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IR - SPECTROSCOPY OF USED FAT SUBSTANCES FOR THE PROCESS OF EMULSION FATLIQUORING OF KARAKUL

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ABSTRACT

The article presents the possibility of using waste oil obtained by repeatedly frying fish, and using it in the process of fattening karakul. The main properties of the purified oil were determined and an IR spectroscopic analysis was carried out. Bleached oil is used in emulsion greasing and karakul is obtained with soft, smooth and elastic leather tissue.

KEY WORDS: karakul, emulsion fatliquoring, waste oil, emulsifier, fattening material, acid number, vegetable oils.

Abbreviations

IR – Infra Red

1. INTRODUCTION

The formation of ergonomic, aesthetic, operational and other properties of the quality of fur semi-finished products mainly depends on the natural properties of the raw material, as well as on the methods of its processing and dressing. The processes of dressing fur, which is a unique natural material, are often associated with the use of chemically aggressive compounds that negatively affect the condition and quality of the hairline.

Conducting comprehensive research aimed at improving the quality of fur semi-finished products and the properties of finished products through the use of local chemical materials in technological processes, namely secondary production resources changed during the production of the main product, opens up new opportunities and prospects. and is considered one of the most pressing issues. The term lipid is traditionally used to describe a wide range of natural products, including fatty acids and their derivatives, steroids, terpenes, carotenoids, and bile acids [1]. Natural oils and fats are the main sources of fats for the leather and fur industry.

If the natural oils and fats that make up leather or fur are not properly selected, they can cause a variety of problems with the finished product, including greasy stains, uneven tanning [2], uneven coloring, saponification [3] and greasy emissions [4]. The main causes of these conditions are oil storage temperature, high humidity and the interaction of fats and oils with skin tissues and the microbiological changes that occur.

The main purpose of the fatliquoring process is to prevent thinning and drying of the fibers in the final product obtained after the drying process, as well as to reduce their adhesion. However, excessive use of fattening materials is also not recommended, as any acids used can cause fats to deposit on the surface of the semi-finished product and cause fat to burp out. Such cases also arise from the use of sulfated, sulphated, phosphated oils and various emulsifiers used in the emulsification of natural oils [5].

Fiber fattening is carried out with an emulsion of 8-12% oils in water. Accordingly, a fatliquoring emulsion consisting of fat and emulsifier is described as a multi-component homogeneous mixture. Fat components include natural and synthetic fats, and



emulsifiers are anionic, cationic or non-ionic. Emulsifiers ensure the solubility of fat droplets inside the structures in the state of aggregation and increase their viscosity, facilitating the diffusion of the emulsion into the dermis. Fats are distributed along the leather fibers and have the necessary physical properties [6].

Most scientific research has focused on the role of emulsifiers in the emulsification of fats and oils and their effect on the quality of the finished product [7]. During the fatliquoring process, 85-90% fat is absorbed, and 10-15% of the unabsorbed material remains in the working solution as waste [8]. The composition of emulsion fats includes a large number of emulsifiers. This is hazardous to the environment as wastewater contains emulsifiers, soap metals, alkylphenylethoxylates, chlorinated paraffin oils and volatile hydrocarbons [9].

2. OBJECTIVES

Most of the fatliquoring materials used at the enterprises of the Republic of Uzbekistan are imported products. This has a significant impact on the cost of the finished product. For example, on average, 4.3 kg of fattening agent is consumed per 1000 pieces of karakul. Considering that the average price of 1.0 kg of fatliquoring material is \$6.00, the purpose of the study was to localize fatliquoring substances for karakul.

In this research work, used vegetable oil is selected [10], which is formed as a result of frying fish, as well as an emulsifier obtained on the basis of it. Using them, the technology of emulsion fattening of astrakhan fur has been developed.

3. METHODOLOGY

Waste oil from fish frying was first bleached and then used as a fatliquor in the emulsion fatliquor process. Clay "Super Gold" from the production of Pakistan was used for bleaching and the main physico-chemical parameters [11-12] of the purified oil were determined. Also, literature on the IR-Fure spectrometer [13] was analyzed on the basis of these methods.

4. RESULTS

The bleached and refined butter was analyzed and the results of the analysis were tabulated. As can be seen from the table, the color of the used oil was determined on a scale of standard iodine solutions and observed as it changed from dark brown to yellow. Yellow is the color of most vegetable oils and will not harm the final product produced. Its smell, which is harmless, conveys the likelihood of oil not affecting the smell of the finished product. The specific gravity of the oil corresponds to the density of most vegetable oils. The acid number of the object under study met the requirements, since the fattening substances used in the processes of fattening leather or fur should not exceed 25.

Table
Physical and Chemical Indicators of used oil

Parameters	Before the bleaching process	After the bleaching process
Color, from 0 to 100 on the iodine scale (GOST 5477-2015)	60	40
Odor	Cutting	Characteristic odor of foils
Density 20 °C, g/cm ³	0,39	0,67
Acid number	27,48	24,5

To obtain information about the structure of the object under study, IR spectroscopic analysis was performed.

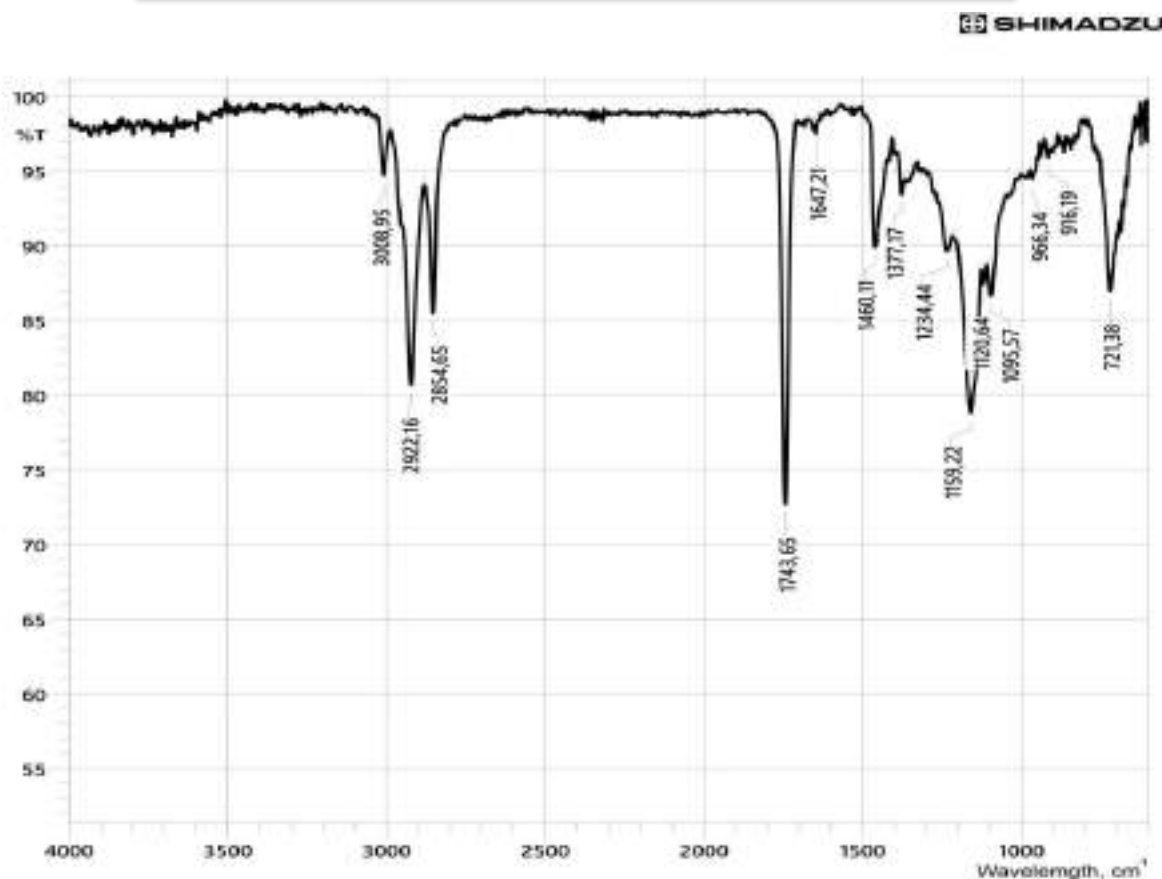


Fig. IR spectrogram of bleached butter

The IR spectra were interpreted using literature data on the characteristic absorption frequencies of various groups of atoms.

In the region of 3008.95 cm^{-1} of the IR spectrogram - COO - H in the alternating stretching vibration, as well as in the region of 2922.16 cm^{-1} - in the strong stretching vibration of C-H, the formation of alicyclic compounds is observed. When hydrogen bonds are formed, the vibrations decrease and the field expands. These compounds are commonly found in oil, essential oils, sterols, steroids, antibiotics, etc. For example, alicyclic compounds present in natural pure oils and esters can also be found in sunflower oil, used oil obtained from frying fish.

In the absorption band 2854.65 cm^{-1} - in the stretching vibration of COO-H with variable intensity, peaks characteristic of carboxylic acids appears. Usually salts of carboxylic acids and alkali metals are used as soaps, emulsifiers and fattening agents. The band in the region of 1743.65 cm^{-1} shows peaks related to esters with a strong C=O stretching vibration. Aliphatic esters usually absorb at $1750\text{--}1735\text{ cm}^{-1}$. When the fields are combined, the frequency of these oscillations decreases.

Peaks related to alkanes appeared in the bending vibration of the CH_3 medium in the regions of 1460.11 cm^{-1} and 1377.17 cm^{-1} of the object under study. In the IR spectra of alkanes, stretching vibrations of the C-N bond are clearly visible in the region of $2850\text{--}3000\text{ cm}^{-1}$. The frequencies of the stretching vibrations of the S-S bonds are not constant and often have a low intensity. Alkanes (paraffins, also saturated or unsaturated hydrocarbons) are acyclic hydrocarbons with a linear or branched structure, containing only simple (single) bonds that form a homologous series.

In the infrared spectrum, the range characteristic of ethers occupies the $1150\text{--}1080\text{ cm}^{-1}$ range with vibrations corresponding to the C-O-C group. In particular, in the IR spectroscopy of the studied fat in the regions of 1159.22 cm^{-1} , 1120.64 cm^{-1} and 1095.57 cm^{-1} , ethers appeared in a strong asymmetric stretching vibration and were divided into three components. On the IR spectrogram in a strong stretching vibration, one can observe S-O sulfoxide and sulfonic groups at an absorption frequency of 721.38 cm^{-1} . This ensures the thermal stability of the oil.

5. CONCLUSIONS

The results obtained showed that after the bleaching process, the waste oil obtained by repeatedly frying the fish can be used as a greasing for fur. The process of fatliquoringkarakul is usually carried out on the basis of the emulsion fatliquor method. An emulsifier is required to form an emulsion. The emulsifier was also obtained from oil, from waste oil.



In the process of preparing the emulsion, the emulsifier is added while stirring the fatliquoring solution. The emulsion did not separate within one hour, which indicated the stability of the emulsion.

The process of fatliquoring karakul was carried out on the basis of this emulsion. Process temperature 36-37°C, duration 3 hours, pH 8.5. After the lubrication process, the pressing process was carried out. Drying of karakul fur was carried out in the open air, indoors.

When organoleptically assessed, it was noted that the skin tissue of karakul deeply absorbed the fat emulsion, was soft and elastic. According to the organoleptic analysis, it should be noted that the level of absorption of fattening materials from the working composition after the fatliquoring process was high.

6. ACKNOWLEDGEMENTS

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IMPACT OF USES OF METACOGNITIVE INSTRUCTIONAL STRATEGIES TO EXCEL IN COMPETITIVE EXAMINATIONS AMONG UNDERGRADUATE STUDENTS

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ABSTRACT

Metacognition in competitive examination involves and processes that developing students' self-awareness and self-regulation while attempting questions. Metacognition enables the students to facilitate and reflect on their learning in order to enable themselves to improve or to make any changes to their examinations. In particular, learning activities, especially in the 21st century, do not merely involve the transfer of knowledge and then applying that knowledge into daily life, but students need to reflect, plan and evaluate learning outcomes to enhance their competitive examinations. The investigator used quasi experimental method and convenient sampling technique for selecting the sample and samples consists of 168 undergraduate students studying in Periyar University affiliated colleges of arts and science. Use of Metacognitive instructional strategies scale was used, this is containing five dimensions like metacognitive task analysis, metacognitive instructional objective, metacognitive preparation, metacognitive evaluation, metacognitive reflection and its reliability value was 0.896. The major findings of the study shows that undergraduate students differ significantly in their use of metacognitive instructional strategies ($t=59.307, p<0.001$) from pre-test and the post-test at 0.01 level of significance. The mean score of the post-test ($M=174.84$) is greater than that of pre-test ($M= 53.91$). It is note that the experimental method could even enhance use of metacognitive instructional strategies among undergraduate students. Further undergraduate students differ significantly between the pre-test and post-test in their use of metacognitive instructional strategies to excel in competitive examinations.

KEYWORDS: *Competitive examination, metacognition, metacognitive instructional strategies, Undergraduate students, regulation and evaluation.*

INTRODUCTION

Metacognition involves wondering one's thinking, or knowledge, with the goal of enhancing learning (Conyers, 2018). instructional theory and analysis in metacognition are predicated on the work of biological process man of science John Flavell explicit that "applied this language in describing the management of information-processing activities that occur throughout psychological feature transactions". "Metacognition refers, to the active watching and resultant regulation and orchestration of those processes typically in commission of some concrete goal or objective" (Donna Wilson and Marcus Conyers, 2016). Metacognition involves being and up to speed of one's psychological feature abilities: Metacognitive information includes information about oneself as a student and therefore the factors that may impact performance, information concerning ways, and information concerning once and why to use ways. Metacognitive regulation is that the watching of one's knowledge and includes coming up with activities, awareness of comprehension and task performance, and analysis of the efficaciousness of watching processes and techniques (Eslami Sharbabaki H, 2013).

Metacognition is a necessary, however usually deserted, element of a twenty first century education that teaches students a way to learn (Donna Wilson and Marcus Conyers, 2016) from educational institution through high school, the academic schedule is jam-pawnced with content lessons with very little time for guiding students in developing the metacognitive and psychological feature skills that may facilitate them stand out within the schoolroom and within the operating world. despite the fact that the program and skilled development could cowl instruction on psychological feature methods, the daily agenda might not give the apparent teaching



and focused apply students have to be compelled to find out how, when, where, and why to use these methods effectively. the idea seems to be either that kids hit college naturally equipped with the power to be told or that they're going to selection up these skills on their own within the course of learning a way to scan, write, and do arithmetic, science, and social studies. Spreading this assumption, students WHO don't develop thinking and learning skills on their own square measure usually discharged as having restricted learning potential (Donna Wilson and Marcus Conyers, 2016).

WHY METACOGNITION IS IMPORTANT?

The traditional stress on material knowledge-with very little or no time assigned to show metacognitive and psychological feature strategies-may not sufficiently prepare students for faculty and career (<http://www.ascd.org/publications/books/117002/chapters/The-Case-for-Teaching-for-and-with-Metacognition.aspx>). A report from the National analysis Council on "Education for all times and Work" (Pellegrino & Hilton, 2012) identifies 3 domains of twenty first century competencies, psychological feature (thinking and reasoning), intrapersonal (regulating one's behaviors and emotions to attain goals), and social (relating to others and understanding others' points of view)-that square measure supported by several of the psychological feature assets featured during this text (Donna Wilson and Marcus Conyers, 2016).

No longer is it enough to demonstrate an understanding of the info or to understand the way to use basic learning skills. Rather, students should be able to deploy content data and apply thinking methods fittingly on their own in new learning things. In short, they'll enjoy "the full vary of metacognitive methods to watch and direct their thinking and learning" (National Governors Association Center for Best Practices & Council of Chief State college Officers, 2010a, p. 4). As Billings and Roberts note in instructional Leadership, the Common Core State Standards emphasize the event of ability to support freelance learning and faculty and career readiness and "assume that academics square measure ultimately teaching students to suppose the foremost troublesome and necessary accomplishment skill of all". Metacognition is at the center of our approach to learning and teaching students to suppose.

Mia Maric & Marija Sakac (2018) investigated the metacognitive parts as predictors of educational institution children's performance in problem-solving tasks. The queries were asked by the investigator throughout the method of children's problem-solving. youngsters were inspired by the researchers to suppose aloud and verbalize their thoughts. The seven auxiliary queries that the kids were asked were: one. What area unit you doing now?, 2. however have you ever done that?, 3. What area unit you about to do next?, 4. Why have you ever chosen this action?, 5. What helps you in finding this task?, 6. What disturbs you in finding this task?, and 7. are you able to attempt to do one thing else?.

Victoria Bonnett, Nicola Yuill & Amanda Carr (2017) discussed to encourage the children to persevere and seek understanding during the formal mathematics sessions, each child was given a "Helping Hints" card with specific actions to encourage perseverance. These were focused on the process of problem-solving:

- 1) I can read through the problem again
- 2) I can find something in the classroom to help me.
- 3) I can listen to my partner's ideas.
- 4) I can think about similar problems I have solved

REVIEW OF RELATED LITERATURE

Asha Lukman et.al (2022) studied teacher collaborative metacognitive feedback as the application of teacher leadership concept to scaffold educational management students' metacognition. This mixed-method study conducted a quasi-experimental method by involving EM students. This study revealed that TCMF positively and significantly affected EM students' metacognition. TCMF contributed to EM students' metacognition better than ITMF did. The students perceived that TC developed their collaborative skills, continuously supporting their critical thinking skills, intercultural communicative competence, and problem-solving skills.

Sulaiman Tajularipin et.al (2021) studied primary science teachers' perspectives about metacognition in science teaching. This study attempts to gain the perspective and implementation of metacognition skills in teaching science in the primary school classroom. The data was collected through a qualitative research method based on interviews with six science teachers in primary school using semi-structured interview protocol. Hence, the understanding of science teachers in regards to metacognition in science teaching is important and gives a positive impact towards teaching and learning in primary science teaching.

Stringer Thomas and Looney Kathy (2021) investigated the role of metacognition in mindfulness interventions with Japanese EFL university students. Results of the current study were not significant. However, this study represents an important step in terms of investigating mechanisms of change in educational practices.

Dezhbankhan Fariba et.al (2021) examined the impacts of Metacognition Management System (MMS) training course on metacognitive competencies. The large effect size ("Partial $n^2 = 0.939$," 95% confidence interval) implied that MMS



training course has a statistically significant impact on metacognitive competencies. This study has implications for further theoretical and experimental researches on the configuration and application of the MMS as well as designing multidimensional metacognitive intervention.

