).

Social reinforcement encompasses positive reinforcement through various gestures. Educators in the United States have long used social reinforcement to motivate students (Baron, R. M 1966). Teachers continue to utilize social reinforcement to encourage student achievement (Hitz & Driscoll, 1989). According to Martin and Pear (2019), social reinforcement includes affectionate gestures, praise, nods, smiles, attention, and simple glances. Everton et al. (2002) define social reinforcement as recognition in the form of attention, certificates, awards, displays of student work, and verbal commendations. Early childhood educators leverage social reinforcement to support student progress (Hitz & Driscoll, 1989).

The immediate delivery of items such as stickers, pencils, erasers, or pens as tangible rewards can reinforce positive behaviors, while verbal praise such as "fantastic," wonderful or "terrific" serves as a form of social reinforcement during in-class activities. Additionally, social reinforcers such as compliments and encouragement play a pivotal role in serving as potent motivators for individuals striving towards their goals (Rademacher et al., 2017). These reinforcements aim to encourage desired behaviors and foster a conducive learning environment for pre-adolescent children. In this regard, both tangible and social reinforcement strategies contribute to sustaining motivation and encouraging continued effort, underscoring their importance in behavior modification and learning.

For children, earning points or accumulating tokens to exchange for valued items provides a tangible and immediate form of positive reinforcement (Birnbrauer et al., 1964). Utilizing tangible rewards with younger children is advantageous, enhancing the immediacy and frequency of positive feedback, thus reinforcing desired behaviors effectively (Flowers et al., 1976). However, it's crucial that tangible reinforcements are closely aligned with the values and behaviors being encouraged to ensure their effectiveness in promoting positive outcomes (Sugai et al., 2009). Smith et al. (2021) conducted a comprehensive review of reinforcement in children and adolescents, covering various types such as positive reinforcement, negative reinforcement, and punishment. They discussed the effects of reinforcement on behavior and its role in shaping and maintaining behavior, as well as the development of reinforcement processes.

In this context, pre-adolescent behavior in social situations is not solely dictated by reinforcement learning theory. Children exhibit unique behavior patterns and neural activity during reward anticipation, indicating that their decision-making processes are influenced by the potential for significant incentives

(Starvopoulos et al., 2018). The above writings recommend valuable insights into the use of reinforcement in children and adolescents, highlighting the superiority of positive reinforcement, the unique behavior patterns of adolescents, and the importance of individualized approaches to reinforcement. However, it becomes vital to investigate which form of reinforcement and more importantly its anticipation can, if at all, boost the performance among pre-adolescent students.

Rationale for the Study

From the above literature it's understood that there are established investigations that have identified the significance of reinforcement on behavior modification. However, anticipation solely has not been considered in most of the studies, while keeping the theoretical proposition open that anticipation has an impact on the behavior. This study then became essential to understand if anticipation of tangible reward and that of social reward has impact on the performance of pre-adolescent students. This research endeavored to compare the effects of anticipating tangible reinforcement versus social reinforcement among pre-adolescent Indian children, aiming to elucidate how anticipation alone, of these distinct forms of reinforcement influences their behavior.

