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EFFECT OF MUSIC ON PRODUCTIVITY OF INDUSTRIAL WORKERS ENGAGED IN REPETITIVE WORK

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Abstract

In this project effect of music on workers engaged in repetitive work has been checked out in automobile industry manufacturing rear view mirrors for four wheelers and two wheelers. In this assembly plant operations like cutting of mirror, marking of mirror glass, cut marked glass, laser printing , assembly of parts, machine oven functions, packing performed by 18 workers. The test was conducted on 18 people for two weeks each, without music for first two weeks, then with pleasant happy instrumental music for next two weeks ,devotional music for next two weeks and similarly bollywood music for next two weeks. The experiment showed that there is significant difference before and after implementation of music. Workers relished working in presence of music, the felt motivated and fresh at work. Overall there was productivity increase.

Keywords: repetitive, happy, devotional, bollywood music, motivated, productivity

I. INTRODUCTION

Music a part of human factor engineering has a huge impact on humans physically and mentally. It's melody and cadency can elicit feelings from sadness to serenity to elation to amazement; and can bring memories from infancy vividly back to life [1].

Since music evokes emotions and has direct link to our mind body and soul, it has been used at work from time immemorial. Workers used to sing in noisy factories at the time of industrial revolution. During late 1800s and early 1900s industries like cigar making encouraged singing. Many industries even started to hire musicians to play for factory workers and by 1930s many industries had their own band and singing groups. This was done because many studies supported music has a significant positive effect on morale and productivity [2,3,4].

Music has been aid in industries especially where there is repetitive or monotonous work , just like assembly line work. It is effective in boosting efficiency in this type of work even when in competition with the unfavorable conditions such as those produced by machine noise [5]. For more demanding or complex task there is not much confirmation that productivity increases with music because such type of work requires more concentration and attention [6].

Multiple factors affects interrelationship between music and performance eg type of music and task being performed [2,7]. For example simple music is needed for arousing situations where as in arousing music is required in dull situations [8]. Here it is worth mentioning Uhbrock (1961) concluded that music can have both positive or negative effect depending upon individual difference and task variables . He manily concluded (1) feelings of happiness and excitement with music on have a physiological basis, which is evident by changes in blood pressure that occur in some participants while they are listening to music.(2) age and preference for music at work has negative correlation. (3) Inexperienced, young employees, engaged in doing simple, , monotonous , repetitive task increased their output when music is being played on.(4) experienced factory operators, who were performing complex tasks and whose work patterns were stabilized ,did not increase their production when music was being played on (5) At times music adversely affected individual employees output, even though they proclaimed that music they were listening was `quite pleasant'.

So multiple factors like age, type of work and individual preference for music can have significant effect on productivity and work performance of people.

Numerous studies have shown that music motivates us, makes us more focused and helps us with coming up with better and new ideas. It also helps in relieving stress and pain. Overall all this happens because whenever we listen to music brain releases a neurotransmitter chemical called dopamine. Dopimine is brain motivational molecule. This is the same chemical which is released when we sleep, eat sweets, orgasm and runners high.In all its lifts our mood and makes us more productive to work. [9,10, 11, 12,13,14].

In our study we have focused on industrial workers engaged in repitive work , in an Indian automotive industry with the aim of improving productivity. Since not much research has been done on Indian industries, so we have chosen Indian automotive industry for our test.

II. AIMS AND OBJECTIVE

The objectives of the study were:

- To see the effect of music on industrial work particularly in Indian industry through quantitative analysis using T-test and Anova analysis.
- To see the effect of music on industrial work particularly in Indian industry through qualitative analysis through questionnaire.
- To see and compare the effect of different forms of music on workers engaged in repetitive work.

III. METHOD

The main objective of this project is to increase productivity of the workers, by utilizing the concept of human factor engineering and by providing a comfortable environment for workers in the industries. The project aims to see the effect of music on workers engaged in repetitive work in Indian auto industry and to see if productivity increases, decreases or remains constant in presence of music.

We have conducted a study on workers engaged in repetitive work in an Indian automotive industry making rear view mirrors for two and four wheelers.

For first two weeks data was collected without music. Two weeks later speakers were installed in the plant . Pleasing Happy Instrumental music was played and data was collected accordingly. Similarly for week five and six devotional music was played and data was collected and for week seven and eight bollywood music was played and readings was taken accordingly. The data was analyzed using T-test and Anova analysis.