Çetin, Baris (2021) studied the factors affecting the general academic achievement of university students: gender, study hours, academic motivation, metacognition and self-regulated learning. A significant relationship between the university students' self-regulated learning, metacognition and academic motivation scores, and their grade point averages (GPAs) was found. It was also determined that the total scores related to the university students' self-regulated learning.

Naufal, Muhammad Ammar et.al (2021) studied the effectiveness of infusion of metacognition in van hiele model on secondary school students' geometry thinking level. The result revealed the significant difference between the final geometry thinking level in both groups. Thus, it can be concluded that the geometry learning strategy based on the infusion of metacognition in van Hiele model is more effective in improving the student's geometry thinking level than the geometry learning strategy based on van Hiele model.

Wang Li-Chih, Li Xiaomin, Chung Kevin Kien Hoa (2021) examined the relationships between test anxiety and metacognition in Chinese young adults with and without specific learning disabilities. Structural equation modeling analyses showed that test anxiety among Chinese adolescents was linked to literacy difficulties but that only high-functioning and typically functioning students with SpLDs experienced a direct effect (without mediation by other factors). For those without SpLDs, the influence of test anxiety on literacy difficulties was not direct but significantly mediated by metacognition.

Hidayat Riyan et.al (2021) studied the interrelationships between metacognition and modeling competency: the moderating role of the academic year. Our findings confirmed the direct correlation between metacognition and mathematical modeling was statistically significant. Academic year level as a partial moderator significantly moderates the interrelationships between the metacognitive strategies and mathematical modeling competency. The effect of metacognition on mathematical modeling competency was more pronounced in the year two group compared to the year one and three groups.

OBJECTIVE OF THE STUDY

- ❖ To find out the impact of use of metacognitive instructional strategies to excel in competitive examination among undergraduate students.
- ❖ To find out if there is any significant difference between pre test and post test scores of use of metacognitive instructional strategies among undergraduate students with respect to their locality.

HYPOTHESES OF THE STUDY

For the accomplishment of the objectives, the following hypotheses are formulated for testing.

H₀1: There is no significant difference between pre test and post test scores of uses of metacognitive instructional strategies and its dimensions among undergraduate students.

H₀2: To find out if there is any significant difference in the pre test scores of use of metacognitive instructional strategies among undergraduate students with respect to their locality.

H₀3: To find out if there is any significant difference in the post test scores of use of metacognitive instructional strategies among undergraduate students with respect to their locality.

METHOD OF THE STUDY

The method selected for this study was quasi experimental method of investigation. The population of this study undergraduate students in Salem district. The sample of this study consisted of 168 students from undergraduate students studying in Periyar University affiliated colleges of arts and science. The data required for this study was collected by the use of questionnaire; it was a selfmade test for the students (Use of Metacognitive Instructional Strategies Tool). In the present study the alpha coefficient of internal consistency reliability for Use of Metacognitive Instructional Strategies was 0.896.

DATA ANALYSIS AND FINDINGS

Hypothesis-1 There is no significant difference between pre test and post test scores of uses of metacognitive instructional strategies and its dimensions among undergraduate students.

**Table-1****Pre Test and Post Test Comparisons of Mean Score of Uses of Metacognitive Instructional Strategies and its Dimensions**

Variables	Mean	N	S D	r-value	t-value	p-value
MTA Pre Test	10.77	168	2.104	0.106	13.030	0.000**
MTA Post Test	14.77	168	3.608			
MIO Pre Test	10.86	168	2.109	0.047	13.061	0.000**
MIO Post Test	15.00	168	3.630			
MP Pre test	10.76	168	2.097	0.157	14.293	0.000**
MP Post test	15.56	168	3.496			
ME Pre test	10.72	168	2.070	0.052	8.752	0.000**
ME Post test	13.90	168	4.337			
MR Pre test	10.80	168	2.207	0.059	8.018	0.000**
MR Post test	13.46	168	3.575			
MIS Pre Test Total	53.91	168	4.676	0.167	59.307	0.000**
MIS Post Test Total	174.84	168	26.802			

* - Significant at 5% and ** - Significant at 1%

In order to analyse the differences in the mean scores of pre - test and post - test use of metacognitive instructional strategies score and paired 't' test was used by the investigators. From the table-1 the 't' test analysis indicates that undergraduate students (N=168) differ significantly in their Use of metacognitive instructional strategies (t=59.307, p<0.001) from pre-test and the post-test at 0.01 level of significance. The mean score of the post-test (M=174.84) is greater than that of pre-test (M= 53.91). It is note that the experimental method could even enhance use of metacognitive instructional strategies among undergraduate students. Further undergraduate students differ significantly between the pre-test and post-test in their Metacognitive Task Analysis (t=13.030, p<0.01), Metacognitive Instructional Objective (t=13.061, p<0.01), metacognitive preparation (t=14.293, p<0.01), metacognitive evaluation (t=8.752, p<0.01), and metacognitive regulation (t=8.018, p<0.01), at 0.01 level of significance. These results also indicate that a significant correlation exist between the pre-test and the post-test in Use of Metacognitive Instructional strategies and its dimensions. It can also be observed from the fig. 1.1 that there is a slight increase of scores in the post-test in use of Metacognitive instructional strategies and its dimensions from the pre-test.

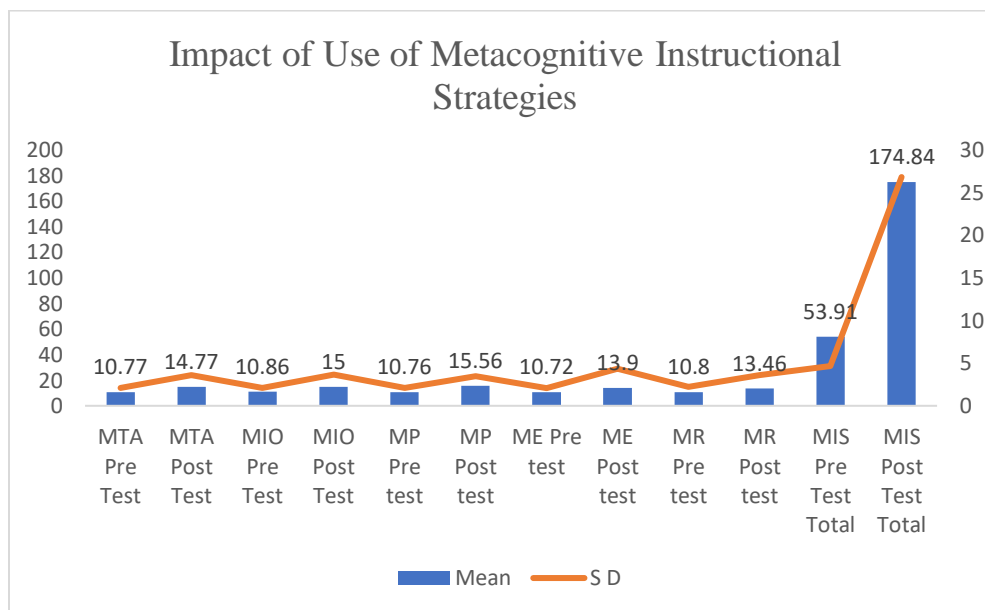


Figure 1.1 Showing Impact of Use of Metacognitive instructional strategies and its dimensions scores of pre-test and post-test. [Locality]



Hypothesis-2 There is no significant difference in the pre test scores of uses of metacognitive instructional strategies among undergraduate students with respect to their locality.

Table-2
Significance Difference in the Pre Test Scores of Uses of Metacognitive Instructional Strategies among Undergraduate Students with respect to their locality

Pre Test	Locality	N	Mean	SD	t-value	P-value
MTA	Rural	117	10.71	2.072	0.587	0.559
	Urban	51	10.92	2.189		
MIO	Rural	117	10.93	2.164	0.716	0.475
	Urban	51	10.69	1.985		
MP	Rural	117	11.00	2.125	2.238	0.021*
	Urban	51	10.22	1.942		
ME	Rural	117	10.92	2.077	1.969	0.042*
	Urban	51	10.25	1.998		
MR	Rural	117	10.89	2.177	0.796	0.428
	Urban	51	10.59	2.282		
MIS Total	Rural	117	170.62	26.979	3.322	0.001**
	Urban	51	184.51	23.953		

*-Significant at 5% and **-Significant at 1%

It is inferred from the above table, since p values are greater than 0.05, the null hypothesis is accepted at 5% level of significance in the pre test scores of uses of metacognitive instructional strategies' dimensions metacognitive task analysis, metacognitive instructional objectives and metacognitive reflection. Hence it is concluded that there is no significant difference in the pre test scores of the dimensions metacognitive task analysis (t=0.587, p>0.05), metacognitive instructional objectives (t=0.716, p>0.05), and metacognitive reflection (t=0.796, p>0.05) of undergraduate students with regard to locality.

since p values are less than 0.05, the null hypothesis is not accepted at 5% level of significance in the pre test scores of uses of metacognitive instructional strategies' dimensions metacognitive preparation, metacognitive evaluation and overall use of metacognitive instructional strategies. Hence it is concluded that there is significant difference in the pre test scores of the dimensions metacognitive preparation (t=2.238, p<0.05), metacognitive evaluation (t=1.969, p<0.05), and overall use of metacognitive instructional strategies (t=3.322, p<0.05) of undergraduate students with regard to locality.

Hypothesis-3 There is no significant difference in the post test scores of uses of metacognitive instructional strategies among undergraduate students with respect to their locality.

Table-3
Significance Difference in the Post Test Scores of Uses of Metacognitive Instructional Strategies among Undergraduate Students with respect to their locality

Post Test	Locality	N	Mean	SD	t-value	P-value
MTA	Rural	117	14.35	3.763	2.538	0.012*
	Urban	51	15.75	3.039		
MIO	Rural	117	14.40	3.712	3.600	0.000**
	Urban	51	16.37	3.046		
MP	Rural	117	15.01	3.604	3.463	0.001**
	Urban	51	16.82	2.889		
ME	Rural	117	13.34	4.404	2.681	0.009**
	Urban	51	15.18	3.928		
MR	Rural	117	13.04	3.517	2.337	0.022*
	Urban	51	14.43	3.551		
MIS Total	Rural	117	54.45	4.750	2.400	0.018*
	Urban	51	52.67	4.293		

*-Significant at 5% and **-Significant at 1%



since p values are less than 0.05, the null hypothesis is not accepted at 5% level of significance in the post test scores of uses of metacognitive instructional strategies' dimensions metacognitive task analysis, metacognitive instructional objective, metacognitive preparation, metacognitive evaluation, metacognitive reflection and overall use of metacognitive instructional strategies. Hence it is concluded that there is significant difference in the post test scores of the dimensions metacognitive task analysis ($t=2.538$, $p<0.05$), metacognitive instructional objective ($t=3.300$, $p<0.05$), metacognitive preparation ($t=3.463$, $p<0.05$), metacognitive evaluation ($t=2.681$, $p<0.05$), metacognitive reflection ($t=2.337$, $p<0.05$), and overall use of metacognitive instructional strategies ($t=2.400$, $p<0.05$) of undergraduate students with regard to locality.

FINDINGS AND CONCLUSION

The study found that undergraduate students differ significantly in their use of metacognitive instructional strategies from pre-test and the post-test at 0.01 level of significance. The mean score of the post-test is greater than that of pre-test. It is note that the experimental method could even enhance use of metacognitive instructional strategies among undergraduate students to excel in their competitive examination. Another finding shows that there was a significant difference in the post test scores of uses of metacognitive instructional strategies among undergraduate students with respect to their locality. Many psychologists believe that metacognitive plays a vital role in learning. If that's the case, in institutes of higher education where students are expected to be self-directed in their learning, cognition becomes an essential element. Therefore, this study will facilitate students to control their learning behavior and to require responsibility for his or her own learning. Also, they need to form selections in such how which can facilitate them to accomplish their competitive examination learning tasks. So, the extent of metacognition could play a vital role in the manner they attend to those learning. Also, this study is important as it addresses educators, teachers, and parents about improving students' competitive skill through metacognitive way to implement the learning process.

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MEDICINE BALL WITH RESISTANCE BAND EXERCISES – AN EXPERIMENTAL STUDY

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ABSTRACT

Cricket is often criticized for being a slow sport, especially in the case of five-day test matches, but do not underestimate the mental and physical endurance required to play the game at the highest level. Cricketers must be able to bolt into action from a standing start, and this is true whether they are batting, bowling, or fielding. In order to assess the real facts the investigator made an attempt to examine the impact of Medicine Ball Exercise with Resistance Band Exercises on Strength Parameters of Cricket Players were selected from Bharathiar university inter collegiate cricket players, in Coimbatore district. Their aged of the subject ranged from 21 to 23 years. Selected subjects was randomly assigned to two equal groups (n=15), group I underwent Medicine Ball Exercise with Resistance Band exercise (MBWRB) and group II acted as control group (CG). The Strength Parameters was given to the experimental group for 3days per week for the period of 8 weeks. The control group did not practice in any training except their routine work. The following variables were measured with standard test items: shoulder strength and grip strength. Pre and posttest was conducted on separate days with warm up. The shoulder strength measures by medicine ball in meters, grip strength measured by and grip dynamometer test. To find out the individual effect 't' test was applied at 0.05level of significant. Further, the findings confirmed the medicine ball with resistance band exercise is suitable protocol to bring out the desirable changes over the shoulder strength and grip strength of cricket players.

KEY WORD: *Shoulder strength, Grip strength, Medicine Ball Exercise with Resistance Band Exercises and cricket players*

INTRODUCTION

Cricket is a bat-and-ball sport contested by two teams, usually of eleven players each. A cricket match is played on a grass field, roughly oval in shape, in the centre of which is a flat strip of ground 22 yards (20.12m) long, called a pitch. At each end of the pitch is a construction of three parallel wooden stakes (known as stumps) driven vertically into the ground, with two small crosspieces (known as bails) laid across the top of them. This wooden structure is called a wicket.

The batsman, if he or she does not get out (for example if the bowled ball hits the wicket, or if a fielder catches the ball off the bat before it bounces), may run between the wickets, exchanging ends with a second batsman (the non-striker), who has been waiting near the bowler's wicket. Each completed exchange of ends scores one run, and the match is won by the team that scores more runs. Cricket has been an established team sport for hundreds of years. It originated in its modern form in England and is most popular in the present and former members of the Commonwealth. Cricket is the second most popular sport in the world. More than a hundred cricket-playing nations are recognized by the International Cricket Council. In the countries of South Asia, including India, Pakistan, Bangladesh and Sri Lanka, cricket is the most popular sport. It is also a major sport in England and Wales, Australia, New Zealand, South Africa, Zimbabwe and the English-speaking countries of the Caribbean, West Indies. There are also well-established amateur club competitions in countries as diverse as the Netherlands, Kenya, Nepal and Argentina, among others. The aim of the batting team is to score as many runs as possible. A run is scored when both batsman successfully moves to their respective opposite ends of the pitch [the is sometimes referred to as the term with multiple meaning]. The batsman will usually only attempt to score runs after the striker has hit



the ball, but this is not required by the rules- the batsman can attempt runs at any time after the ball has been bowled. Runs are also scored if the batsman propels the ball to the boundary of the playing area (scoring six runs if the ball crosses the boundary without having touched the ground or four runs otherwise), or if the bowler commits some technical infringement.

The aim of the bowler's team is to get each batsman out (this is a wicket, or a dismissal). Dismissals are achieved in a variety of ways. The most direct way is for the bowler to bowl the ball in such a way that it hits the stumps, dislodging the balls. While the batsmen are attempting a run, the fielders may attempt to dismiss either batsman by using the ball to knock the bails off the set of stumps to which the batsman is closest, before he has grounded himself or his bat in the crease. Other ways for the fielding side to dismiss a batsman include catching a struck ball before it touches the ground, or having the batsman adjudged LBW (leg before wicket, i.e., his body, which is prohibited). Once the batsmen are not attempting to score any more runs, the ball is "dead" and is bowled again (each attempt at bowling the ball is a ball or a delivery). The game is divided into overs of six (legal) balls. At the end of an over, the batting and bowling ends will be swapped, and the bowler replaced by another member of the fielding side. The two umpires also change positions at this time (the umpire previously at square-leg becomes the bowler's umpire at what is now the bowling end, and vice versa), and the fielding positions are rearranged.

Once out, a batsman is replaced by the next batsman in the team's line-up (The batting side can reorder their line-up at any time, but no batsman may bat twice in one innings.) The innings (singular) of the batting team ends when the tenth batsman is given out, since there always must be two batsmen on the field. When this happens, the team is said to be all out. (In limited overs cricket the innings ends either when the batting team is all out or a predetermined number of overs has been bowled.) At the end of an innings, the two teams exchange roles, the fielding team becoming the batting team and vice versa. A team's score is reported in terms of the number of runs scored and the number of batsmen that have been dismissed. For example, if five batsmen have been given out and the team has scored 224 runs, they are said to have scored 224 for the loss of 5 wickets (shortened to "224 for 5" and written 224/5 or, in Australia, "5 for 224" and 5/224).

The team that has scored more runs at the end of the completed match wins. Different varieties of the game have different definitions of "completion"; for instance there may be restrictions on the number of overs, the number of innings, and the number of balls in each innings. If the team that bats last has all of its batsmen dismissed before it can reach the run total of the opposing team, it is said to have lost by (n) runs (where (n) is the difference between the two run totals). If however, the team that bats last exceeds the opposing team's run total before its batsmen are dismissed, it is said to have won by (n) wickets, and where (n) is the difference between the number of wickets conceded and 10.

If, in a two-innings-a-side match, one team's combined first and second innings total fails to reach its opponent's first innings total, there is no need for the opposing team to bat again and it is said to have won by an innings and (n) runs, where (n) is the difference between the two team's totals. If all the batsmen of the team batting last are dismissed with the scores exactly equal then the match is a tie; ties are very rare in matches of two innings a side. In the traditional form of the game, if the time allotted for the match expires before either side can win, then the game is a draw.