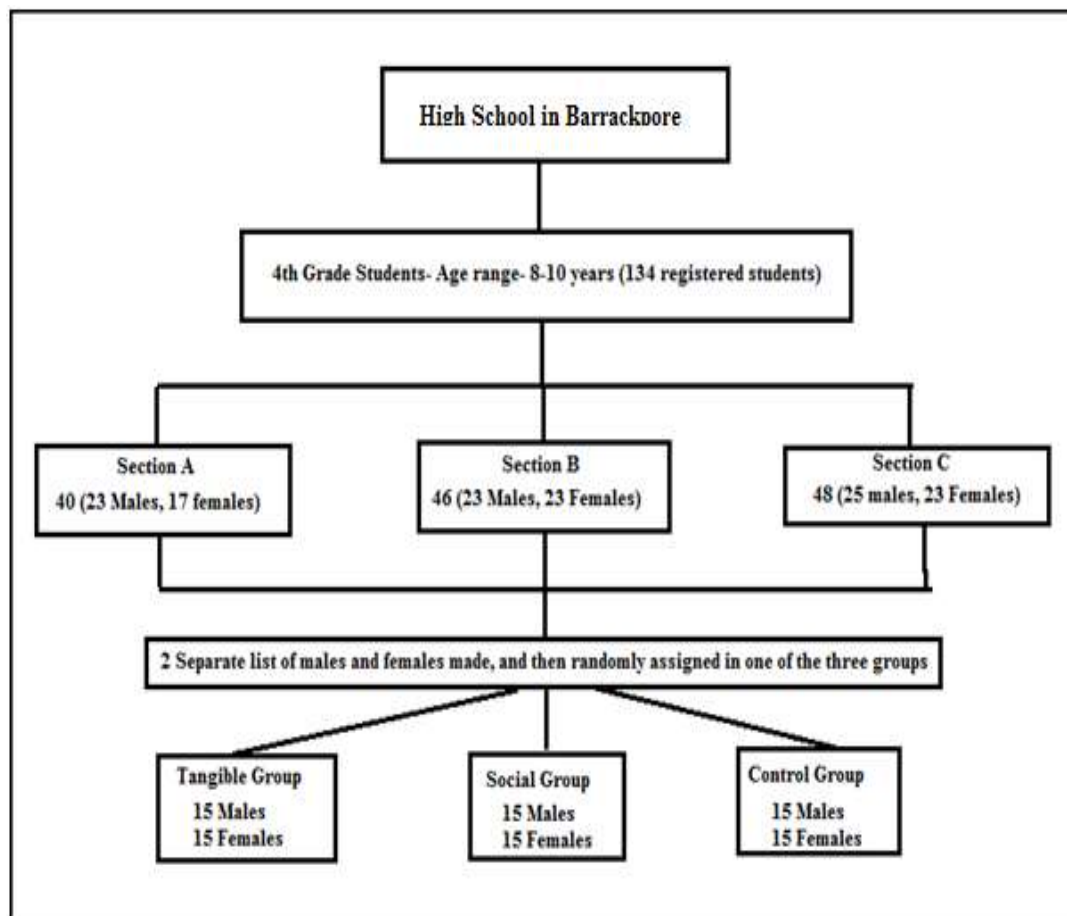
Objective of the Study

1. To investigate the differential impact of anticipation of tangible reinforcement versus social reinforcement on the performance of pre-adolescent students.
2. To investigate the significant difference in performance due to anticipation of tangible reinforcement versus social reinforcement.
3. To investigate the significant difference in performance due to anticipation of tangible reinforcement versus no reinforcement.
4. To investigate the significant difference in performance due to anticipation of social reinforcement versus no reinforcement.

Research Methodology

A high school situated inside the Army Camp of the city of Barrackpore, West Bengal, India, was approached for the study. The rationale of the investigation was discussed with the school authorities. On paper approval was taken from the school while informing that the ethical considerations will be fully maintained in the study. The study was conducted within the school campus and under the presence of a teacher all the time and the school permitted to take data on the 4th grade students in the age range of 8-10 years.

A sample of 90 students was randomly chosen from the pool of 134 registered students (separate list of males and females was made, and each student in both list was numbered serially and then each learner was haphazardly assigned in a group). Equal proportion of male and female students was represented in the sample. There were three groups, namely – the Tangible Group, the Social Group and the Control group. Under each group, 30 students were assigned- 15 males and 15 females in each condition. The study design can be represented from the following diagram:-



- The investigation was spread over 5 consecutive days. The researcher devised different tasks to be conducted in all the 5 days, for which 10 minutes of discussion was planned and executed prior to giving students multiple choice question of 10 marks related to the task. Also, for each day, there were coupons that were distributed among the tangible group after the 1st MCQ test, for different tangible reinforcements they would receive if they scored 5 out of 10 or more. Also, promise was made by the research to the social group for the social reinforcements they would receive if they scored 5 out of 10 or more in the next MCQ Test. There were no such reinforcements on all 5 days for the control group.