At the end of experiment subjects were also given a questioner as for qualitative analysis.

IV. RESULTS AND DISCUSSIONS

18 healthy male workers were selected for the study. Data was collected without music for first two weeks. Two weeks later speakers were installed in the plant .Pleasant happy instrumental music was played and data was collected accordingly. Similarly for week five and six devotional music was played and data was collected and for week seven and eight bollywood music was played and readings were taken accordingly. The data was analyzed using T-test to compare and see whether there was any significant difference with and without music.

Null Hypothesis (H0): $\mu_1-\mu_2=0$; There is no significant difference before and after applying music

Alternate Hypothesis (H1): $\mu_1< \mu_2$; There is significant difference before and after applying music and with music has greater value.

Table 6.1 below shows the data without and with pleasant happy instrumental music using T-test.

Parameters	*Without Music Packing*	*With Pleasing Happy instrumental Music Packing*
Mean	1308.333333	1529.166667
Variance	39924.24242	25662.87879
Hypothesized Mean Difference	0	

t Stat	-2.333400461	
T critical(observed)	-1.795884819	
P(T<=t) one-tail	0.019815402	

[Table 6.1]

The data above clearly shows there is increase in production when pleasant happy instrumental music is applied in the plant from mean earlier being 1308.333333 to 1529.166667 now and productivity increases by 16.87% with pleasing happy instrumental music. T observed value (-1.795884819) and t stat calculated value (-2.333400461) which shows that t-Stat calculated value lies in rejection region. Hence we reject null hypothesis. P(0.019815402) which is less then 0.05 also shows that we reject null hypothesis i.e there is no significant difference and except alternate hypothesis i.e there is significant difference before and after applying happy music.

Table 6.2 shows the data without and with *Devotional* music using T-test

Parameters	*Without Music Packing*	*With Devotional Music Packing*
Mean	1308.333333	1475
Variance	39924.24242	16136.36364
Hypothesized Mean Difference	0	
t Stat	-3.640468658	
T critical(observed)	-1.795884819	
P(T<=t) one-tail	0.001942448	

[Table 6.2]

The data above clearly shows there is increase in production when devotional music is applied in the plant from mean earlier being 1308.333333 to 1475 now and productivity increases by 12.96% . T critical((observed value (-1.795884819))and t stat calculated value (-3.640468658) which shows that t-Stat calculated value lies in rejection region. Hence we reject null hypothesis P(0.001942448) which is less then 0.05 also shows that we reject null hypothesis i.e there is no significant difference and except alternate hypothesis i.e there is significant difference before and after applying devotional music.

Table 6.3 shows the data without and with Bollywood music using T-test.

Parameters	*Without Music Packing*	*With Bollywood Music Packing*
Mean	1308.333333	1495.833333
Variance	39924.24242	14753.78788
Hypothesized Mean Difference	0	
t Stat	-2.342606428	
T critical(observed)	-1.795884819	
P(T<=t) one-tail	0.019496312	

[Table 6.3]

The data above clearly shows there is increase in production when bollywood music is applied in the plant from mean earlier being 1308.333333 to 1495.833333 now and and productivity increases by 14.29%. . T observed value (-1.795884819) and t stat calculated value(-2.342606428) which shows that t-Stat calculated value lies in rejection region. P(0.019496312) which is less then 0.05 also shows that we reject null hypothesis i.e there is no significant difference and except alternate hypothesis i.e there is significant difference before and after applying bollywood music.

Table 6.4 shows comparison among happy, devotional and bollywood music using Anova analysis.

Groups	*Count*	*Sum*	*Average*	*Variance*		
With Happy Music Packing	12	18350	1529.167	25662.88		
With Devotional Music Packing	12	17700	1475	16136.36		
With Bollywood Music Packing	12	17950	1495.833	14753.79		

ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	17916.67	2	8958.333	0.475218	0.625939	3.284918
Within Groups	622083.3	33	18851.01			
Total	640000	35				

[Table 6.4]

The data above clearly shows there is not much significant difference among varieties of music i.e pleasant instrumental, devotional and bollywood music as F calculated(0.475218) lies with in the range of F critical or observed value(3.284918). P-value(0.625939) which is also greater then 0.05 also shows there is not much significant difference and we can accept null hypothesis.