Cricket is of its own significance and while physical strength is important, fitness also focuses on increased flexibility, faster recovery from illness or injury, improved endurance, and much that has grown to the point where most people know that being physically fit doesn't just mean having a strong body it means being mentally fit too. Fitness helps an individual to control the body and mind and use it accordingly when required for their performance. Setting goals and maintaining it depends on how self-disciplined an individual is and how religiously one follows the fitness routine. The medicine ball slam is a great exercise to develop explosive power in the shoulders and lower abdominal. Stand with your feet shoulder width apart and knees slightly bent. Catch the rebounding ball and return to the start position. Advanced athletes can perform this exercise with one arm at a time. If the match has only a single innings per side, then a maximum number of deliveries for each innings is often imposed. Such a match is called a limited overs or one-day match, and the side scoring more runs wins regardless of the number of wickets lost, so that a draw cannot occur. If this kind of match is temporarily interrupted by bad weather, then a complex mathematical formula known as the Duckworth-Lewis method is often used to recalculate a new target score. A one-day match can be declared a No-Result if fewer than a previously agreed number of overs have been bowled by either team, in circumstances that make normal resumption of play impossible-for example, an extended period of bad weather. (SubhashK .Goyal, 1998)

METHODOLOGY

Thirty physically active and interested university inter college cricket players were randomly selected as subjects and their age ranged between 21 and 23 years. The subjects are categorized into two groups namely control group (CG), medicine ball with Resistance band exercises (MBWRB) and each group had 30 subjects. The selected criterion variables shoulder strength endurance was assessed by push-ups in counts, grip strength measured by and grip dynamometer test. Medicine ball exercise with resistance band exercise group underwent the experimental treatment for 8 weeks, 3 days/ week and a session on each day with 45 min duration.



MEDICINE BALL EXERCISES

Using a medicine ball adds a whole new dimension to your training since it takes you through all planes of motions (unlike traditional weight training). Warm-up exercise was performed in ground. After that the medicine ball exercises group performed the following exercises.

1. Mountain climbers,
2. Overhead squat.
3. Circles
4. Russian twist.
5. Side lunge
6. Pushups.
7. Single-leg deadlift.
8. Superman

RESISTANCE BAND EXERCISES

Research shows that strength gains from using elastic resistance bands are similar to training with dumbbells or weight machines, benefiting not only the average person but also benefit athletes. Resistance band are likely best inexpensive training tool you can get whether you are a beginner or already at an advanced fitness level, resistance band exercise can give your muscles a good challenge.

1. Banded Single-Leg Tempo Deadlift
2. Deadlift
3. Lateral Raise
4. Lateral Squat To Cross-Body Row
5. Split-Stance Banded Shoulder Press
6. Standing Banded Triceps Extension
7. Banded Plank Tap

These exercises were performed for 45 min in a day and for 3 days/week. Pre and post test data were collected before and after 12 weeks of training. The collected data was analyzed using paired sample “t” test.

TEST OF ADMINISTRATION

SHOULDER STRENGTH:

Purpose: To measure the explosive Strength of the shoulder.

Equipment:



Medicine ball of 3 kgs, measuring tape, marking powder.



Procedure:

Each subject was asked to stand with legs shoulder-width apart behind the marked line in the direction where they had to throw the ball. They were instructed to hold the ball with both hands and take that ball above the head, and when instructed to throw, they could bend their hands from the elbow to take that ball behind and throw the ball with maximum force in the forward direction. After releasing the ball, the subject was allowed to step forward from the restraining line to balance the body. For the administration of this test, the researcher needed two experts for measuring the distance of the medicine ball thrown by the subjects.

Scoring:

The distance from the starting line to where the ball landed was recorded in the nearest 0.1cm. The best of 3 throws was used for data analysis.

GRIP STRENGTH

Purpose: To measure grip strength

Equipment: Handgrip dynamometer.



Procedure:

Before starting the test, the handgrip dynamometer was kept dry, and subjects were instructed to use chalk powder for a firm grip. Each subject was asked to hold the handgrip dynamometer with the shooting hand with the elbow at a right angle, and then the tester adjusted the handle as per the subject's comfort. After that, subjects were asked to hold the dynamometer so that the base of the dynamometer was set between the thumb and index finger (on the heel of the hand), and the other four fingers were on the handle of the dynamometer. The tester immediately reset the dial to zero before starting the test. When the subject was ready, they had to squeeze the dynamometer with maximum effort. Three trials were allowed with a minimum one minute rest in between each squeeze.

Scoring:

Best out of the 3 trials was recorded for the study in kilograms.

STATISTICAL ANALYSIS

The means and standard deviations of both control and medicine ball exercises with resistance band exercises groups were calculated for shoulder strength for the pre as well as posttests. The collected data was analyzed using “t” test. Statistical significance was set to a priority at $p < 0.05$. All statistical tests were calculated using the statistical package for the social science (SPSS).



TABLE - I
COMPUTATION OF ‘T’ RATIO ON SHOULDER STRENGTH OF CRICKET PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP
(Scores in beat/min/seconds)

Group	Test	Mean	Std. Deviation	T ratio	
Shoulder Strength	Experimental Group	Pre test	9.25	.70836	17.87*
		Post test	10.91	.68415	
	Control Group	Pre test	8.65	.57491	1.24
		Post test	8.46	.44673	

*Significant at 0.05 level of confidence (2.14)

Table I reveals the computation of mean, standard deviation and ‘t’ ratio on selected variables are strength endurance of experimental group. The obtained ‘t’ ratio on strength endurance were 17.87 and 1.24 respectively. The required table value was 2.14 for the degrees of freedom 1 and 14 at the 0.05 level of significance. Since the obtained ‘t’ values were greater than the table value it was found to be statistically significant.

FIGURE – I

BAR DIAGRAM SHOWS THE MEAN VALUES OF PRE TEST AND POST TEST ON SHOULDER STRENGTH OF CRICKET PLAYERS EXPERIMENTAL AND CONTROL GROUP

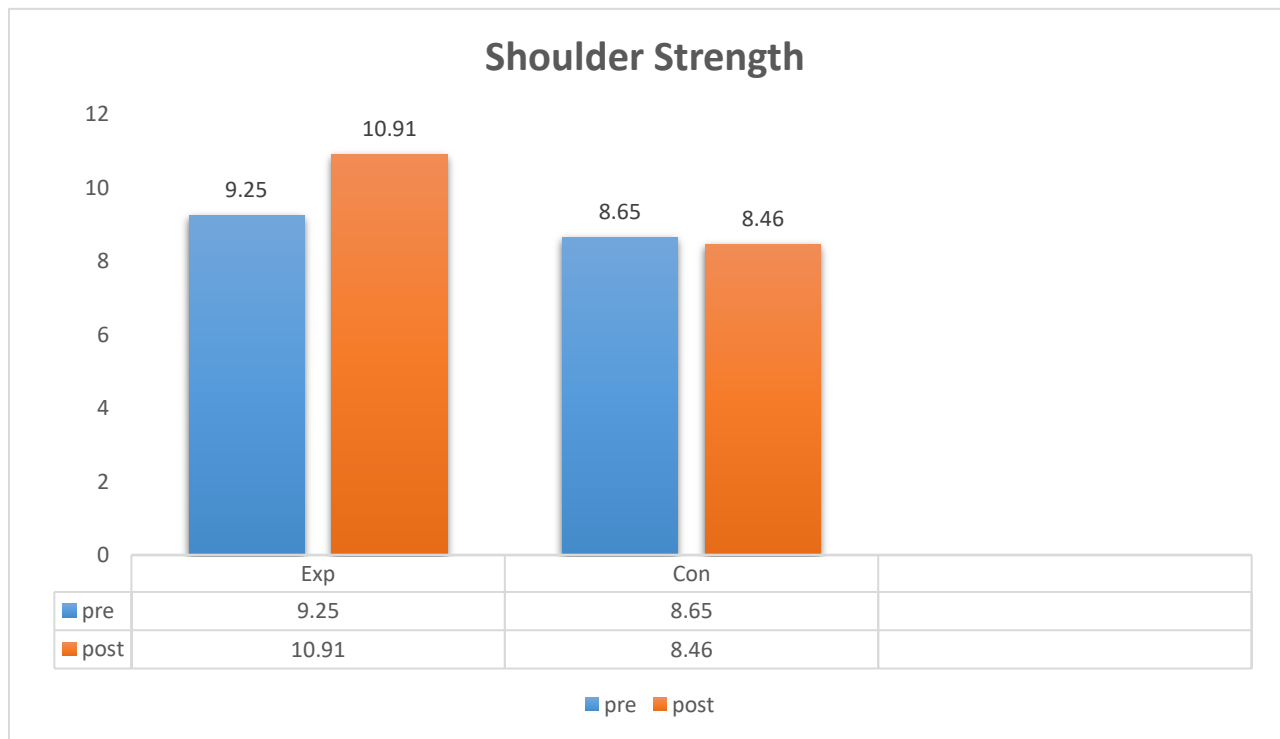




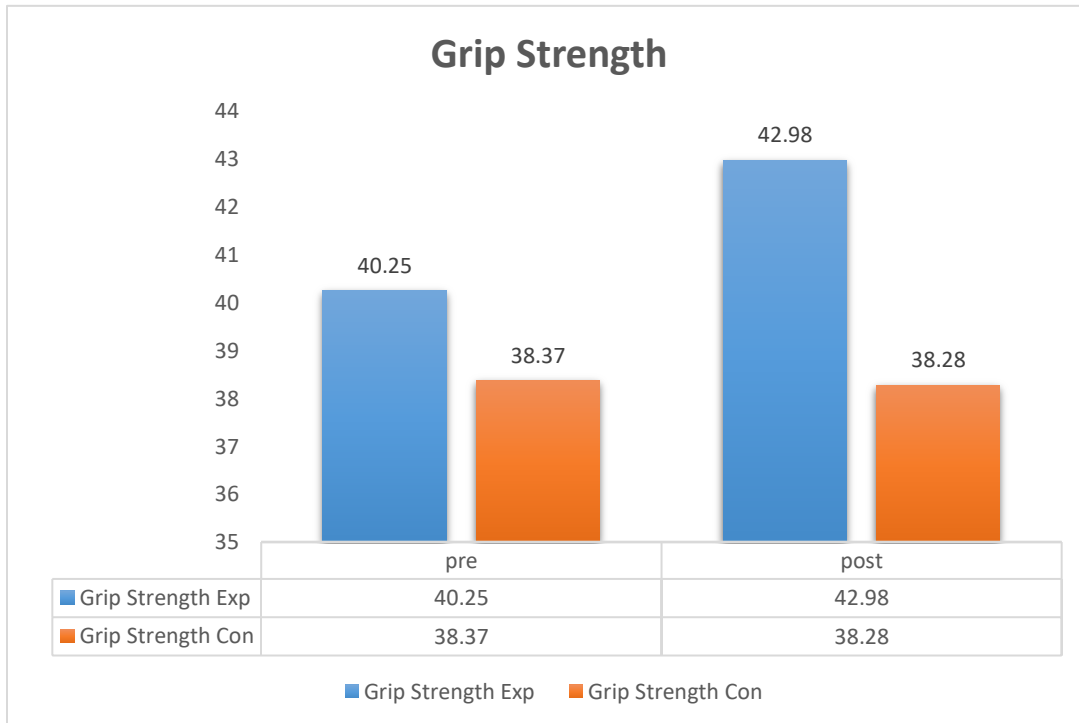
TABLE - II
COMPUTATION OF ‘T’ RATIO ON GRIP STRENGTH OF CRICKET PLAYERS ON EXPERIMENTAL GROUP AND CONTROL GROUP
 (Scores in beat/min/seconds)

Group	Test		Mean	Std. Deviation	T ratio
Grip Strength	Experimental Group	Pre test	40.25	2.34321	9.76*
		Post test	42.98	2.09385	
	Control Group	Pre test	38.37	1.25625	1.44
		Post test	38.28	1.37807	

*Significant at 0.05 level of confidence (2.14)

Table II reveals the computation of mean, standard deviation and ‘t’ ratio on selected variables are leg explosive power of experimental group. The obtained ‘t’ ratio on leg explosive power were 9.76 and 1.44 respectively. The required table value was 2.14 for the degrees of freedom 1 and 14 at the 0.05 level of significance. Since the obtained ‘t’ values were greater than the table value it was found to be statistically significant.

FIGURE - II
BAR DIAGRAM SHOWS THE MEAN VALUES OF PRE TEST AND POST TEST ON GRIP STRENGTH OF CRICKET PLAYERS EXPERIMENTAL AND CONTROL GROUP



DISCUSSION ON FINDINGS

The result of the present study should that methods of medicine ball with resistance band exercise had a significant and effect of upper body extremity cricket players. The cricket players who under well resistant band exercise with medicine ball exercise were able to improve that shoulder, elbow and wrist of joint movement.



Based on the current study a positive relationship is established between medicine ball with resistance band exercise to improve the selected physical fitness variables in the upper extremity of cricket players. Moreover, there are significant differences in motion output as a result of changes in the intensity practices. Thus, the selection of intensity of the preload spur in concurrence with the selection of intra-complex with cricket players seems to play the vital role in determining the effectiveness of the training regimes. The propositions of the contemporary study were very well experimented.

The result from the study may encourage and it demonstrates the benefits of medicine ball with resistance band exercise to overall playing ability. Cricket players not using resistance band to improve their mobility but also to improve performance. In addition, the result supports the improvements in programmes that occur in 8 weeks of medicine ball with resistance band exercises which can be useful during the preparatory phase before the competition for the sportsmen.

The result of the present study indicates that the medicine ball with resistance band exercises is an appropriate and effective programme to improve selected shoulder strength and grip strength of upper body edge of cricket players. Pre and posttest scores between the experimental group and control group were examined, there was a significant difference in posteromedial and posterior direction. Physical fitness variables likely to shoulder and grip strength to developing the medicine ball with resistance band exercises for the movement of bowling, batting, catching and throwing on fundamental skills improvement of performance especially for the beginners of the exercises.

Ferrauti, et al., (2015) Medicine ball training exercises seem to be a useful and inexpensive strength training strategy in enhancing functional performance by closely mimicking sport-specific movement activities.

Phansopkar et al., (2021) will depend on outcome measures that are shoulder strength, agility, speed and function. To conclude, this research may help badminton players to enhance their performance through the better exercise protocol.

Rooney, et al., (2016). Exercises with greater movement and speed specificity to throwing should be used in preference over exercises that are slower and have less movement specificity to the throwing motion. Cricket players should engage in power training to bridge the gap in performance between them and baseball players.

Christie, et al., (2018) changes for the experimental group were greater than those shown in the control group, likely owing to the additional conditioning sessions. Furthermore, significant ($p < 0.05$) changes were observed between the two groups for the percentage body fat, flexibility, plank time, 20-m sprint time, push ups, and 25-m shuttle distance.

Keerthirathne et al., (2021) Strength training and resistance band training can be utilized to develop strength in the upper body and it may help to develop throwing velocity in other throwing sports, such as cricket, throw ball and so on.

Robinson, et al., (2021) resistance bands appear to be a practical alternative when traditional means of resistance training are not available. In addition, strength and conditioning coaches should not use the Chop-test or shoulder ROM to predict throwing performance.

Ghodake, et al., (2016) The results showed that there is positive correlation (moderate to strong) between grip strength and shoulder power. Thus during training program, focus should be given equally on improvement of both shoulder power and grip strength. As there is positive correlation between grip strength and shoulder power that grip strength can be used as a predictor of shoulder power.

Febin, P. (2017) results from the present study are very encouraging and demonstrate the benefits of plyometric push-ups in improving throwing distance as compared ball push-ups. A training program that would be more likely to adopt (do not take lot of time or effort) as a regime with low risk of muscle and connective tissue. This can be used during the last preparatory phase before in-season competition for athletes.

CONCLUSIONS

From the results of the study and discussion the following conclusions were drawn.

1. From the findings, it was concluded that the cricket players doing the medicine ball exercises with resistance band for the more strengthening particularly upper body.
2. Within the limitation and on the basis of the findings, it was very clear that twelve weeks of medicine ball exercises with resistance band (MBWRB) produced significant changes in the strength parameters of cricket players.
3. It was clear that twelve weeks of medicine ball exercises with resistance band (MBWRB) produced significant changes in the grip strength of footballers.
4. In summary, the results of this study demonstrated that, the cricket coaches specific on upper body in the training schedule, particularly for cricket players.

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IMPACT OF METHOD OF TEACHING ON SELECTED PHYSICAL FITNESS COMPONENTS OF HANDBALL AMONG SCHOOL BOYS

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ABSTRACT

The purpose of the study was to find out impact of method of teaching on selected physical fitness components of handball among school boys. To achieve the purpose of the study, forty school boys were selected randomly 12 to 14 years of age from thondamuthur boy's higher secondary school at Coimbatore. The selected subjects were divided into two equal groups namely experimental and control groups of 20 subjects each. The training period was limited to twelve weeks and for three days per week. The whole part whole method of teaching was selected as independent variables and Speed, Strength, Flexibility, Agility and Balance were selected as dependent variables and it was measured by 50 meters dash, 1RM test, sit and reach, Shuttle run (6X10) and flamingo balance test respectively. All the subjects were tested two days before and immediately after the experimental period on the selected dependent variables. The obtained data from the experimental group and control group before and after the experimental period were statistically analyzed with dependent 't'-test to find out significant improvements. The level of significance was fixed at 0.05 level confidences for all the cases. Significant improvement was found on speed, strength, flexibility, agility and balance of experimental group due to the whole part whole method of teaching when compared to the control group.

KEYWORDS: Speed, Strength, Flexibility, Agility and Balance.

INTRODUCTION

The main and aim and object of all education is all – around development of individual's personality. To achieve this aim it is very essential for an educational institution or school to provide different activities to its students. Over the year, the educationists have realized to a great extent that the center of all education is the child or individual. This implies that the teaching – learning process in education has taken a broader meaning and scope. It is now absurd, if not foolish, to think that teaching is only, passing on the experiences from one generation to the other or that it is merely instruction i.e., do's and do not's of behavior (**Mike Anderson 2010**).

Whole – Part - Whole Method in this method a full and clear conception of the whole activity is given at the outset. Then the activity is divided into its meaningful parts and taught. After practising these parts as separate skills they are put in a practice game situation. Thus initial practice is on the individual parts. Then the parts are combined into the whole activity. This method is highly recommended to teach major games.

Physical fitness is a systematic process extending over a long period. For best results the system of training has to be based and conducted on scientific facts and lines where it is not possible to do that, the training has to be based on the results of successful practice which has withstood the test of time sport. The physical fitness on condition is the namely, speed, strength, agility, explosive power, flexibility, cardio respiratory endurance and coordinate abilities. These all motor abilities and their complex forms are the basic requirement for human motor actions. Therefore, the sports performance in all sports depends to a great extent on these abilities. The improvement and maintenance of physical fitness of condition is perhaps the most important aim of physical training.