The chosen tasks and the reinforcements for the 5 days were as follows:

Day of Experiment	Task for Completion	Reward for Tangible Group	Reward for Social Group
Day 1	Task - Simple Addition Problem (For example: $16+20=?$)	Pencil and Eraser	Verbal Praise by Teacher present in the classroom
Day 2	Task - Simple Subtraction Problem (For example: $20- 16 =?$)	One favorite Color Pencil they can choose	A round of Applause from other classmates
Day 3	Multiplication Problem (For example: $10 * 4 =?$)	A challenging puzzle game	A special sticker badge of star student
Day 4	Task - Division Problem (For example: $12/4=?$)	Favorite sports activity in school	A handwritten note from the teacher expressing

		after the test	gratitude for their effort and contribution
Day 5	Task - Money Problem (For example: Nintendo has 24 rupees, he gave 8 rupees to her friend. How many rupees does Nintendo have now?)	Drawing a favorite cartoon on the black board will be allowed	A paper certificate from the researcher recognizing the student's effort and improvement

After the 1st MCQ test was over, the researcher discussed briefly what students in tangible and social group would receive if they performed well in the next MCQ test. And, then the researcher debriefed one more time about the task they will be required to perform in the MCQ.

Inclusion and Exclusion Criteria:

- Individuals within the age range of 8-10 years were included for the study.
- Individuals above the age of 10 years were excluded from the study.
- Individuals below the age of 8 years were excluded from the study.

Data Collection

The MCQ tests in each trail on each was taken on pen and paper and then the scores were fed and organized into an excel sheet.

Tangible Group	Social Group	Control Group
Day 1- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 1- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 1- 10 minutes debriefing 10 Marks MCQ Test 1 10 minutes debriefing again 10 marks MCQ Test 2
Day 2- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 2- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 2- 10 minutes debriefing 10 Marks MCQ Test 1 10 minutes debriefing again 10 marks MCQ Test 2
Day 3- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 3- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 3- 10 minutes debriefing 10 Marks MCQ Test 1 10 minutes debriefing again 10 marks MCQ Test 2
Day 4- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 4- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 4- 10 minutes debriefing 10 Marks MCQ Test 1 10 minutes debriefing again 10 marks MCQ Test 2
Day 5- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 5- 10 minutes debriefing 10 Marks MCQ Test 1 Discussing Reward to generate anticipation 10 minutes debriefing again MCQ Test 2	Day 5- 10 minutes debriefing 10 Marks MCQ Test 1 10 minutes debriefing again 10 marks MCQ Test 2

Data Analysis

The findings of all the 5 days were added to get the scores out of 50 for each condition. The gathered figures were analyzed using statistical methods to compare the performance of the control group, tangible reinforcement group, and social reinforcement group. Descriptive analysis was done using the mean and standard deviation. Independent sample-t test was done to check group differences. Paired sample t-test was done to delve into the within group difference that arose due to before and after condition. Analysis of Variance (ANOVA) was done to determine significant overall group differences among all the three groups. Statistical Package of Social Sciences, SPSS Version 16 was used to do the statistical operations. The analysis was focused on identifying any significant differences in performance among the three groups based on the anticipation over the type of reinforcement that would be received.

Ethical Considerations

The study adhered to ethical procedure for investigation concerning children, ensuring school consent and safeguarding participant rights and privacy throughout the study. The reinforcements were actually given to the students after each day's data collection to ensure that they remain motivated.

Results and Findings

Before Anticipation – Between group Differences in performance in the Three Conditions with respect to mean

Group Statistics- I					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ One	Tangible	30	22.0667	4.51765	.82481
	Social	30	22.3000	3.94051	.71943

From the above table it can be seen that there is very slight difference in the MCQ Test scores combined of all 5 days, of Tangible group and Social Group before the Anticipation phase. This is indicative that participants in both the groups are almost the same level of performers.