Table 6.5 below shows one tail t-Test: Paired Two Sample test for Means-Rejection without and with pleasant happy instrumental music.

Parameters	*Rejection Without Music*	*Rejection With pleasant Happy instrumental Music*
Mean	57.08333333	56.66666667
Variance	106.6287879	92.42424242
Hypothesized Mean Difference	0	
t Stat	0.120704335	
T critical(observed)	1.795884819	
P(T<=t) one-tail	0.453050898	

[Table 6.5]

The data above clearly shows there is not much significant change in rejection data when pleasant happy music is applied in the plant as from mean earlier being 57.08333333 to 56.66666667.T observed value (1.795884819) and t stat calculated value(0.120704335) which shows that t-Stat calculated value lies within the region. Hence we accept null hypothesis. P(0.453050898) which is more than 0.05 also shows that we accept null hypothesis i.e there is no significant difference and except null hypothesis .

Table 6.6 below shows one tail t-Test: Paired Two Sample test for Means-Rejection without and with devotional music. [Table 6.6]

Parameters	*Rejection Without Music*	*Rejection With Bollywood Music*
Mean	57.08333333	56.66666667
Variance	106.6287879	65.15151515
Hypothesized Mean Difference	0	
t Stat	0.13161624	
T critical(observed)	1.795884819	
P(T<=t) one-tail	0.448832148	

Table 6.7 below shows one tail t-Test: Paired Two Sample test for Means-Rejection without and with bollywood music.

Parameters	*Rejection Without Music*	*Rejection With Devotional Music*
Mean	57.08333333	56.66666667
Variance	106.6287879	65.15151515
Hypothesized Mean Difference	0	
t Stat	0.157577599	
T critical(observed)	1.795884819	
P(T<=t) one-tail	0.438822484	

[Table 6.7]

The data above clearly shows there is not much significant change in rejection data when devotional music is applied in the plant as from mean earlier being 57.08333333 to 56.66666667. T observed value (1.795884819) and t stat calculated value(0.157577599) which shows that t-Stat calculated value lies within the region. Hence we accept null hypothesis. P(0.453050898) which is more then 0.05 also shows that we accept null hypothesis i.e there is no significant difference and except null hypothesis .

The data above clearly shows there is not much significant change in rejection data when bollywood music is applied in the plant as from mean earlier being 57.08333333 to 56.66666667. T observed value (1.795884819) and t stat calculated value (0.13161624) which shows that t-Stat calculated value lies within the region. Hence we accept null hypothesis. P(0.453050898) which is more then 0.05 also shows that we accept null hypothesis i.e there is no significant difference and except null hypothesis .

Table 6.8 shows comparison among happy, devotional and bollywood music using Anova analysis for rejection data.

Groups	*Count*	*Sum*	*Average*	*Variance*		
Rejection With Happy Music	12	680	56.66667	92.42424		
Rejection With Devotional Music	12	680	56.66667	65.15152		
Rejection With Bollywood Music	12	680	56.66667	65.15152		
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4.55E-13	2	2.27E-13	3.06E-15	1	3.284918
Within Groups	2450	33	74.24242			
Total	2450	35				

[Table 6.8]

The data above clearly shows that F(0.475218) value clearly lies within the range of *F crit(*3.284918) therefore we accept null hypothesis I.e. there is no significant difference among the varieties of music . The data above clearly shows there is not much significant difference among varieties of music i.e pleasant instrumental, devotional and bollywood music as F calculated (3.06E-15) lies within the range of F critical or observed value(3.284918). P-value(1) which is also greater than 0.05 also shows there is not much significant difference and we can accept null hypothesis.

V. CONCLUSION

The result can be concluded that music has a significant effect on workers. Their productivity increases and they feel motivated to work which is proved by questionnaire provided. T- test has also been provided to show the significant difference. Pleasant happy instrumental music had a significant effect on workers and their productivity. They felt elated and motivated to work in an environment where music is played on. Bollywood music making workers contend they felt energetic and ready to do more work with this kind of music. Devotional music also helped in creating positive feeling among workers .They felt like doing more work. Anova showed there is not much difference among varieties of music pleasant instrumental, devotional and bolloywood music .Overall music helped in enhanced productivity though not much improvement in rejection rate . In all it helped in improving workers mood and making them ready to do more work.

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