METHODOLOGY

For the purpose of this study, altogether forty school boys were selected randomly 12 to 14 years of age from thondamuthur boy's higher secondary school at Coimbatore. Their age group ranges from 12 to 14 years. They were divided into two groups of 20 each. The Experimental group I would undergo Whole – Part - Whole Method. In this method a full and clear conception of the whole activity is given at the outset. Then the activity is divided into its meaningful parts and taught. After practising these parts as separate skills they are put in a practice game situation. Thus initial practice is on the individual parts. Then the parts are combined into the whole activity. This method is highly recommended to teach major games.

. The second group Control group did not undergo any training program. Pre – test and post –test would be conducted. Treatment would be given for twelve weeks. It would be find out finally the out impact of method of teaching on selected physical fitness components of handball among school boys in scientific methods.

The selected tests were measured by following units for testing:

Criterion Variables	Test Items	Unit Measurements
Speed	50 meters dash	Seconds
Strength	1RM test	Kg
Flexibility	Sit and Reach	Centi Meters
Agility	Shuttle run(6X10)	Seconds
Balance	flamingo balance test	Seconds

TRAINING PROGRAMME

The following schedule of training was given for the Whole – Part - Whole Method group.

Group	Design of the Training
Experimental Group I	Whole – Part - Whole Method
Control Group II	Did not do any Specific Training
Training Duration	90 Minutes
Training Session	3 Days a week
Total Length of Training	Twelve weeks



CHART-1
EXPERIMENTAL TREATMENT ADOPTED
FOR EXPERIMENTAL GROUP-I

WHOLE – PART - WHOLE METHOD EXERCISES GROUP (WPWMEG)

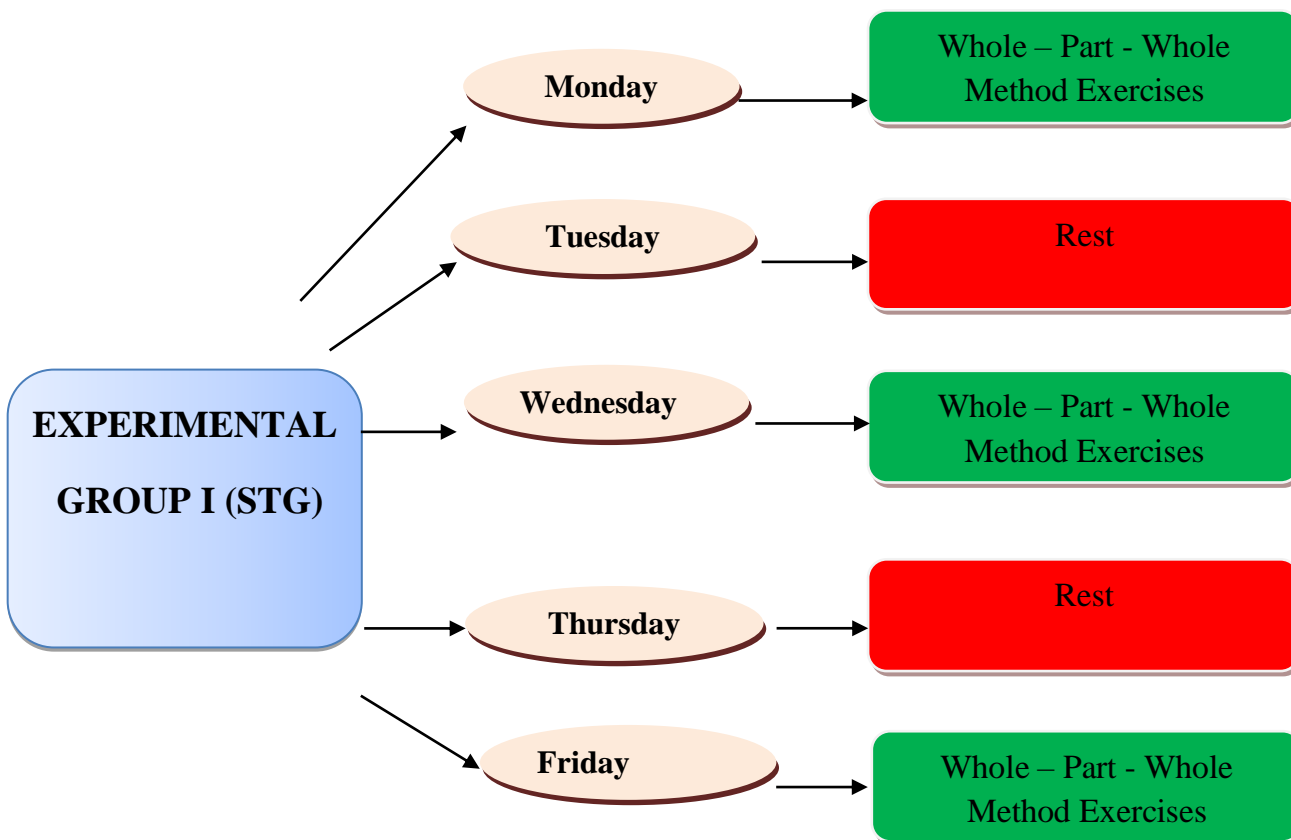




TABLE- I
PROGRESSION OF LOAD FOR EXPERIMENTAL GROUP-I (STG)

Weeks	Swissball Training (Monday, Wednesday, Friday)	Duration(10+25+4 0-+15= 60 min)	Load
I to IV	Warm -up	5 minutes	
	1000M Walking / Jogging		
	Over head pass Writs pass Jump pass Behind the back pass Behind the head pass	10 minutes 40 minutes	
	Warm- down	5 minutes	
V to VIII	Warm- up	5 minutes	
	2000 M Walking /Jogging		
	Dribbling full court Dribble routine Dribble train	10 minutes	
	Dribble relay Dribble chase down	40 minutes	
	Warming down	5 minutes	
IX to XII	Warm- up	5 minutes	
	3000 M Walking /Jogging	10 minutes	
	Set shoot Jump shoot 2 foot jump shoot Wing shoot	40 minutes	
	Positional shoot Warming down	5 minutes	

**EXPERIMENTAL DESIGN**

The experimental group was given swissball training exercises after taking an initial test. After the initial test selected swissball exercises were given for twelve weeks in three days. The time of practice was from 6.00AM to 7.30 AM. The control groups were not participating in any of the special training programme. However they were allowed to participate in their regular education classes in the school as per their curriculum.

STATISTICAL TECHNIQUE

The data were statistically evaluated with dependent t-test to discover obtainable significant development. The level of significance was secure at 0.05 level of confidence for all the cases.

RESULTS AND DISCUSSIONS

The impact of independent variables on each criterion variables was considered by dependent 't' - test on the data achieved for speed, strength, flexibility, agility and balance. The pretest and post- test means of experimental group and control group have been analyzed and existing in Table II & III.

TABLE – II
MEAN AND DEPENDANT 't' – RATIO FOR THE PRE AND POST TESTS ON SPEED, STRENGTH, FLEXIBILITY, AGILITY AND BALANCE OF EXPERIMENTAL GROUPS

S.No	Variables	Pre-test Mean± SD	Post-test Mean± SD	Diff	SE	't' –ratio
1.	Speed	08.20 ± 2.16	07.76 ± 1.88	0.44	0.61	4.86*
2.	Strength	29.14 ± 2.28	30.12 ± 2.32	0.98	0.13	5.76*
3.	Flexibility	8.46 ± 2.47	10.33 ± 3.23	1.87	0.24	7.80*
4.	Agility	8.07 ± 1.04	7.12 ± 1.12	.95	.05	8.10*
5.	Balance	13.15 ± 1.69	15.70 ± 1.49	24	.34	7.58*

*Significance at 0.05 level of confidence (2.09).

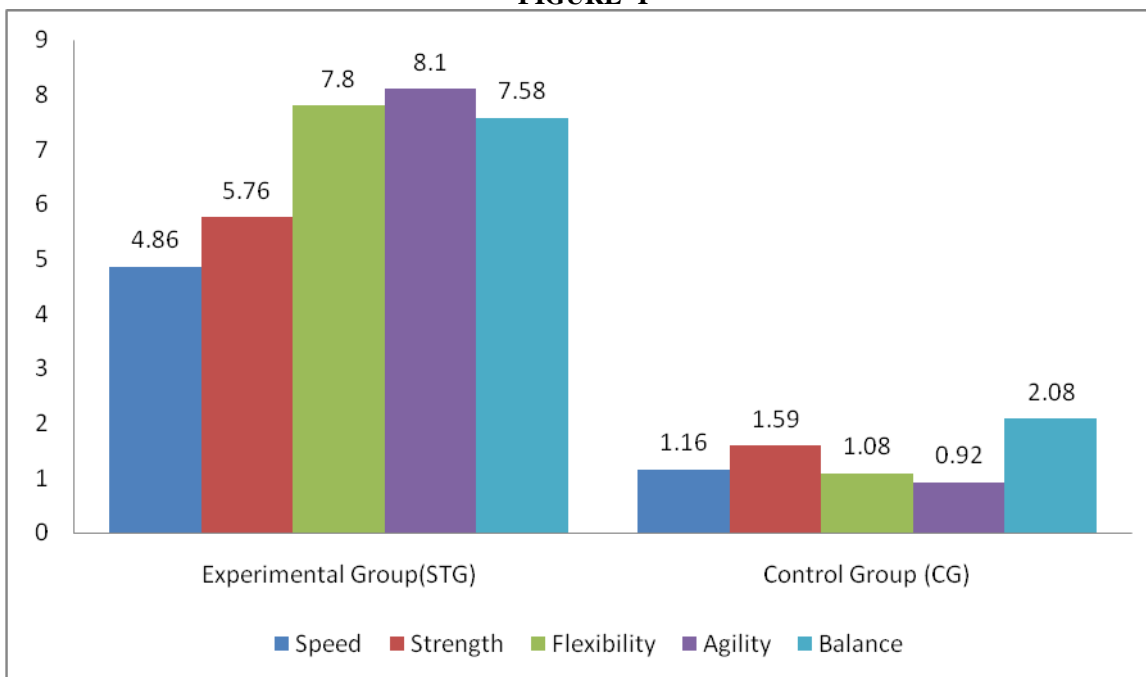
TABLE – III
MEAN AND DEPENDANT 't' – RATIO FOR THE PRE AND POST TESTS ON SPEED, STRENGTH, FLEXIBILITY, AGILITY AND BALANCE OF CONTROL GROUP

S.No	Variables	Pretest Mean±SD	Post test Mean± SD	Diff	SE	't' –ratio
1.	Speed	08.26 ± 2.16	08.24 ± 1.88	0.02	0.61	1.16
2.	Strength	29.14 ± 2.28	29.20 ± 2.32	0.06	0.13	1.59
3.	Flexibility	8.53 ± 3.05	8.83 ± 2.13	0.30	0.27	1.08
4.	Agility	8.90 ± 1.114	8.73 ± 1.107	.17	.18	.920
5.	Balance	13.17 ± 1.73	11.48 ± 3.70	.35	23	2.08

*Significance at 0.05 level of confidence (2.09).

The table II and III, shows that, the obtained 't' –ratio between the pre and post-test means of experimental group were 4.86, 5.76, 7.80, 8.10, 7.58 and control group were 1.16, 1.59, 1.08, .920, 2.08 respectively. The table values required for significant difference with df 24 at 0.05 level of confidence. Since the obtained 't' – ratio value of experimental and control group on speed, strength, flexibility, agility and balance were greater than the table value 2.09, it was concluded that the Whole – Part - Whole Method group had significantly improved speed, strength, flexibility, agility and balance of experimental group.

The pre and post- test mean value of experimental and control group on speed, strength, flexibility, agility and balance were graphically represented in the figure 1.

**FIGURE -I**

DISCUSSION ON FINDINGS

The finding of the study reveals that the Whole – Part - Whole Method group because significant improvement in their physical fitness components .In the view of control group there was no significant improvement in their physical fitness components. The findings of the study had close relationship with the results of the previous study conducted by Moradi, J., Movahedi, A., & Salehi, H. (2014). Specificity of learning a sport skill to the visual condition of acquisition.

CONCLUSIONS

Improvement on speed, strength, flexibility, agility and balance was found significantly on experimental group due to the impact of Whole – Part - Whole Method group on physical fitness when compared to the control group.

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RECIPROCITY IN PSYCHOLOGICAL CONTRACT AND CHANGE-ORIENTED ORGANISATIONAL CITIZENSHIP BEHAVIOUR OF HOTEL INDUSTRY IN NIGERIA

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ABSTRACT

The goal of this research is to discover the nature of the link between reciprocity in psychological contract and change-oriented organisational citizenship behaviour. The research issue is that, since the fall of the Naira, the emergence of COVID-19, the limits, and income loss, the responsibility of hotel success has been placed on the shoulders of the leader. As a result, the innovative atmosphere is obsolete, and managers are implementing drastic initiatives that are not in line with employee expectations. To acquire a picture of the hotel sector, a cross-sectional survey was used, coupled with other mixed research approaches for a broader view. The figures were gathered through an online poll of 243 hotel employees working in premium hotels in South-South Nigeria. The research findings were obtained through the use of structural equation modelling.

KEYWORDS: *Reciprocity in Psychological contract, Change-oriented OCB, Innovative Climate, Supportive Leadership*

INTRODUCTION

Organizations should be able to influence their employees' attitudes and behaviours so that they may care for their own values, ambitions, aspirations, and inclinations on a community level vicariously (Kaur, 2011). One approach to achieve the aforementioned state is through change-oriented organisational behaviour (OCB). Choi (2007) defines change-oriented OCB as constructive efforts by management and workers working together to achieve its goals.

Furthermore, workers' own efforts, ideas, proposals, and change implementation may considerably improve the running of the company as well as contribute to organisational transformation. To be more precise, researchers observed that growth in the hotel business, our field of study, is enabled by a small number of hotel employees who have proved the capacity to execute the behaviours necessary to meet particular performance targets on an annual basis (Akinwale et al., 2021). It is thus critical to do more research to identify determinants of change-oriented OCB and how this affects employee behaviour in the hotel business (Seppl et al., 2012). According to the United Nations, hotel expenditures account for between 70 and 75% of a tourist's budget. Hotel revenue in Nigeria grew by 252 million dollars between 2013 and 2018. By 2023, it was expected to reach 445 million dollars (Statista, 2021).

However, the sector has been harmed by the naira's 45 percent loss in value versus the US dollar from 2015 to 2018, as well as the outbreak of COVID-19 in 2020 (Obiakpolor, 2020).

STATEMENT OF THE PROBLEM

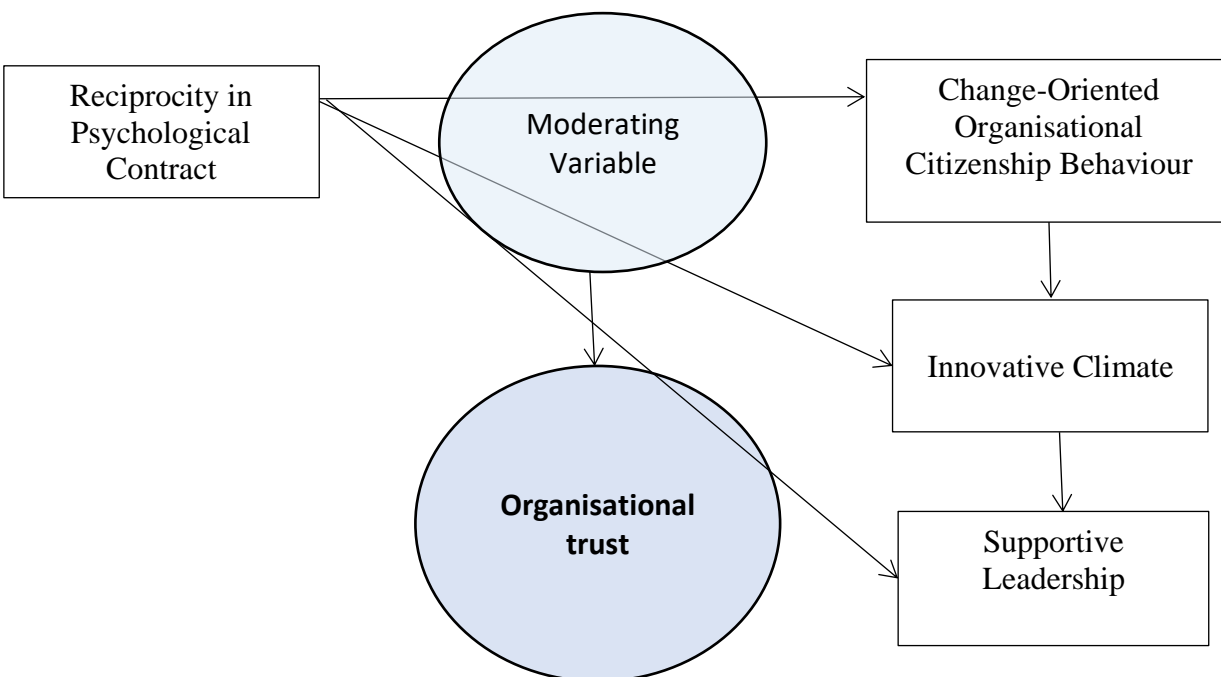
To remain competitive in the market, firms have been pushed to embrace radical management approaches due to extraordinary changes in the business environment. Even with poor revenue this year, shareholders want a strong return on investment, therefore hotel management is putting employees under great pressure to preserve a competitive edge and enhance profits at any costs.

The main problem is that hotel managers are becoming less helpful, and staff are losing confidence, trust, and innovativeness. Reciprocity is also non-existent in the majority of hotels. Theoretically, the construct change-oriented OCB as well as the indicators are understudied. OCB (extra-role behaviours) and change-oriented OCB (constructive efforts) are sometimes used interchangeably by researchers. Reciprocity in psychological contracts is one of the emerging management approaches used by the successful few. There is, however, a research bias. Only a few prior research have revealed that psychological contracts are also inconsistent, and that each employee develops their own psychological contract, making implementation extremely challenging.

This study attempts to investigate the influence of reciprocity on workers' change-oriented OCB in this regard. As a result, there is an opportunity for study into the role of organisational trust as a moderating component.