Independent Samples Test - I										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MCQ One	Equal variances assumed	.604	.440	-.213	58	.832	-.23333	1.09448	-2.42418	1.95751
	Equal variances not assumed			-.213	56.948	.832	-.23333	1.09448	-2.42504	1.95837

The above table is signifying that there exists no noteworthy distinction in the means between the tangible and social groups before the anticipation phase ($p = -0.233 > 0.05$).

Group Statistics- II					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ One	Tangible	30	22.0667	4.51765	.82480
	Control	30	20.0687	4.51733	.82431

It can be seen from the above statistical output that the mean score for the tangible group is higher than that for the control group during before anticipation condition, indicating that participants in the tangible condition, on average, scored higher on the MCQ Tests combined of all 5 days than those in the control group.

Independent Samples Test- II										
		Levene's Test for Equality of Variances		t-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MCQ One	Equal variances assumed	.000	1.000	.000	58	1.000	-.1988	1.16645	-2.33491	2.33491
	Equal variances not assumed			.000	58.000	1.000	-.1988	1.16645	-2.33491	2.33491

From the above chart it is evident that the mean distinction among the tangible group and the control group in the non-anticipation phase is not significant.

Group Statistics- III					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ One	Social	30	22.3000	3.94051	.71943
	Control	30	22.0667	4.51765	.82481

The mean score for the social group is slightly higher than that of the control group, signifying that the participants in the social group, on average scored higher on the MCQ test in the before anticipation situation combining data of all 5 days.

Independent Samples Test- III										
		Levene's Test for Equality of Variances		t-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MCQ One	Equal variances assumed	.604	.440	.213	58	.832	.23333	1.09448	-1.95751	2.42418
	Equal variances not assumed			.213	56.949	.832	.23333	1.09448	-1.95837	2.42504

The above statistical analysis is indicative that there exists no significant differences in means of combined MCQ test scores of the 5 days in the before anticipation phase of the social group and the control group.

After Anticipation- Differences in Performances in the three conditions with respect to mean

Group Statistics- IV					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ Two	Tangible	30	40.9667	2.57954	.47096
	Social	30	39.0667	2.87598	.52508

In the after anticipation phase, the mean score of the combined MCQ tests of the 5 days, for the tangible group is higher than that of the social group, suggestive of participants in the tangible group scoring higher on the tests compared to the social group.

Independent Samples Test- IV										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MCQ Two	Equal variances assumed	.698	.407	2.694	58	.009	1.90000	.70534	.48810	3.31190
	Equal variances not assumed			2.694	57.327	.009	1.90000	.70534	.48775	3.31225

The t-test results show that there is a noteworthy difference in the mean scores of the combined MCQ tests of the 5 days, of the tangible group and the social group ($p = 0.009 < 0.05$).

Group Statistics- V					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ Two	Tangible	30	40.9667	2.57954	.47096
	Control	30	25.3000	4.10340	.74918

The mean score for the tangible condition is substantially elevated than that of the control condition in the after anticipation phase, suggesting that participants in the tangible condition on average scored higher on the MCQ Test scores of the 5 days combined.

Independent Samples Test- V									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower Upper
MCQ Two	Equal variances assumed	3.577	.064	17.704	58	.000	15.66667	.88491	13.89533 17.43801
	Equal variances not assumed			17.704	48.825	.000	15.66667	.88491	13.88821 17.44512

The t-test results show that there is a considerable difference in means between the tangible group and the control group in the after anticipation phase ($p = .000 < .05$).

Group Statistics- VI					
	Condition	N	Mean	Std. Deviation	Std. Error Mean
MCQ Two	Social	30	39.0667	2.87598	.52508
	Control	30	25.3000	4.10340	.74918

The mean score for the Social Group in the after anticipation condition is substantially higher than the Control Group, signifying that participants in the social condition on average, scored higher on the MCQ Test scores combined from all the 5 days.

Independent Samples Test- VI									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower Upper
MCQ Two	Equal variances assumed	1.592	.212	15.048	58	.000	13.76667	.91486	11.93537 15.59796
	Equal variances not assumed			15.048	51.953	.000	13.76667	.91486	11.93082 15.60251

The table above is indicative that the t-test result shows a noteworthy difference in the mean scores between the social and the control groups in the after anticipation phase. ($p = .000 < .05$).

Before and After - Anticipation- Difference in performance in Tangible group with Respect to Mean

Paired Samples Statistics- I					
		Mean	N	Std. Deviation	Std. Error Mean
Tangible	Before	22.0667	30	4.51765	.82481
	After	40.9667	30	2.57954	.47096

The above table is indicative that the before mean score of the tangible group was smaller than the after mean score of the same group with combined MCQ Test scores of the 5 days. There is a reduction the variability of the scores in the after anticipation condition as is apparent from the SD values. These changes suggest that introducing the anticipation of tangible reinforcement had a considerable impact on the performance of this group on the MCQ tests.

Paired Samples Test- I									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Tangible	Before - After	-1.89000E1	4.99206	.91142	-20.76407	-17.03593	-20.737	29	.000

The above table is reflective that on average, the scores increased from before anticipation condition to the after anticipation condition. However, the p-value associated with the paired sample-t test is highly significant ($p= 0.00$) suggesting that there is a considerable difference between means of the two phases within this group.

Before and After - Anticipation- Difference in performance in Social group with Respect to Mean

Paired Samples Statistics- II					
		Mean	N	Std. Deviation	Std. Error Mean
Social	Before	22.3000	30	3.94051	.71943
	After	39.0667	30	2.87598	.52508

This data chart is reflective that in the before anticipation phase the social group mean was reasonably lower than the after anticipation phase. Also, the drop in SD score is indicative that there is a reduction in the variability as well. These changes are suggestive, that similar to the tangible group, social group also had a significant impact on the scores of MCQ tests of the 5 days combined together due to the introduction of the anticipation of the social reinforcement condition.

Paired Samples Test- II									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Social	Before - After	-1.67667E1	5.08333	.92808	-18.66481	-14.86852	-18.066	29	.000

The table above is indicative that on average the scores increased from the before to the after anticipation situation, however, the p-value associated with this group is highly significant ($p= 0.00$) suggestive that there is a noteworthy difference between the means of this group due to the introduction of the anticipation of social reinforcements.

Performance Differences in control group with respect to mean

Paired Samples Statistics- III					
		Mean	N	Std. Deviation	Std. Error Mean
Control	1 st Phase	22.0667	30	4.51765	.82481
	2 nd Phase	25.3000	30	4.10340	.74918

In the control group condition, will all scores of the two condition of the 5 days combined separately, it is apparent that mean value of the MCQ test scores in the 1st phase is slightly smaller than the mean value of the MCQ test scores in the 2nd phase. Also, the SD score is slightly reduced in this condition. These changes suggest that in the control condition, there is some impact on the test scores with a slight increase in the mean and a reduction in variability.

Paired Samples Test- III									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Control	1 st - 2 nd	-3.23333	2.82456	.51569	-4.28804	-2.17862	-6.270	29	.000

The paired mean difference is indicative that the scores increased from the 1st phase to the 2nd phase. The paired sample t-test for the control group, is reflective that the p-value is highly significant, suggesting there is a large difference between the means of the 1st phase scores combined and the mean of the 2nd phase score combined ($p= 0.000$). This finding can be ascribed to the practice effect.