Conceptual/Operational Framework



LITERATURE REVIEW

Theoretical Framework

Homans' (1958) social exchange theory was used as a theoretical lens in this study to investigate the relationship between reciprocity in psychological contract and change-oriented OCB. The psychological contract may be traced back in time to the establishment of conventional theories such as Barnard's (1938) theory of equilibrium, Matthew and Simon (1958), and Menniger's (1958) inducements vs. contributions theory, all the way up to George Homans's social exchange theory in 1958. There was some theoretical progress in the early days, but there had been no actual research or application of the idea prior to Rousseau's work (Bavik, 2020). The term "psychological contract" alluded to various methods of transmitting information (Rousseau, 1989). Argyris (1960) identified the psychological contract as an unspoken agreement between workers and their bosses. According to his idea, employees may be prepared to trade improved output and grumpiness for a raise; for a job well done. In the modern age, there has been little theoretical advancement, but rather an enlarged, quantitative, and empirical approach to the study of the human condition (Grama, 2020).

CONCEPTUAL REVIEW

Reciprocity in Psychological contract

Reciprocity in psychological contract is the practice of being reciprocal in the way of mutual understanding. The formation of a psychological contract begins with the job applicant's subjective points of view and may be anticipated by the notion that there will be reciprocity if the job applicant is hired (Akhigbe & Sunday, 2018). Rousseau (1989) observed that during the early stages of developing a psychological contract, the organisation either paid for or offered some sort of consideration in exchange for the promise that the employee will reciprocate.

After being hired, an applicant will be expected to reciprocate in some way, which is where psychological contracts come into play (Akhigbe & Sunday, 2018). Some form of remuneration was exchanged for the employee's promise to reciprocate right away if the corporation paid for or provided it. Early communications between a company and a job seeker include a job offer and acceptance of the offer; such as statements in the line of 'things should be fine as long as integrity is sustained'.

However, opposing scholars claim that reciprocity in psychological contracts is a rhetorical idea that is meaningless because it is not written and legally binding. Furthermore, both the employee and the employer may have opposing views on what is expected of them during a psychological contract formation. Employees may believe that their effort is worthy of extra appreciation, but companies are only permitted to pay incentives to those who perform more than the regular 40-hour work week. Keep in mind that, even if employment expectations and performance requirements have been established, a psychological contract may not be recognised by a firm. A psychological agreement can exist between the Management and employee, although only the latter possesses such agreements, while the former does not (Rousseau, 1989). One may argue that reciprocity is embedded in human social interaction, according to Eisenberger and colleagues (2004). Few studies in the past have supported reciprocity in psychological contracts by using transactional (give and take) norms; however, even this is limited because it only takes into account what is offered as an incentive; it is important to remember that both parties have informal expectations that must be taken into



account when calculating the value of the employment relationship. The Change-oriented OCB(constructive efforts) by the management and the employee cannot be overemphasised.

Change-oriented Organisational Citizenship Behaviour

Change-oriented OCB is concerned with bringing about change rather than just exhibiting collaboration and adaptability, and it includes innovation behaviours such as the invention and execution of new ideas or procedures (Bettencourt, 2004). Individual discretionary behaviour targeted at effecting positive change is the emphasis of change-oriented OCB. Choi (2007) discovered strong vision and an inventive atmosphere to predict change-oriented OCB in a longitudinal study of 1,923 individuals from a big electronics industry in Korea. Furthermore, psychological empowerment and perceived responsibility for change were shown to be moderately mediated at the person level and totally mediated at the group level by the influence of work environment factors on change-oriented OCB. The findings imply that organisational level variables have a greater effect on change-oriented OCB than group level ones. According to Campbell (2015), future research should focus on the practical links between an innovative climate and supportive leadership as indicators of change-oriented organisational citizenship behaviour that influences the overall performance of any average firm.

Innovative Climate

The ensuring work environment that supports, nourishes, and improves individual creativity is referred to as an innovative climate. It is the responsibility of both the boss and the staff to create such an environment (Wang et al.,2020). Employees with inventive and creative potential are more likely to engage in new practises when they feel strong organisational support and trust from management. Furthermore, if organisations can create a favourable organisational environment, it is more likely to result in better levels of motivation, commitment, and employee engagement, leading to enhanced organisational performance (Simo et al.,2020). Ozmen (2019) defined innovative climate as "the shared perceptions of organisational members regarding the practises and behaviours that promote the generation of new knowledge and practises." An innovative climate is assimilated into an organisation through a series of steps relating to the awareness of a potential innovation that is evaluated for rights appropriateness (Gui et al.,2020). Chen (2018) investigated worker empowerment in order to stimulate creative behaviour. The authors observed that empowering employees helped foster innovation. According to Kao (2017) the more creative the organisational atmosphere, the more employees would be inspired to demonstrate change-oriented OCB. Furthermore, the study investigated how change affects employees' change-oriented OCB in a cross-level organisation. The findings indicated that organisational environment has a contextual influence on change-oriented OCB. To summarise, previous research has shown that a creative atmosphere has a considerable favourable influence on employees' motivations, attitudes, and behaviours toward accepting, proposing, and achieving objectives. Research Critics, however, claim that creative climate and change-focused OCB is a rhetoric ideology(Aneke & Folalu,2021); And that some employees' expectations and behaviour are governed only by the written contract. They do not aim to be more creative or to accomplish more. Employers, on the other hand, simply demand what is specified in the job description (Obiakpolor,2020).

Supportive Leadership

Supportive leadership is an organisational technique that entails providing a structure that allows people to fully release and utilise their knowledge and talents (Paper and Johnson, 2002). According to Iyayi (2018), supportive leadership may be defined as management methods that strive to increase workers' responsibilities and independence, allowing them to do their jobs more successfully. Empowerment benefits employees by increasing their innovativeness. When employees are empowered, they build a sense of belonging to the firm and begin to think creatively(Bavik,2020). Employees will endeavour to come up with novel solutions via creativity and innovation (Aneke & Folalu,2021). According to Akpabio(2017), perks such as pay, rank, training and development, and opportunities to participate in decision-making boosted employees' perceptions of organisational support. More crucially, research has shown that the more supportive a workplace is seen to be, the higher the employee's job satisfaction (Rhoades & Eisenberger,2002). Suazo and Stone-romero (2011), on the other hand, perceive change-oriented OCB differently from the general public. Their research has revealed a negative relationship between psychological contract breach and supportive leadership (Eisenberger et al,2004). According to Bavik(2020), while change-oriented OCB organisations are aimed toward being helpful, spending more in employee training and development, not all workers are trusting on the same level and have the desire to stay long term.

Organisational Trust

Trust and reciprocal duties are two notions that are inextricably intertwined (Blau,1964;Guest et al.,2010). Trust is notably developed when two people reciprocate; and reciprocal commitments over a certain length of time, resulting in an exchange relationship (Blau,1964;Coyle-Shapiro & Conway,2005). Experiences of psychological contract violation should be influenced by social and psychological aspects unique to the job relationship in question (Morrison & Robinson,2000). Prior definitions of trust include an individual's proclivity to trust, as well as an individual's expectations regarding a trustee's future behaviour (Dialoke & Chinwe, 2016;Mayer et al.,1995). Formally defined, A trusts B if A exhibits behaviour toward B that would allow B to harm/violate A's interests (Aselage & Eisenberger, 2003). Researchers have utilised selective interpretation arguments to claim that workers



perceive breaches based on their current levels of confidence in their organisation. Indeed, Rhoades and Eisenberger (2002) discovered that trust moderates the relationship between violation of contract and future trust. The implications of contract breach rely on the amount of confidence in their organisation when selecting how much effort put in for the organisation. Employees who perceive high levels of trust will feel more deceived, reducing their work and discretionary efforts. According to Mayer et al. (1996), when an organisation violates the psychological contract, employees face more risks in trusting their employer. As a result, they take less risk in their current relationship and reduce work performance and discretionary behaviour. However, most experts overlook the fact that prior studies in which employees felt left out and distrust might be attributed to a lack of communication about why promises were not kept and what was promised by the employer was not supplied.

To summarise, past research has revealed that psychological contracts and organisational citizenship behaviour have a considerable favourable influence. To the best of the researcher's knowledge, this is the first study to look into a relationship between reciprocity in psychological contracts, innovative climate, and supportive leadership, as well as a moderating effect of organisational trust between reciprocity in psychological contracts and change-oriented OCB.

EMPIRICAL REVIEW

Akhigbe and Yakubu(2021) investigated the association between psychological contract fulfilment and organisational citizenship behaviour in Rivers State, Nigeria. A cross-sectional survey-quasi-experimental approach was used for the investigation. The survey included a total of 2454 personnel from three public colleges in Rivers State. The population yielded a sample size of 344. The study employed the standard random sampling approach. The primary data for the study was gathered through the use of duplicates of a well-structured questionnaire. The Spearman rank order correlation coefficient was used to analyse the data. According to the findings, the aspects of psychological contract fulfilment (transactional contract fulfilment and relational contract fulfilment) show a substantial association with the measures of organisational citizenship behaviour (helping behaviour and loyal boosterism). It was therefore established that when both relational and transactional contracts are fulfilled in the workplace, lecturers' organisational citizenship behaviour in terms of assisting behaviour and loyal boosterism will rise.

According to Li et al. (2016), supportive leadership has a favourable influence on change-oriented OCB, which is primarily driven by the socially embedded model. The study also looked at the validity of the link between empowered leadership and change-oriented OCB to see if it might be mitigated or even enhanced. According to the study's findings, enabling leadership has a good influence on people at work, which also impacts change-oriented OCBs.

Dialoke and Chinwe (2016) evaluated the current literature on psychological contracts in Nigeria and conducted an empirical study to investigate the link between psychological contract violation, manpower development, and turnover retention. In evaluation, the study used a mixed method technique. SPSS 17.0 was used to analyse secondary and primary data. Concerning the first issue, the study discovered that a significant academic debate on the concept and implications of psychological contract had just evolved in Nigeria. Dialoke and Chinwe(2016) also questioned Rousseau's (1989) straightforward interpretation of the psychological contract. Contrary to popular belief, organisations, individuals, and the larger sociological, political, economic, and cultural framework all have a role. As Bal et al. (2008) point out, a single article or book cannot reasonably handle all facets of a psychological contract. Owing to the content of the reviewed literatures, the following hypotheses are formulated

HYPOTHESES

H₁: reciprocity in psychological contract(role of reciprocity i.e employer obligations and employee obligation) is negatively related to innovative climate for hotel employee in South-South Nigeria.

H₂: reciprocity in psychological contract(role of reciprocity i.e employer obligations and employee obligation) is negatively related to supportive leadership of hotel employee in South-South Nigeria.

H₃: organisational trust does not significantly mediate the relationship between Reciprocity in Psychological Contract and Change-Oriented Organisational Citizenship Behaviour of hotel employees in South-South Nigeria.

METHODOLOGY

The online survey approach was utilised to collect data for analysis, with a self-administered questionnaire adapted from previous research. This study's population comprises of 1086 hotel employees working in 19 luxury hotels in South-South Nigeria. The optimum sample size, according to Krejcie and Morgan (1970), was 285. The total number of responders was 243, with 239 completed responses. In accordance with the mixed methods approach, structural equation modelling (SEM), AMOS, and SPSS 25.0 were employed to assess the hypothesised model, in addition to descriptive statistics and other statistical approaches.

RESEARCH RESULTS

H₁: reciprocity in psychological contract(role of reciprocity i.e employer obligations and employee obligation) is negatively related to innovative climate of hotel employee in South-South Nigeria.

**Table 1: Test of hypothesis 1**

Null	Structural Path			Path coefficient (β)	T-values (t)	Level of significance (p)
H ₁	Reciprocity in Psychological contract	→	Innovative climate	0.340	8.477	0.000

According to the path association analysis in Table 1, there are positive and significant routes between Reciprocity in psychological contract and Innovative Climate ($\beta = 0.340$, $t = 8.477$, $p = 0.000$). As a result, the study finds a favourable and substantial association between Reciprocity in psychological contracts and Innovative Climate. As a result, the study rejects the null hypothesis in favour of the alternate hypothesis that Reciprocity in psychological contracts (role of reciprocity i.e. employer responsibilities and employee obligations) is positively associated to the creative atmosphere of hotel employees in South-South Nigeria.

H₂: reciprocity in psychological contract(role of reciprocity i.e employer obligations and employee obligation) is negatively related to supportive leadership of hotel employee in South-South Nigeria.

Table 2: Test of hypothesis 2

Null	Structural Path			Path coefficient (β)	T-values (t)	Level of significance (p)
H ₂	Reciprocity in Psychological contract	→	Supportive leadership	0.070	3.759	0.000

Table 2 path relationship analysis shows that there are positive and significant routes between Reciprocity in psychological contract and Supportive Leadership ($\beta = 0.070$, $t = 3.759$, $p = 0.000$). As a result, the study finds a positive and substantial relationship between Reciprocity in psychological contracts and Supportive Leadership. As a result, the study rejects the null hypothesis in favour of the alternate hypothesis that Reciprocity in psychological contracts (role of reciprocity i.e. employer responsibilities and employee obligations) is positively connected to supportive leadership of hotel employees in South-South Nigeria.

H₃: Organisational trust does not significantly mediate the relationship between Psychological Contract breach and Change-Oriented Organisational Citizenship Behaviour of hotel employees in South-South Nigeria.

Table 3: Test of hypothesis 3

Null	Structural Path			Path coefficient (β)	Level of significance (p)	
H ₃	Organisational trust(OT)	→	Reciprocity in Psychological contract	Change-oriented OCB	0.544	0.000

Following the inclusion of Organizational trust (OT) in Table 3, a multivariate data analysis was performed using partial correlation to test the moderating effect of Organizational trust on the relationship between reciprocity in psychological contract and change-oriented organisational citizenship behaviour. The results suggest that ($\beta = 0.544$, $p = 0.000$) is significant. As a result, the link between reciprocity in psychological contract and change-oriented organisational citizenship behaviour is considerably constrained by organisational trust. Therefore, the null hypothesis is rejected, and the alternate is accepted. Hence, we restate that *Perceived organisational support significantly moderate the relationship between reciprocity in psychological contract and change-oriented organisational citizenship behaviour of hotel employees in South-South Nigeria.*

RESEARCH IMPLICATIONS

A non-reciprocal psychological contract and non-change-oriented corporate citizenship behaviour are damaging to the organization's and hotel industry's growth and well-being in Nigeria. However, guaranteeing psychological contract fulfilment and reciprocity will aid in lowering the rate of psychological contract violation and improving the hotel's creative atmosphere. The greater the psychological contract fulfilled by supporting leadership, the lesser the expression of negative attitudes and behaviour among hotel employees. This means that when leadership is unsupportive and unconcerned with employee wellbeing, it exacerbates the workers grumpiness and unhappiness.



CONTRIBUTIONS TO KNOWLEDGE

In numerous ways, this study will contribute to the advancement of knowledge on change-oriented OCB and employee empowerment. First, unlike most prior research in the literature, which have consistently distinguished between multiple OCB internal characteristics, this study focuses on a specific component of OCB that challenges the status quo and hence promotes organisational transformation. Second, by supplementing the classic OCB model with empirical data from a field study on change-oriented OCB, this research will contribute to theory development while also providing managers and practitioners with practical insights in an area that has received little attention. To summarise, this study is one of the first to put to the test a model based on reciprocity in psychological contracts and change-oriented OCB. It also defined the psychological role of the employer and employee.

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THEORETICAL ISSUES OF LINGUOPOETICS

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ABSTRACT

This article deals with issues related to the emergence of linguopoetics. The relationship between linguistics and poetics is shown.

KEY WORDS: *linguopoetics, structural linguistics, structural poetics, generative linguistics, rhetoric, philological poetics.*

It has long been known that issues related to the emergence of linguopoetics have attracted the attention of many researchers and caused debates and discussions. Linguopoetics is not an emerging field today. The sciences within the concept represented by this term have long been studied as part of the philological field, and this field has been studied as part of social sciences, in particular, as part of philosophy. Later, the development of disciplines such as linguistics and poetics as new scientific concepts and scientific paradigms into independent disciplines increased the need for interdisciplinary research. Such a need for the field of linguopoetics was connected with the development of methodology, which serves both disciplines equally. As the fate of linguopoetics is connected with the stylistics field of science, it is important to dwell on the views of specialists of stylistics who serve as a bridge between the two disciplines. The fact that the relationship between linguistics and literary studies is still a problem is reflected in the works of the great linguist V.V. Vinogradov. It is known that unlike other forms of art, literature is an art of words. Ideological-artistic features of works of art are revealed through the medium of words. For this reason, the role of the word in reflecting the content of the work is incomparable. Only the word itself is incapable of pictorially reflecting the reality. Thus, the linguistic unit used in the artistic work - the word - requires great skill from the writer in expressing the linguopoetic features. In this sense, the writer describes the reality in the work of fiction, using colorful images to express to the reader the tools that influence his subtle thinking. Such expression is sometimes contradicted by normative linguistics, since the contradiction is expressed with the help of linguistic means, the diversity of form and meaning performs a linguopoetic task. In the artistic representation of events, there are situations that cannot be expressed in linguistic forms. National traditions and national mentality do not allow this. That is why an object, thing, event is expressed through figurative means. In order to express the artistic reality intended by the writer, extralinguistic tools are used instead of linguistic units. In such times, non-linguistic and extra-linguistic means are also used. That's why, along with the image of linguistic means, other means find their expression, all means are charged by the writer with an artistic-ideological burden. English linguist S. Saporta, thinking about the study of linguistics in poetic language, identifies three aspects of the relationship between linguistics and poetics:

1. Poetics is a language.
2. Poetics is not a language, but an art.
3. Poetics is the intersection of art and language.



Linguistic methods are important in the field of poetics, and he puts forward the principle that any poetics is a language. However, he emphasizes the importance of not forgetting the difference between linguistics and poetics. [6.97]

Naturally, without being fully aware of the essence and industrial laws of a complex phenomenon like language, it is a fruitless task to study literature objectively and deeply, which is the address of living in a thousand and one meanings and glosses, or without knowing the thousand and one laws of literature. [3.34] For this reason, the act of choosing a clear and harmonious way for the field of linguopoetics, which is emerging as a new field in the science of philology, is studied to one degree or another in the research conducted by many philologists, more precisely, linguists in this field.

Linguistics and poetics were comparatively studied in V. Ya. Zadornova's works on linguopoetics. In this comparative study, the concept of poetics is close to the thoughts of R. Jakobson, and it shows that poetics represents the same scope and meaning, while linguistics shows a separate direction and ideas. Like M. Birvish, some authors interpret linguistics and poetics as actual models [7.98], while Chetman and Yu.I. Levin interpret the traditional structural meaning and approach from a taxonomic point of view. Some researchers, such as A.J. Greymas, try to summarize the ideas of different approaches, expressing the closeness of poetics and structural linguistics.

Linguists focus more on the relationship between poetics and linguistics in linguopoetics than literary writers. A.A. Leontev [5.125] and V.V. The views of Kojinov [4.78] can be cited as an example. "Structural Poetics" by Y. M. Lotman in terms of linguostylistics is more close to modern linguistics than other works. In the studies of B. V. Tomashevsky "Poetic Methodology", "Introduction to Poetics" and "Literary Studies and Linguistics" prepared by Y. I. Ives, linguopoetics was studied comparatively. [8.156]

Arguments and debates about the relationship between linguistics and literary studies first appeared hundreds of years ago and continue to this day. [2.22] It is known that the direction regulating the relationship between linguistics and poetics is linguopoetics. Therefore, the tasks performed by the field of linguopoetics are approached through the method of philological approach to the analysis summarizing different points of view. In linguistics and literary studies, research directions and content are determined based on the nature of the field. The research conducted in the field of linguopoetics is the basis for determining its content structure. Existing theories and views are put into the system, as a result, the general direction of the direction is visible. The remaining open questions form the basis of the research.

Linguopoetics is one of the new directions studying the language of artistic works as a separate new field of linguistics. It cannot be said that the existing research carried out in this direction has not yet been able to fully reflect the content of the field. Under the concept of Linguopoetics, there is a view that due to a narrow understanding of the field, the linguistic features of works of a poetic nature are studied. In fact, the content of the concept of poetics is very broad. In ancient times, Aristotle wrote his famous work "Poetics" about this. In it, he spoke about poetic art - poetic types (genres) and poetics - the art of poetry. In the chapter "Language and Thought", he emphasizes the relevance of phenomena related to speech and thought to rhetoric, and specifically acknowledges its connection with the knowledge of speech composition [1.39].

As each language event moves into a speech situation, the imagination, psyche, and emotions of a person move in relation to this speech connection. Due to the extensive attention paid to the study of the language of artistic works in the linguistics of the 20th century, the term "linguopoetics" appeared, reflecting the comprehensive, deep and comprehensive study of the image of reality in the artistic work, combining the concepts of rhetoric and poetics.

Linguopoetics analyzes problems related to language features of any genre. In particular, the study of epic works in terms of language features is explained by the concept of linguopoetics. Interest in the problems of linguopoetics began to form in the 60s of the 20th century. It is known that since those times, the branch of linguistics



that studies the specific features of the poetic language began to be called linguopoetics. Using the term linguopoetics is more convenient than the term “philological poetics” proposed by some researchers.

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INDIVIDUAL WORK PERFORMANCE, PUBLIC LEADERSHIP, AND PUBLIC SERVICE MOTIVATION: A CAUSAL MODEL ON PROFESSIONALISM AMONG THE PACIFICATION COMMITTEE (LUPONG TAGAPAMAYAPA) IN THE BARANGAYS

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ABSTRACT

This non-experimental quantitative study found a best-fit structural model of professionalism among 400 Lupong Tagapamayapa [LP] (Pacification) members in the barangays of Panabo City. Statistical tools used in analyzing data were the weighted mean, Pearson r, multiple linear regression, and structural equation modeling (SEM). Results exposed the high-level work performance, public leadership, public service motivation, and professionalism of the Lupong Tagapamayapa. Moreover, the correlation test yielded a significant linear relationship between leadership and professionalism and public service motivation and professionalism. However, the relationship between work performance and professionalism was insignificant. Subsequently, the regression result revealed a combined predictive capability of work performance, leadership, and public service motivation on professionalism. Furthermore, the structural equation modeling revealed that public leadership and public service motivation are predictors of professionalism with specific manifest variables: accountability and network governance for public leadership; compassion and self-sacrifice for public service motivation. These manifest variables can only predict professional ethos and challenge under the professionalism construct. Finally, the study's findings have implications for effective and efficient mediation protocols in the barangays. The paper contained further discussions and inferences about the results.

KEYWORDS: *public administration, lupong tagapamayapa, work performance, public leadership, public service motivation, professionalism, structural equation modeling, Panabo barangays*

INTRODUCTION

The problem of professionalism is evident among the Lupong Tagapamayapa, especially in performing their roles and responsibilities for effective mediation processes [1], [2]. This unprofessionalism demonstrated by incompetence might have been the reason for the docket congestion in the Philippines' regular courts, which was a perennial problem ever since the '80s, with as many as 5,000 cases handled by one court [3], [4], [5].



Professionalism is crucial among the barangay conciliation panel or the *Lupong Tagapamayapa*. The disputing parties expect the mediating panel to be competent and have a sense of independence, probity, honesty, and integrity (Explanatory Note on the Barangay Justice System Act, 2021). In addition, cases handled by the barangay mediation panels and other alternative dispute resolution (ADR) are of many types, requiring thorough knowledge and skills in conciliation to avoid backlogs [6], [7].

Moreover, there is a significant relationship between individual work performance and professionalism in all practice fields [8], [9], [10], [11]. Public leadership also significantly correlates with professionalism [12], [13], [14]. Leadership training that starts early in life, as in childhood, can develop professionalism when the child becomes an adult [15]. In other words, the more the child experiences leadership training, the more significant the chance of developing the value of professionalism. Further, public service motivation significantly relates to professionalism in that when a person has a solid motivation to serve others and do good, their dealings with others are as professional as possible [16]. Workers with high-level motivation in public service have meaningful insights into their work and do their jobs enthusiastically and professionally [17], [18].

Consequently, the very few studies on these topics convey a research gap, especially on studies using structural equation modeling to establish the best fit model of professionalism insofar as the *Lupong Tagapamayapa* is concerned. Therefore, this study became necessary, as the results might help the Barangay Conciliation Board, which supervises the conciliation processes and panels, plan the activities relevant to professionalizing the conciliation procedure in the barangays for successful mediation.

OBJECTIVES

The study intends to construct a model of professionalism among the Pacification Committee (*Lupong Tagapamayapa*) in the barangays concerning individual work performance, public leadership, and public service motivation. Specifically, this study will focus on the hereunder objectives:

1. To assess the level of work performance of pacification committee members in terms of task and contextual performance and counterproductive work behavior.
2. To evaluate the level of public leadership of the pacification committee in terms of accountability leadership, rule-following Leadership, political loyalty leadership, and network governance leadership.
3. To ascertain the level of public service motivation of the pacification committee in terms of attraction to policymaking, commitment to the public interest, compassion, and self-sacrifice.
4. To measure the level of professionalism of the pacification committee members in terms of professional ethos, professional challenge, professional facilitation, and work engagement.
5. To determine the significant relationship between the exogenous variables and professionalism.
6. To determine the combined influence of the exogenous variables on the professionalism of the pacification committee in the barangays.
7. To determine the best-fit model for the professionalism of the pacification committee in the barangays.

HYPOTHESIS

1. There is no significant relationship between the exogenous variables and professionalism.
2. No variable best predicts the professionalism of the pacification committee members.
3. No structural model best fits the professionalism of pacification committee members.

METHODS

This study is a non-experimental quantitative research that employed structural equation modeling (SEM) to establish the best fit model for professionalism in the barangay mediation panel. SEM is a dominant method used in testing multivariate causal relationships [19], [20]. It analyzes relationships between observed and latent variables and conceptualizes models by identifying model fit parameters and estimations [21], [22], [23]. Moreover, SEM integrates regression analysis to explain data causation [24], [25], [26], [27]. Significantly, social science researchers usually use structural equation modeling in creating models for their research [28], [29]. Again, structural equation modeling is appropriate in this study because the study requires establishing a model for professionalism among the *Lupong Tagapamayapa*.

In addition, besides the use of SEM, this study also used descriptive research as it aims to systematically and accurately describe, identify, characterize, and categorize a population vis-à-vis the variables [30]. Also, the study used the correlation method to



determine the relationships between two or more variables. For example, the relationship may be positive or negative, strong or weak. Alternatively, the study may yield no correlation between variables [31], [32], [33].

To achieve the study's objectives, the researcher recruited 40 Lupon Tagapamayapa members from each barangay in Panabo using stratified random sampling. Additionally, the study employed the half-balanced sample variance estimation to get half of the population because each barangay has the same number of Lupon members [34]. Since there are 40 barangays (mentioned under the locale of the study) with 20 Lupon members each, the sampling included only half the members, the same proportion [35]. Further, the samples included only those with experience handling mediation cases for the last three years. The selection of samples excluded the newly elected barangay officials and functionaries since they did not qualify for the criteria as they had not handled mediation cases yet.

RESULTS AND DISCUSSION

Table 1
Individual Work Performance of the Lupon Tagapamayapa Members

Indicator	Mean	SD	Descriptive Level
Task performance	4.10	0.58	High
Contextual Performance	4.01	0.61	High
Counterproductive Work Behavior	3.24	0.91	Moderate
Overall	3.78	0.52	High

Table 1 shows the result of individual work performance with task performance (M=4.10, SD=0.58), contextual performance (M=4.01; SD=0.61), and counterproductive behavior (M=3.24; SD=0.91) as manifest variables. The overall high-level score (M=3.78; SD=0.52) indicates that the respondents agreed that they often demonstrated the behaviors or actions stated in the survey. The standard deviation of 0.52 indicates the concentration of the data around the mean. In other words, the data are the expected responses (norm).

These results more or less correspond with Dofeliz and Dela Peña's (2022) [36] finding about the Lupon members' outstanding performance under the barangay justice system in Bandiangan, Iloilo. Villamor and Dagohoy (2020)[37] also had the same finding, stating that the Lupon Tagapamayapa in Tibal-og, Santo Tomas, and Davao del Norte are very highly effective in the conciliation process. These are indeed very noticeable results.

The results indicate that the Lupon members did well in their task and contextual performances and did not display counterproductive behaviors. For instance, the respondents often agreed that they managed to plan their work optimally, keeping the plan's outcomes in mind. Also, they often agreed to collaborate, taking on extra responsibilities, new tasks, and challenges to improve performance.

In contrast, not all Tagapamayapa members know about handling the different disputes filed in the barangay. For example, Sotto (2021)[38] suggested that barangay officials conduct a seminar on basic laws, protocols, and procedures for addressing community disputes. Likewise, Sobradil (2019)[39] also indicated that members of the Lupon boost their paralegal skills and training to effectively settle disputes and update themselves on some laws and mediation procedures. In addition, Guia and Mangubat (2021)[40] reported that members of the Katarungang Pambarangay in Barangay Wakas South, Pilar, Bataan need more technical know-how to dispense the barangay justice system.

Table 2
Public Leadership of Lupon Tagapamayapa Members

Indicator	Mean	SD	Descriptive Level
Accountability Leadership	3.68	0.64	High
Rule-following Leadership	3.85	0.73	High
Political Loyalty Leadership	3.50	0.79	High
Network Governance Leadership	3.65	0.62	High
Overall	3.67	0.57	High



Table 2 displays the public leadership data of the members of the lupong tagapamayapa. The table shows a high-level overall mean score (M=3.67; SD=0.57), indicating respondents often demonstrate these manifest variables: accountability, rule-following, political loyalty, and network governance leadership.

Specifically, the manifest indicators also got high mean ratings: accountability leadership (M=3.68; SD=0.64), rule-following leadership (M=3.85; SD=0.73), political loyalty leadership (M=3.50; SD=0.79), and network governance leadership (M=3.65; SD=0.62). These high mean ratings suggest that they agreed they often exhibit the statements given in the survey.

In public leadership, the high-level results in accountability, rule-following, political loyalty, and network governance leadership confirmed the Lupons' openness and honesty, seeking consensus with the other members of the committee before making decisions. The results revealed that the respondents always agree to follow judicial rules and protocols accurately, even if other stakeholders disagree. In addition, the results revealed that respondents had established a good network with the stakeholders, upholding good governance and professionalism in the process.

Significantly, tribal leaders best exemplified their public leadership. For example, in Talubin, Bontoc, Mountain. Province, tribal leaders decide cases based on customary laws [41]. In another example, the Lumads of Mindanao have a unique way of settling conflict called "husay," following their tribal laws [42]. The elders made their leadership known by expertly addressing the conflict and mediating the parties. In addition, although the tribes have customary laws, Lupong Tagapamayapa, led by the barangay captain, made sure these laws do not violate state laws and are congruently applied [43].

Table 3
Level of Public Service Motivation of LupongTagapamayapa Members

Indicator	Mean	SD	Descriptive Level
Attraction to Policymaking	3.55	0.60	High
Commitment to Public Interest	3.62	0.62	High
Compassion	3.61	0.69	High
Self-sacrifice	3.77	0.65	High
Overall	3.64	0.49	High

Table 3 presents the data on the public service motivation of the lupong tagapamayapa. Again, all manifest variables got high mean ratings, ranging from 3.55 to 3.77. The overall mean score is 3.64, with a standard deviation of 0.49. The result means that the respondents often demonstrated the manifest variables, such as attraction to policymaking, compassion, commitment to the public interest, and self-sacrifice. Specifically, the high mean score for attraction to policymaking (M=3.55; SD=0.60) suggests that respondents often believed politics is a dirty word. They also often believed that ethical behavior is as crucial as competence. However, the respondents also often did not care much about politics.

Generally, public service motivation is inherent in barangay officials. For example, members of Lupong Tagapamayapa are public officials headed by a barangay captain. These barangay officials serve the public by implementing laws for the people's good. They carried out their functions, duties, and responsibilities well, even with minimum benefits and privileges [44]. Public service is not exclusive to the male population. More women are now in politics because they love public service and have the will and determination to serve, fuelled by public service motivation [45], [46].



Table 4
Level of Professionalism of the LupongTagapamayapa Members

Indicator	Mean	SD	Descriptive Level
Professional Ethos	3.73	0.65	High
Professional Challenge	3.74	0.72	High
Professional Facilitation	3.81	0.71	High
Work Engagement	3.83	0.73	High
Overall	3.78	0.62	High

Table 4 displays the data on the professionalism of the pacification committee members. Again, all mean scores are high: professional ethos (M=3.73; SD=0.65), professional challenge (M=3.74; SD=0.72), professional facilitation (M=3.81; SD=0.71), and work engagement (M=3.83; SD=0.73). Likewise, these mean scores yielded a high overall rating of 3.78, with a standard deviation of 0.62. The respondents' high mean score denotes that they often agreed with the statements in the survey. For example, for professional ethos (M=3.73; SD=0.65), the high mean score signifies that being a member of the pacification committee meant more than just earning money because they felt they contributed to the barangay. They viewed their work as a vocation with personal meaning, so non-material values were central to their cause, knowing these could practically shape their ideals. They believed that being a member of the Lupong Tagapamayapa made their barangay a better place.

Moreover, the results revealed that respondents have high professional ethos, challenge, facilitation, and work engagement. These results mean that they work not for whatever they can get out of it but for what they can contribute to making the situation of the conflicting parties better for a peaceful barangay. Of course, being a member of the Lupon have some challenges, especially in dealing with irate parties, but they agreed that they face these challenges head-on as a group, applying the best mediation skills and professionalism they have to succeed in the situation. For example, Agustin et al. (2018)[43] found that the Lupon members in Barangay Caritan Centro, Tuguegarao City, were confident and disciplined in discharging their mandate. In other words, the Lupon members have exercised their professionalism in the mediation and conciliation processes by being diligent and carefully executing mediation protocols. Some barangay officials lack academic degrees [44], but they can show professionalism in settling disputes.

All these results upheld the theories purported in the study. Furthermore, the satisfactory work demonstrated by the Lupong Tagapamayapa in their work performance, public leadership, public service motivation, and professionalism exemplify good governance and a deep sense of professionalism, which is commendable.

Table 5
Significant Relationship between the Exogenous Latent and Endogenous Latent Variables

Exogenous Variables	Endogenous Variable (Professionalism)				Overall
	Professional Ethos	Professional Challenge	Professional Facilitation	Work Engagement	
Work Performance	.113*	.005	.000	.039	.042
	.023	.923	.993	.441	.405
Leadership	.416**	.288**	.339**	.272**	.367**
	.000	.000	.000	.000	.000
Public Service Motivation	.605**	.441**	.462**	.411**	.536**
	.000	.000	.000	.000	.000

Table 5 displays the summary result of the correlation tests between work performance, leadership, public service motivation, and professionalism. The basis of significance is $p < 0.05$. The table shows that only two exogenous variables have significant relationships with professionalism: leadership ($r = .367$; $p = .000$) and public service motivation ($r = .536$; $p = .000$). The correlation test between work performance and professionalism yielded an insignificant result ($r = .042$; $p = .405$).



In addition, the table shows that the correlation test is significant in a 2-tailed test, denoting that the mean scores are significant in the upper and lower tails of the distribution. The function of a 2-tailed test is to establish whether the mean is significantly greater than X and lower than X, resulting in a p-value of less than 0.05; thus, a significant result.

The significant result is that as leadership and public service motivation increase, professionalism also increases. The inference is that the relationship is linear, and these three variables move in tandem. Besides being linear, the relationship is also positive, suggesting that the movement of leadership and public service motivation will lead professionalism to move in the same direction.

Incidentally, correlation tests examine the strength and direction of the association or relationship of variables. Thus, in examining the data in the table, leadership and professionalism have a medium association ($r=.3$ to $.5$), while public service motivation and professionalism have a significant association ($r=.5$ to 1.0).

Research shows a significant relationship between work performance and professionalism. These constructs are applicable in almost all disciplines. For instance, authors proved that performance, accountability, and standards significantly associate with professionalism [47], [48]. In addition, Maryani, Entang, and Tukiran (2021)[49] found a strong association between work performance and work discipline, one of the principles of professionalism. Work performance significantly correlates with professionalism because employees bring their values to work and operate them according to the rules of their profession [50].

Similarly, leadership also correlates with professionalism. One of the indicators of leadership is accountability. Generally, people think of accountability as the answerability of one party to another. Incidentally, accountability is a virtue that promotes flourishing. Manifesting accountability as a virtue, people respond with the right attitudes. Thus, accountability leadership has a significant relationship with professionalism [51], [52].

Conversely, a lack of accountability weakens professionalism. For example, Lubis (2021)[53] found that a lack of accountability affects audit quality, conveying the negative relationship between accountability leadership and professionalism. In other words, when accountability leadership is weak, professionalism also becomes weak.

Finally, a study revealed that public service motivation and work engagement, one of the indicators of professionalism, are significantly correlated. People with good public service motives for others enhance their work performance to benefit more people [16]. In other words, making other people benefit from the fruits of their labor motivates public servants to give their best at what they do. For barangay officials, enhancing work performance can lead to a positive barangay development outcome [54]. Therefore, improving oneself and giving the best of oneself is one of the essences of professionalism [55].