Overall Group Differences:

a) Before Anticipation scores of the three groups-

ANOVA Before Phase					
Before Condition					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	69.183	10	6.918	1.062	.435
Within Groups	123.783	19	6.515		
Total	192.967	29			

The ANOVA results above are pinpointing that there are no major variations in the MCQ test scores between the groups in the before anticipation condition. The non-significant p-value ($p = 0.435$) is suggestive that any distinctions observed between the groups in the before condition are likely due to random chance.

b) After Anticipation scores of the three groups-

ANOVA After Phase					
After Condition					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	490.188	10	49.019	9.160	.000
Within Groups	101.679	19	5.352		
Total	591.867	29			

Lastly, the result table above is indicative that there are significant differences in the MCQ Test scores of all the 5 days between the groups in the after anticipation phase ($p < 0.001$). The significant p value ($p = 0.000$) is suggestive that the disparity between the group means are improbable to be due to random chance alone.

Discussion

Before Anticipation Phase

In the scrutiny of performance before the anticipation phase, the study compared the mean scores of participants across three conditions: Tangible, Social, and Control. The results are implying that there were minor differences in the MCQ test scores among the Tangible and Social groups before the anticipation phase, indicating that partakers in both groups performed at a similar level. This observation is supported by the non-significant difference between the means of the Tangible and Social groups ($p = -0.233 > 0.05$).

Furthermore, the analysis showed that the mean score of the Tangible group was somewhat higher than that of the Control group, while the mean score of the Social group was also slightly higher than that of the Control group. Nevertheless, these distinctions were not statistically significant. Therefore, before the anticipation phase, no significant disparities were found in the mean scores between the Tangible, Social, and Control groups.

After Anticipation Phase

In contrast, the investigation of performance after the anticipation phase revealed more distinct disparities between the groups. The mean score of the Tangible group was drastically superior than that of the Social group, indicating that participants in the Tangible group performed better on the MCQ tests compared to the Social group ($p = 0.009 < 0.05$). Correspondingly, large distinctions were observed between the Tangible group and the Control group, as well as between the Social group and the Control group ($p < 0.05$).

These results implied that the introduction of the anticipation phase had a notable impact on performance outcomes. Participants in the Tangible and Social groups demonstrated improved performance compared to the Control group, with the Tangible group exhibiting the highest mean

scores. The significant differences observed in the after anticipation phase underscore the effectiveness of tangible and social reinforcements in enhancing performance on the MCQ tests.

Before and After Anticipation Phase within Groups

The analysis also examined the performance distinctions within each group before and after the anticipation phase. Both the Tangible and Social groups showed an increase in mean scores from before to after anticipation, indicating a positive effect of the anticipation phase on performance. These changes were statistically significant, with highly significant p-values ($p = 0.00$), suggesting a substantial improvement in performance within these groups.

Similarly, the Control group exhibited a slight increase in mean scores from the first to the second phase, which was statistically significant ($p = 0.000$). This finding may be ascribed to the practice effect, where participants' performance improves as they became more familiar with the test over time.

Overall Group Differences

In summary, the study's findings show that while there were no considerable differences in performance between groups before the anticipation phase, significant disparities emerged after the anticipation phase. The tangible and social reinforcement conditions led to improved performance compared to the control condition, highlighting the efficacy of these interventions in enhancing performance outcomes. These results underscore the importance of anticipation and reinforcement mechanisms in influencing cognitive performance.

Conclusion

In conclusion, this study investigated the impact of anticipation and reinforcement mechanisms on cognitive performance across three experimental conditions: Tangible, Social, and Control. Before the anticipation phase, no considerable discrepancies were observed in performance between the groups. However, after the anticipation phase, significant disparities emerged, with participants in the Tangible and Social groups demonstrating improved performance compared to the Control group.

The findings suggest that both tangible and social reinforcements have a notable effect on enhancing cognitive performance. Participants in the Tangible and Social groups exhibited higher mean scores on the MCQ tests compared to the Control group, highlighting the efficiency of these interventions in promoting performance outcomes. Furthermore, within-group analyses discovered noteworthy improvements in performance from before to after the anticipation phase, indicating the positive impact of anticipation on cognitive performance within each experimental condition.

Overall, these results underscore the importance of anticipation and reinforcement mechanisms in influencing cognitive performance and have implications for the design of interventions aimed at enhancing cognitive functioning in various contexts. Further research is warranted to explore the fundamental mechanisms driving these effects and to appraise their long-term impact on cognitive performance.

Limitations

While the study provides priceless insights into the effects of anticipation and reinforcement on cognitive performance, it is imperative to recognize certain limitations that may have influenced the interpretation and generalization of the findings. The study may have been limited by its sample size

and composition. With a relatively small sample size, the generalizability of the findings to larger populations may be limited. Additionally, the composition of the sample, such as age, educational background, and other demographic factors, may not be representative of the broader population, potentially impacting the external validity of the study. The study's design, particularly its reliance on a between-subjects design, may introduce confounding variables and limit the ability to establish causal relationships. A within-subjects blueprint could have provided more robust comparisons by controlling for individual differences.

The utilization of a single measurement instrument (MCQ tests) to assess cognitive performance may not capture the full range of cognitive abilities and may lack sensitivity to subtle changes. Including additional measures of cognitive function could provide a more all-inclusive understanding of the effects of anticipation and reinforcement. The duration of the anticipation and reinforcement interventions may have been relatively short-term. Longer-term interventions and follow-up assessments could provide insights into the sustainability of the observed effects eventually. The study may not have accounted for all impending impenetrable variables that could influence cognitive performance, such as individual differences in motivation, attention, and prior experience with similar tasks. The study's findings may be influenced by specific contextual factors, such as the setting in which the interventions were administered and the instructions provided to participants. Variations in these factors across different settings or populations could yield different results.

Implications

The study suggests that incorporating anticipation and reinforcement mechanisms into educational interventions may enhance cognitive performance. Educators can utilize these findings to develop teaching strategies that leverage anticipation and reinforcement to improve learning outcomes in academic settings. Training programs aimed at enhancing cognitive abilities, such as memory, attention, and problem-solving skills, could benefit from integrating anticipation and reinforcement techniques. By incorporating these mechanisms, trainers may facilitate more effective skill acquisition and retention among participants. In behavioral interventions targeting various populations, such as individuals with cognitive impairments or developmental disorders, anticipation and reinforcement strategies could be implemented to promote positive behavioral changes. These interventions may help individuals develop adaptive behaviors and improve their overall functioning. Employers and organizations may implement anticipation and reinforcement strategies in workplace settings to enhance employee performance and productivity. By providing tangible or social reinforcements for desired behaviors, employers can motivate employees and foster a positive work environment. Anticipation and reinforcement techniques may also be applicable in healthcare settings to promote adherence to treatment regimens and health-related behaviors. Healthcare providers can use these strategies to encourage patients to engage in healthy lifestyle practices and adhere to prescribed treatments. Individuals seeking to improve their cognitive abilities or achieve personal goals can apply anticipation and reinforcement principles in their self-development efforts. By setting clear goals, anticipating rewards or incentives, and reinforcing desired behaviors, individuals may enhance their motivation and success in reaching their objectives.

Recommendations

The study provides a foundation for further research exploring the underlying mechanisms of anticipation and reinforcement effects on cognitive performance. Future studies could investigate the

neural correlates, psychological processes, and individual differences associated with these effects to deepen our understanding and inform more targeted interventions. Educational policymakers may consider integrating anticipation and reinforcement strategies into curriculum development and educational policies to optimize learning environments and improve educational outcomes at a systemic level. Recognizing that individuals may respond differently to anticipation and reinforcement strategies, interventions should be tailored to the unique needs, preferences, and characteristics of participants. This may involve conducting assessments to identify individual strengths, challenges, and motivational factors, and then designing interventions accordingly. Future research should include long-term follow-up assessments to evaluate the sustainability of the effects of anticipation and reinforcement interventions on cognitive performance and behavior. Longitudinal studies could provide insights into the durability of improvements and identify factors that contribute to long-term success. Anticipation and reinforcement strategies should be integrated into existing programs, policies, and initiatives aimed at improving educational outcomes, workforce development, healthcare delivery, and personal development. This integration could be facilitated through collaborations between researchers, practitioners, policymakers, and stakeholders.