Table 6
Significant Influence of the Exogenous Latent Variables on Professionalism

Exogenous Variables	Endogenous Variable (Professionalism)			
	B	β	t	Sig.
Constant	1.552		6.821	.000
Individual Work Performance	-.421	-.348	-6.883	.000
Public Leadership	.422	.385	7.279	.000
Public Service Motivation	.623	.484	11.172	.000
R	.622			
R ²	.386			
ΔR	.382			
F	83.084			
ρ	.000 ^b			

Table 6 exhibits the result of the regression test. Regression tests are necessary to determine whether the independent variable impacts the dependent variable and to what extent. Besides this, regression analysis also identifies the indicators that can predict the dependent variable for future applications. The F-value ($F=83.084$; $p=.000$) is significant in this study, meaning the independent variables can predict the dependent variable. The F-value tells the combined predictive capability of the independent variables on the dependent variable. For example, in this study, the capability of individual work performance, public leadership, and public service motivation on professionalism have a combined predictive value of 38.2% ($\Delta R=.382$). However, each independent variable can predict professionalism by 38.6% when taken singly. As observed, each independent variable added to the equation can decrease the combined impact on the dependent variable.

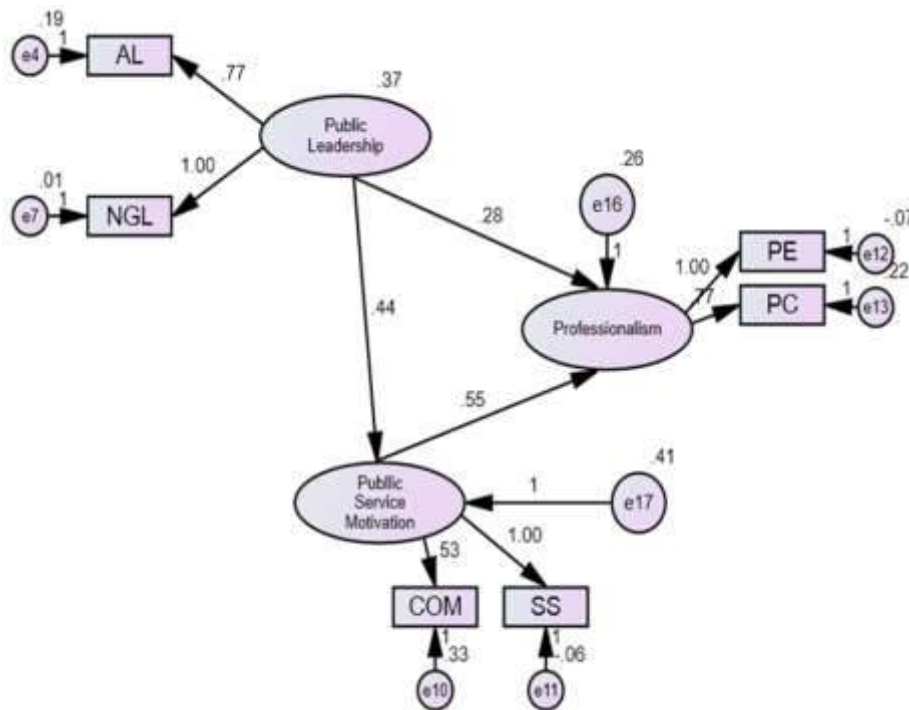


Figure 1. The Best-Fit Structural Model for Professionalism

Legend:

AL-accountability leadership

NGL-network governance leadership

COM-compassion

SS-self-sacrifice

PE-professional ethos

PC-professional challenge

Table 7
Values obtained for the Best-Fit Model

INDEX	CRITERION	MODEL FIT VALUE
Probability Value (P-value)	> 0.05	.099
Chi-Square/Degrees of Freedom (CMIN/DF)	0 < value < 2	1.780
Goodness of Fit Index (GFI)	> 0.95	.991
Comparative Fit Index (CFI)	> 0.95	.997
Normed Fit Index (NFI)	> 0.95	.992
Tucker-Lewis Index (TLI)	> 0.95	.991
Root Mean Square of Error Approximation (RMSEA)	< 0.05	.044
P of Close Fit (P-Close)	> 0.05	.529

Figure 1 is the best-fit model for professionalism since it satisfied all the criterion indices of the goodness of fit measures specified in Table 7. The model shows the exogenous latent variables with their manifest variables. These are latent variables because they are not directly observable except through their manifest variables (or indicators).

In Figure 3, leadership and public service motivation predict professionalism. At the start of the study, there were three exogenous variables (individual work behavior, public leadership, public service motivation, and professionalism). Consequently, the SEM analysis result excluded individual work performance. Therefore, accountability leadership (AL) and network governance leadership (NGL) are the manifest public leadership variables that predict professionalism. Furthermore, the deleted manifest variables were rule-following leadership and political loyalty leadership. Whereas, under public service motivation, the predictor variables are



compassion (COM) and self-sacrifice (SS). Discarded were: attraction to policymaking and commitment to the public interest. These predictor variables can also predict professional ethos (PE) and professional challenge (PC). Only these two manifest variables remained under professionalism after SEM analysis discarded professional facilitation and work engagement.

The structural equation modeling (SEM) result showed that leadership and public service motivation are the best indicators of professionalism. This result is congruent with the discussion in Table 5. Prediction is impossible without correlation. This argument verifies that public leadership predicts professionalism through their significant relationship [51], [52] and public service motivation and professionalism [16], [55].

Moreover, network governance is necessary to accomplish a goal that a single person or entity cannot achieve [56], [57]. Furthermore, network governance operates professionally [58]. Thus, there is professionalism where there is network governance [59].

Compassion is often evident in the medical field [60], [61], [62]. However, this could also work in governance, inspired by professionalism [63], [64]. Additionally, self-sacrifice indicates public service motivation within the professional ethos and challenge. No person can claim compassion and self-sacrifice yet violate the laws of their profession, which contradicts professionalism [65], [66], [62]. In other words, professionalism sets the norms on how government officials, for instance, will act out their leadership and public service motivation.

CONCLUSION

The Lupong Tagapamayapa have high work performance, leadership, public service motivation, and professionalism. Leadership and public service motivation have significant positive relationships with professionalism. However, the relationship between individual work performance and professionalism is not significant. The combined influence of individual work performance, public leadership, and public service motivation on professionalism is 38.2%, while the individual influence is 38.6%. Leadership (accountability & network governance) and public service motivation (compassion & self-sacrifice) can influence professionalism (professional ethos & professional challenge).

Finally, the study affirmed its foundation theories of good governance and professionalism. For one, the work of the Lupon members as the pacification committee lies within the purview of good governance. In their duties, the Lupon should observe transparency and impartiality, follow the rule of law, and be accountable for their actions and decisions. Moreover, the deep theory of professionalism reminds the Lupon of being goal-based (to succeed in mediating conflicting parties, rights-based (upholding the law), and duty-based (responsive, consensus-oriented, and accountable).

Professionalism entails competence; thus, the Lupong Tagapamayapa has to undergo an intensive seminar and training on arbitration, conciliation, and mediation to become competent and knowledgeable about their job. The DILG may encourage the Lupong Tagapamayapa members to enroll in diploma courses to have a highly professional approach regarding arbitration, conciliation, and mediation. The DILG or LGU may shoulder the costs of this endeavor. In addition, the Lupong Tagapamayapa members can benchmark to other barangays or to the mediation center at the Hall of Justice to measure themselves and their mediation approach against external standards. Finally, researchers may replicate this study in other cities and regions to check the findings' accuracy and provide rich literature on the subject.

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METHODS OF DETERMINING THE INTEGRATIVE CREATIVITY OF SOCIO-HUMANITARIAN TEACHERS

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ANNOTATION

This article argues methods for determining and assessing the professional creativity of teachers, characteristics of creative skills, criteria for professional creativity, outcomes as well as analysis of scientific research in this field.

KEY WORDS: *creativity, indicator, formation of creative skills, cognitive aspects of creativity, tests for creativity.*

INTRODUCTION

President Sh. Mirziyoyev recommends that "Uzbekistan, in terms of science, capacity, contemporary personnel, high technologies, is a must for the intellectual world." Intellectual improvement of a country as well as development of social fields are closely related to the scientific along with professional enhancement of foreign affairs. From the first days of the 21st century, globalization in the enterprise, political changes in the world, socio-economic and cultural transformations are visible in the quality. Nowadays, the improvement of our country is primarily based on science and higher education. If we do not approach science as well as education with a new quality based upon high technologies, it is unlikely to achieve high goals in this field. Today, the most important task is not to lose the existing opportunities, to preserve and develop all the good aspects of higher education, and to raise the quality of individual training. Scientists and teachers, creative ideas as well as knowledge are the foundation on which the modernization of the higher scientific school rests. For this reason, creative teachers in a broad sense are the "beginning" of all processes related to the enhancement of the scientific individual potential of the country.

MAIN PART

Creative enlightenment is the thinking of contemporary managers, teachers, students, as well as participates in the process from the lowest stages of the continuous education system to its highest stages, it is a means of improvement, growth, development, expansion and moderate maintenance, it is its main weapon.

Creative enlightenment performs the most significant functions of education in the modern world. The creative thinking of the teacher manifests itself in the process of planning, organizing, implementing, analyzing, justifying as well as controlling the results of the modern educational process.

Having creative qualities of pedagogues working in the higher education system gives them special opportunity to create new ideas different from the traditional approach to the organization of educational processes, to avoid stereotypes, originality, initiative, non-standard thinking, and timely advancement of innovation. Motivation, values as well as personal characteristics play a key role in the professional development of a teacher of a higher education institution.

The issues of educating creativity, formation of creative skills (Dj. Gilford, Dz. Gilmer, K. Rodgers, E. Torrens, etc.) were studied as well as analyzed on a scientific basis.

In the model (concept) proposed by E. Torrance, if the expert's IQ is below 115-120, intelligence and creativity are the only factor, if the IQ is above 120, creativity is an autonomous value.

J.S. Renzulli reflects the interaction between three main groups of gifted qualities, which are above average general capabilities, high participation in the task and high level of creativity. According to the author, creative people have such a system of qualities and they are able to apply these kinds of qualities in any field of their scientific works.



E.P. According to Torrens, creativity includes a high sensitivity to the lack or inconsistency of knowledge in the process of solving problems, actions aimed at identifying these kinds of issues, searching for their solutions based on hypotheses, testing and changing hypotheses, and forming a result.

Scientists, who have conducted scientific research in the direction of the problem of creativity, recommend the usage of different tests, personality questionnaires and activity analysis to assess the creativity of a person.

E. Torrens lists the following as criteria of creativity:

- fluency - the number of thoughts that occur per unit of time;
- originality - the capability to produce unique ideas that differ from the generally recognized ones;
- adaptation - the significance of this parameter depends on two situations: firstly, this parameter allows to distinguish individuals who are flexible in the process of solving problems from those who indicate persistence in solving them, and secondly, it can distinguish individuals who solve real problems from those who show false originality.
- sensitivity - sensitivity to unusual signs, contradictions and uncertainty, readiness to quickly switch from one idea to another;
- metaphor - willingness to work in a completely unexpected context, a tendency to symbolic, associative thinking, the ability to see the complex as simple, to simplify the complexity;
- enhancement (satisfaction with activity) - the feeling of understanding that the problem has been solved, creativity

METHODS OF ASSESSING THE CREATIVE POTENTIAL OF A PERSON (MULTIPLE APPROACH)

Assessment of the cognitive component of creativity. Tests of this category are designed to measure the basic processes of thinking, which support to determine the divergent indicators of a person - fluency, adaptation as well as originality. Including:

- A. Binet, T. Simon's "Ink spot" test - diagnosis of imagination (using answers to the question "What does a person see in an ink spot?"), the number of answers is counted and their nature is evaluated;

- test for literary imagination (A. Binet, T. Simon) - allows to determine the widening of a person's literary imagination by randomly choosing from given nouns and verbs and making a sentence with them. In these tests, the number and nature of the constructed sentences are assessed;

- M. M. Wallach, N. According to the task, test for the divergent generation of ideas proposed by Kogan. . In these tests, the total number of ideas and the quality of original answers are evaluated;

-V.V. Moroz identifies five groups of tasks as a diagnostic dimension of creativity. These allow you to diagnose a person's creativity through enumeration, unusual use, analogy, interpretation of numbers and drawings.

-E. Torrens tests for creative thinking offer an assessment of quantitative (adaptation and fluency) and qualitative (originality) aspects of creative thinking.

-Insight (a function of spontaneous brain activity in creative individuals that supports to comprehend a problem on its own and quickly find a way to solve it) and long association methods are aimed at measuring creative potential, because solving this type of problem requires the ability to selectively encode, compare and combine .

- R. Sternberg, D. Davidson, S. *A test of tasks aimed at learning the concept offered by Medniks;*

- K. Dugan, E. Schiff, L. *Welsh word-object association tests;*

- *tests for metaphor (F. Barron);*

- *test for identifying distant associations (S. Mednik);*

- *creativity questionnaire (D. Johnson).*

METHODS OF DETERMINING THE COGNITIVE ASPECT OF CREATIVITY

The word cognition is derived from the English (Latin) word "cognize", which means to know, understand, comprehend and to consider, or "cognition" - to know, to understand. On the other hand, cognitive activity is a phenomenon related to a person's direct perception and feeling of reality. In the process of perception of reality, a "subject-object relationship" appears, based on the mutual opposition between the performer of cognitive activity, that is, the subject, and the object of this activity.

Cognition is an educational activity that leads a person to the process of thinking, motivates cognitive activity to get into the essence of a problem with unclear, unknown new elements and directs them to their solution, leads to the growth of a person's consciousness, independent thinking, creativity and intellectual development.

Essentially, the following methods developed for the assessment of individual characteristics related to creativity in determining the cognitive aspects of creativity are recommended:



- *personality questionnaire NEO-PI (R. McCray, P. Costa) - used to measure openness, extraversion, emotional stability, conscientiousness as well as friendliness;*
- *uncertainty tolerance methodology (F.Zenasni, T.Lyubart) - used to measure risk tolerance and uncertainty tolerance;*
- *a list of personal qualities proposed to measure specific personal characteristics (G. Gou);*
- *scale of diagnostic assessment of level characteristics of skills (D. Renzulli, R. Hartman, K. Kalahen);*

And as cognitive styles

- *a scale for assessing specific personal characteristics of a person belonging to Myers Brigs (diagnosis of level characteristics of capabilities);*
- *Methodology for measuring motivation, attitude to creativity developed by K. Shefer (allows to evaluate the desire and interest in creativity of each person);*
- *E. Torrens' system of self-report tests based on measuring the scale of creative motivation, i.e. extrinsic and intrinsic motivation (used in the study of cognitive aspects of creativity) is interpreted.*

To determine the emotional aspect of creativity

So as to measure the emotional (emotional) variables affecting the development of creativity, the set of "Questionnaires and tests for emotional intelligence" recommended by D. Meyers, P. Selovey, D. Gouldman is used.

To identify the social aspects of creativity

Tests of this category are aimed at measuring the conditions of professional activity and the degree of influence of the social environment on creativity.

T. Amabayl, N. Grinkevich stated that "Questionnaire for evaluation of the quality of the social environment focused on creativity" as methods of assessment of conditions of professional activity;

T. Amabayl, B. The usage of 'CASE', developed by Hennessy, is widely used.

S. Isaacsen's methodology for assessing the creative atmosphere in an educational institution (organization) is used to evaluate the impact of the production environment on the development of creativity.

METHODS OF EVALUATING THE MANIFESTATION OF CREATIVITY

A) Assessment of creative activity

The results of creative activity - products (assignments, drawings, ideas) are evaluated by colleagues and teachers. This method is more subjective, the comparison of evaluations according to established criteria as well as indicators is more reliable due to the large number of experts.

B) Methods of evaluating creative achievements (product)

Objective evaluation is carried out by assessing the number of creative products (articles, compositions, musical works, developments) created during a certain period of time.

C) The method of forming a list of creative achievements

In this case, the combination of processes related to creative activity is focused on self-evaluation based upon objective criteria (according to the number and nature of creative products created):

- *the scale of manifestation of creativity during life (R. Richards) - a structured interview that allows collecting information about the creative success of a person;*

- *assessment of creative products. A methodology for evaluating creative products created by a team for a limited time.*

- *7-point Likert scale (T. Amabayl, T. Lyubart, R. Sternberg) - creative product evaluation methodology. The grade ranges from 1 (low creativity) to 7 (high creativity) depending on the quality of the product created.*

Creative enlightenment is fostered by creating acquiring situations that are incomplete or open to the integration of new elements, where learners are encouraged to ask several open-ended questions.

For this crucial reason, a pedagogue with creative qualities has a creative approach in organizing his professional activity, activeness in creating ideas that serve to develop students' educational activities, personal qualities, independent study of advanced pedagogical achievements and experiences, as well as the experience of constant, consistent exchange of ideas with colleagues about paying attention to pedagogical achievements.



In the sphere of economics, an indicator is understood as a numerical indicator that shows changes in one or more economic, financial values, while in chemistry it is understood as an indicator of the reaction of a substance, alkali and acid, which is added to the studied solution to determine the chemical process that occurs (coloring, dissolution of sediment).

In social sciences or sociology, indicator (indicator in Latin - indicator) is a tool, device, information system for monitoring as well as measuring alterations that occur in the process of monitoring the object being studied, a set of parameters developed for direct research and evaluation of changes in other properties of the object.

Based upon different indicators developed to identify and evaluate creativity, we applied several methods in the process of pedagogical experimental work. As part of the experimental work, we used the following questionnaire to evaluate the creative abilities of teachers.

Determining the teacher's creative competencies

QUESTIONNAIRE

Dear colleagues! We ask you to answer the following questions in order to determine the means of improvement and development of professional activity. Here are the questions. There are no right or wrong answers. Put a "+" next to the answers that reflect your opinion. Please try to give an unbiased answer!

Your age is _____, your teaching experience is _____, category _____

If you are given the opportunity to share your experience with the teaching community (for example: at conferences, methodological associations, professional development courses, etc.) (select one option)? You.....

- 1) I will not participate at all
- 2) I will not participate for now
- 3) yes or no depending on the situation
- 4) I often attend
- 5) I always attend

Comment: Explain your answer or add your own:

- (no, it takes too much time; too expensive in terms of material resources)

-
- (yes, it allows me to learn about the experience of colleagues, Summarize your experience.)