References

1. Baron, A., & Galizio, M. (2005). Positive and negative reinforcement: Should the distinction be preserved?. *The Behavior Analyst*, 28, 85-98.
2. Baron, R. M. (1966). Social reinforcement effects as a function of social reinforcement history. *Psychological Review*, 73(6), 527.
3. Birnbrauer, J. S., & Lawler, J. (1964). Token reinforcement for learning. *Mental Retardation*, 2(5), 275.
4. Bonfonte, S. A., Bourret, J. C., & Lloveras, L. A. (2020). Comparing the reinforcing efficacy of tokens and primary reinforcers. *Journal of applied behavior analysis*, 53(3), 1593-1605.
5. Coll, G., & Harnick, M. A. (1980). The susceptibility of child witnesses to suggestion: An empirical study. *Law and Human Behavior*, 4(3), 201-210.
6. Constantino, M. J., Arnkoff, D. B., Glass, C. R., Ametrano, R. M., & Smith, J. Z. (2011). Expectations. *Journal of clinical psychology*, 67(2), 184-192.
7. DeNike, L. Douglas, and Morris P. Leibovitz. "Accurate anticipation of reinforcement in verbal conditioning." *Journal of Personality* 37.1 (1969).
8. Dunn, J. K. C. (2003). Teacher perception of verbal reinforcement versus tangible reinforcement with regard to academic achievement for the African-American middle school male. Tennessee State University.
9. Everton, T., Galton, M., & Pell, T. (2002). Educational research and the teacher. *Research Papers in Education Policy and Practice*, 17(4), 373-401.
10. Flowers, J. V., & Booraem, C. D. (1976). The use of tokens to facilitate outcome and monitor process in group psychotherapy. *International Journal of Group Psychotherapy*, 26(2), 191-201.
11. Hackenberg, T. D. (2009). Token reinforcement: A review and analysis. *Journal of the experimental analysis of behavior*, 91(2), 257-286.
12. Hitz, R., & Driscoll, A. (1989). Praise in the Classroom.
13. Isbell, C., Shelton, C. R., Kearns, M., Singh, S., & Stone, P. (2001, May). A social reinforcement learning agent. In *Proceedings of the fifth international conference on Autonomous agents* (pp. 377-

384).

14. Martin, G., & Pear, J. J. (2019). Behavior modification: What it is and how to do it. Routledge.
15. Martin-Perez, V., & Martin-Cruz, N. (2015). The mediating role of affective commitment in the rewards–knowledge transfer relation. *Journal of Knowledge Management*, 19(6), 1167-1185.
16. O'Leary, K. D., Poulos, R. W., & Devine, V. T. (1972). Tangible reinforcers: Bonuses or bribes?. *Journal of Consulting and Clinical Psychology*, 38(1), 1.
17. Poli, R. (2017). Introduction to anticipation studies (Vol. 1). Springer.
18. Polivy, J., & Herman, C. P. (2000). The false-hope syndrome: Unfulfilled expectations of self-change. *Current Directions in Psychological Science*, 9(4), 128-131.
19. Rademacher, L., Schulte-Rüther, M., Hanewald, B., & Lammertz, S. (2017). Reward: from basic reinforcers to anticipation of social cues. *Social behavior from rodents to humans: neural foundations and clinical implications*, 207-221.
20. Stavropoulos, K. K. M., & Carver, L. J. (2018). Oscillatory rhythm of reward: anticipation and processing of rewards in children with and without autism. *Molecular autism*, 9, 1-15.
21. Sugai, G., & Horner, R. H. (2009). Defining and describing schoolwide positive behavior support. In *Handbook of positive behavior support* (pp. 307-326). Boston, MA: Springer US.