If you are invited to participate in a professional skills competition, you...:

- 1). I will not participate at all
- 2). I will not participate for now
- 3). yes or no depending on the situation
- 4). I often attend
- 5). I always attend

Comment: Explain your answer or add your own:

- (no, because I feel uncomfortable in front of many people, I don't want to, I'm no different from others, because of my age or my family doesn't allow it) _____

- (yes, if it is some benefit, advantage, some achievement, if there is an order from the administration, if there is support from family and friends, if there is help from colleagues);

-(I always take the initiative and do not miss such an opportunity, which gives me the opportunity to better understand the meaning of my profession) _____

Do you think it is difficult to introduce new pedagogical technologies into practice?

- 1). it's really difficult
- 2). In many cases it is difficult
- 3). It may or may not be difficult depending on the conditions of a particular institution
- 4). Maybe it won't be difficult
- 5). No, it's not difficult. There is nothing complicated about it



Comment: Explain your answer or add your own:

- (yes, lack of time; lack of material and technical resources; low level of financial incentives;

- misunderstanding with the administration, colleagues, parents; low awareness of teachers; high labor costs of the teacher; lack of special methodological developments that fully ensure the process, pedagogical conservatism) _____

- (no, because whoever wants to, finds his way and does not look for excuses)

Is there anything preventing you personally from introducing innovation (developments, new pedagogical concepts, technologies, methods) into mass practice?

- 1). Of course, there are many obstacles
- 2). It often destroys
- 3). sometimes depending on the situation
- 4). almost nothing stands in the way
- 5) nothing interferes, I am always engaged in innovation

Comment: Explain your answer or add your own:

- (no, because whoever wants to, finds a way, does not look for excuses)

-(Yes, misunderstanding with the administration, colleagues, parents; low information awareness of teachers; high labor costs of the teacher; lack of special methodological developments that fully ensure the process, pedagogical conservatism)

Do you personally have any motivation to innovate in the pedagogical process?

- 1). there is no reason to make me innovate, nor can there be.
- 2) I don't think so, innovation is not for me
- 3). sometimes there may be some reasons depending on the situation,
- 4). There are often reasons. yes
- 5). of course yes, I have many reasons for this

Comment: Explain your answer or add your own:

(yes, the desire to increase your reputation; the desire to create something new; the desire to be recognized; the desire to increase efficiency and effectiveness; the desire to move to a new level)

(development, teaching and upbringing of students; desire for self-expression; desire for material rewards; dissatisfaction with existing results;)

(imperfectness of available educational materials, study guides, methodological guides and developments; lack of developments for lessons) _____

(no, innovation and innovation is not for me) _____

Can you say that you are skilled in the use of modern pedagogical technologies?

- 1). of course yes
- 2) Yes
- 3) partially, 50/50
- 4). Often not
- 5). Absolutely No

How many educational technologies do you know?

- 1). Not a single one
- 2). 1-2
- 3). 3-5



- 4). 5-10
- 5). More than 10

How do you think you would score on a test about the characteristics of modern students?

- 1.minimum score
- 2.below average score
3. average score
4. above average
- 5.high score

How do you rate your level of knowledge in your specialty (subject you teach, field of study)?

- 1.minimum
2. sufficient
3. Average
- 4.above average
- 5.high

10. Do you know the specifics of different Programs (state, copyright programs, collective programs, partially related programs) recommended for your field (specialty)?

1. I don't know the features of any program
2. I know, I can tell about the features of 1-2 programs
3. I know, I can tell about the features of 3-4 programs
4. I know, I can tell the features of 4-5 programs
5. I know I can tell you more than 5 features of the program

In the last 3-5 years, how many times have you participated in professional skills competitions? (shows, festivals, competition, competition)

- 1.never
- 2.one or more
- 3.I have wins and awards

Please make your answer more specific

You participated in competitions (at the level of an educational institution);

at the district level;

at the city level;

at the regional level;

At the republican level;

I regularly participate in various levels) _____

12. How often do you refer to scientific (professional) literature in your field (specialty)?

1. rare
2. I apply, but relatively little
3. When and how, depending on the situation
4. often
5. regularly

13. How often should you present your expertise at methodological seminars, methodological board meetings, conferences, etc.?

1. never needed
2. rarely less;
3. sometimes;
4. often;
5. regularly

14. How often do you revise and change your methodological and didactic materials?

1. never, only once and do all



2. rarely;
3. sometimes;
4. often;
5. constant.

15. Do you have experience in developing copyright programs (club program, elective course, extracurricular activities, copyright program, etc.)?

1. No
2. yes, I made changes, adapted other people's (eg custom) programs
3. yes, I created my own original, authored program

16. If you have the opportunity to change your field of activity (leave education), you:

1. of course, I would leave without thinking
2. I can go
3. It is difficult for me to answer the question
4. I prefer to stay in the profession
5. I will not leave and prefer to remain faithful to the profession

17. If your student or child tells you that they want to follow in your footsteps, You...:

1. I strongly advise against doing so
2. I try to persuade you not to do so
3. warn about possible difficulties and problems
4. I will support and help him
5. I am proud of him

18. Is it important for you to be a teacher because this profession has great social value?

1. absolutely not
2. probably not
3. this question is difficult to answer
4. is partly so
5. Yes, it really is

19. Are your personal goals compatible with your professional activities?

1. no, they never match
2. is rarely, if ever, inconsistent
3. 50/50, depending on the situation
4. overlap
5. is the same in most cases

20. How do you evaluate the creativity of your students?

1. I don't have creative students
2. sometimes a creative student comes across
3. 50/50
4. most of my students are gifted and talented
5. all my students are creative

21. Is it important for you that the teaching profession is a creative profession?

1. No
2. No in most cases
3. Yes in most cases
4. yes, it affects my students and or colleagues

22. Do you know how to behave when a problematic situation arises in the relationship with students?

1. No
2. No in most cases
3. 50/50, depending on the situation
4. Yes in most cases



5. Yes, always

23. Do you show enough determination and patience to complete the planned work within the scope of professional activity?

1. No

2. No in most cases

3. 50/50, depending on the situation

4. Yes in most cases

5. Yes, always

24. Can you get along with any student's parents?

1. Yes

2. in part

3. This question is difficult to answer

4. probably not

5. No

25. In personal pedagogical practice, what feelings do you feel the need to change?

1. is negative

2. are often negative, but I know how to deal with them

3. does not evoke emotions; I don't care

4. I can find something positive in all the changes

5. I am always optimistic about the future

This questionnaire and a number of other tests listed above provided an opportunity to make a preliminary diagnosis of the professional creativity of teachers of the social and humanitarian direction of the higher education system and were used in the enhancement of the necessary methodological support for the first stage of experimental work.

Questionnaire analyzes according to the criteria proposed by E.Torrens. made it possible to determine whether the respondents have developed fluency, originality, flexibility, innovation, sensitivity to news, readiness to work in an unusual context, tendency to symbolic, associative thinking, the ability to see the complex in a simple way, the skills to simplify the complex, and the presence of job satisfaction.

CONCLUSION

The whole methods are questionnaires aimed at the assessment of creative thinking and behavior, including self-assessment and expert assessment of creativity. These methods, despite having some disadvantages, are often used to measure the main aspects of creativity, because they allow quantitative assessment and comparative analysis in a short period of time. Taking everything into account, it can be said that the existing methods of creativity measurement and research show that the individual's creative qualities, creative aspects, diagnostic tools, nature, form, time limits and age characteristics differ.

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ENVIRONMENTAL COMPETENCE: THEORETICAL AND METHODOLOGICAL APPROACHES

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RESUME

In the conditions of modernization of modern education, the competence-based approach is one of the leading principles for determining the content of education and ways of organizing it. Environmental competence is an important area of modern educational systems at different levels - school and university - and acts as both a general cultural and professional component. This article analyzes the essence of environmental competence and environmental competence, their relationship in the system of categories of environmental psychology and pedagogy. The structure and content of environmental competence at the level of general secondary education are proposed.

KEYWORDS: *competence, socio-natural environment, environmental competence, ecocentric type.*

Competence is formed not only in the process of specially organized educational activities, but is the result of the entire life and educational experience of each person. Therefore, one should immediately pay attention to the integrity of the educational process in the broad sense of this concept: as an organized learning process in a special institution (school, additional education institution, college, institute, etc.) and as an organically assimilated social experience in the direct living of a person in a socio-natural environment. This is one of the aspects that shows the phenomenological nature of the concept under consideration. In the development of students' competencies, the purposeful activity of teachers, and the influence of parents, and the entire system of family life, schools, institutions of additional education, and society as a whole are essential.

Environmental competence should be considered as a holistic personal education, the formation of which involves:

- formation of a system of basic values (life, health, people, conservation of biodiversity, cultural heritage, educational dominants, etc.),
- awareness and assimilation of environmental knowledge at the level of facts, concepts, theories and laws, ideas of ecology, the role of environmental education in the development of the personality and individuality of each participant in the educational process;
- the ability to operate with this knowledge for the formation of their own picture of the world and the worldview of students, for the theoretical and practical development of reality by all participants in the educational process; systemic vision of pedagogical reality;
- development of methodological and speech culture of teachers, their mastery of system-synergetic, humanistic, acmeological, axiological, activity, polycentric and other methodological approaches in education;
- the development of ecological consciousness (a system of ideas about the world, which is characterized by a focus on environmental expediency, the absence of opposition between man and nature, the perception of natural objects as partners in interaction with man, the balance of pragmatic and non-pragmatic interaction with nature) both among teachers themselves and among students;
- development of ecological thinking - flexible probabilistic thinking, which implies the ability to establish cause-and-effect relationships, modeling and predicting the development of the environment, including in the field of interpersonal relations, which is especially important for pedagogical activity;



- an emotional attitude to the world around in all its fullness and diversity, perception and attitude to it as a significant condition for one's own development and the development of students, a condition for the existence of the entire diversity of life and culture on the planet; - developed skills of environmentally competent behavior in the environment, interaction with other people, harmonious interaction and sustainable development in the system "Nature - Society".

Environmental competence is a multidimensional concept, its content depends on many factors. To determine the essence of environmental competence and, accordingly, competence, it is necessary to analyze the relationship of these concepts in the system of categories of environmental psychology and pedagogy [1].

The central element of this system is an eco-friendly personality — a personality with an ecocentric type of ecological consciousness and characterized by the following features: psychological involvement in the natural world, subjective nature of the perception of natural objects, the desire for non-pragmatic interaction with the natural world. Within the framework of the competency-based approach, it can be assumed that an essential feature of an environmentally friendly person is environmental competence, which is a specific individual manifestation of environmental competence.

The basis for determining the essence of environmental competence is the category of environmental activities, which, in turn, is associated with environmental consciousness, environmental thinking and environmental values [2]. Considering the concept of "environmental activity", it should be noted that it is not interpreted unambiguously (in the psychological and pedagogical literature, eco-oriented, nature-oriented, environmental, nature-saving and other types of activity are also considered). However, in any case, it is necessary to proceed from the fact that the basis of a person's personality is the totality of his relations to the world, which are realized through activity, more precisely through the totality of diverse activities [3]. Ecological activity can be considered as a component of social activity that reflects the attitude of society to nature, which includes "all interactions of the subject of this activity with its object, i.e. eco-environment (which we will call ecological interactions), leading to certain environmental consequences, results (positive or negative)". So, the conditions of ecological activity are associated with such a way of interaction between man and nature, in which a person not only uses and organizes natural processes, is included in them (which is typical for hunting and gathering, agriculture, cattle breeding), but creates processes that become part of the natural environment.

Like any other form of human activity, ecological activity is determined by the quality of consciousness (ecological consciousness), which allows a person to acquire the properties of a subject that not only changes or transforms, but creates an ecological environment.

There are two approaches to the definition of environmental consciousness [4], which seem to be very productive for understanding the essence of environmental competence and competence, in contrast to environmental literacy and education. The epistemological approach is based on the fundamental nature of the cognitive attitude to the world. The consciousness of the subject of the epistemological type performs a reflective function and a regulatory function, mediating his activity in relation to the world from the moment of goal-setting to achieving the goal. In this aspect, it is logical to present the main components of the content of competence: knowledge, skills, experience in the implementation of theoretical and practical actions.

At the same time, it should be noted that understanding life as an activity does not mean reducing it to a multitude of separate actions. Life is integrity, and as one of its many characteristics, the essence of competence can also be understood, reflecting a certain unity of the life manifestations of a person as an individual, their relative stability in time and space. The ontological essence of competence lies in the fact that it determines such interaction of a person with the world, in which the world is experienced as capable of satisfying a wide range of needs and becomes significant for a person, and a person feels that he has the opportunity to master a significant world. Such a state of the fullness of being can be quite stable in the case when it is the result of not learned ideas, but an adequate mental reflection of the objective significance of the world and one's own objective capabilities, i.e. own competence, which acts as a meaningful dominant of the subjective world of the individual. Thus, the ontological approach to the definition of competence lies in the fact that it can be considered as a form of being that is realized in the interaction of a person with the world.

So, the driving forces behind the process of developing environmental competence are the resolution of environmental contradictions, for example, between a person's desire to live in environmentally more favorable, safe conditions and the lack of conditions and opportunities for this. Such contradictions are resolved in environmental activities, the object, subject and content of which, presented as components of the content of education, determine environmental competence.

The relationship of environmental competence with other categories of environmental psychology and pedagogy suggests the following logic. Environmental knowledge acquired by students in the process of environmental education, environmental ideas



formed in everyday life, contribute to the awareness of the importance of environmental problems, understanding the value of nature. Knowledge and values influence the formation of ecological consciousness, transform into beliefs that lay the foundation for an ecological worldview. In turn, the worldview determines the ideals of the individual, determines the attitude towards nature, which are manifested in environmental activities - actions, deeds, behavior, habits. In other words, ecological behavior is a consequence of the realization of the content of ecological consciousness.

In the content of environmental competence, various components are distinguished: motivational, cognitive, activity (L.E. Pistunova); meaningful, active, personal (L.V. Panfilova); methodological, motivational-value, cognitive-informational, prognostic (A.I. Novik- Kachan); environmental-cognitive, environmental-motivational, ethical-social, professional-behavioral (V.A. Danilenkova); cognitive, operational, need-motivational, value-semantic (A.A. Makoedova); scientific block, block of integrative qualities of personality, block of skills (S.N. Glazachev); motivational, intellectual, emotional-volitional, subject-practical substructures (F.S. Gainullova). Proceeding from the principle of psychological unity of consciousness and activity, relying on studies of the structure of professional competencies [5; 8], it is advisable to present the structure of ecological competence in the form of five components: value-semantic, motivational, cognitive, practical-activity, emotional-volitional.

There are two main approaches to the selection of the content of environmental competence. The subject approach involves finding manifestations of competence in a particular academic subject, clarifying the contribution of this subject to the formation of the corresponding competence (knowledge, abilities, skills and methods of activity) [6]. Obviously, this procedure significantly narrows the innovative possibilities of the competence-based approach, since it only leads to a restructuring and some integration of the traditional content of education.

Of course, when designing and implementing the content of environmental competence, it is necessary to take into account the requirements of the state standard of general education, where for some subjects (natural science, biology, chemistry, physics, geography, technology, history, social science) the need for the formation of individual components of environmental competence is indicated: goals, content, experience of cognitive and practical activity.

In the process of ecological activity, the student himself also changes: the amount of knowledge in various areas of ecology increases; skills are formed, focused on the rational and careful use of natural resources; there is a formation and transformation of value orientations that ensure a responsible attitude to the natural environment and one's own health; there is a development of abilities, personal qualities, allowing to implement a new style of behavior in the socio-natural environment, which in many respects contradicts the experience of previous generations.

Thus, the proposed model of environmental competence focuses environmental education not so much on the formation of knowledge, but, first of all, on the development of experience of practical participation in improving the state of Ermakov D.S. Ecological competence of students: content, structure, features environment, identifying and promoting the solution of environmental problems, in the process of which mental neoplasms arise in the form of new goals, assessments, motives, attitudes, meanings.

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THE RESULTS OF A FIELD STUDY ON THE EVALUATION OF COMPREHENSIVE ASSISTANCE TO WOMEN AND CHILDREN RETURNED FROM THE MILITARY ZONES IN THE FRAMEWORK OF STATE REINTEGRATION PROGRAMS

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ANNOTATION

Armed forces in Syria between the government and ISIS illegal paramilitary groups attempting to create a new Islamic state, thanks to the successful dissemination of their radical extremist ideologies among the communities and people who are professionals of Islam, have led to active recruitment as well as joining to their ranks of individuals who have expressed a desire to help their viewpoints. Recruitment and involvement in military teams, although prevailing among men, has also not left aside women as well as children, who are also target groups for the implementation of long-term military strategies of ISIS. Women and children, in most cases, are family members of men who joined ISIS.

KEY WORDS: *ISIS, victims, re-integration, integration, repatriated persons, G. Shmishek and K. Leonhard's test-questionnaire.*

INTRODUCTION

Citizens of the Republic of Uzbekistan also got involved in the processes of participation in paramilitary forces on the territory of Syria, besides, exact data on the number of men, women and children who went to the military zone are not available in the public domain. Mass casualties among men during military operations have caused a humanitarian crisis among women as well as children who have lost their bread winner and are unable to autonomously supply with their minimum necessities of life [1].

From 2019 to 2021, in the Republic of Uzbekistan, at the initiative of the President of the country, five special operations were implemented to return women and children from the zones of armed forces, thereby helping the call of the UN Secretary General Antonio Guterres on the importance of assisting governments in resolving the humanitarian crisis in Syria and Iraq. As part of the Mehr-1 operations [2] (2019), 156 women and children were returned; "Mehr-2" [3] (2019) - 64 children, of which 39 are boys and 24 are girls; "Mehr-3" (2020) - 25 women and 73 children; "Mehr-4" (2021) - 24 compatriots, involving 19 children; "Mehr-5" (2021) - 24 women and 69 children.

Unlike other countries that have also returned their citizens from the zones of armed forces, Uzbekistan has implemented an approach focused on the reintegration of repatriated persons through the restoration as well as strengthening of family ties (mainly biological), which should supply not only rehabilitation, but also assistance in re-socialization women and children in the community.

Conventionally, the process of entire reintegration consisted of three stages, the first of which consisted in the provision of urgent crisis (medical and psychological assistance) to returnees for one month in specially prepared places (boarding houses) with the participation of specialists of different profiles. In parallel, work was carried out with family members who expressed their readiness to accept women and children.



The second stage can be depicted as the stage of integration into biological/adoptive families where the repatriated people were to live in the future. At this stage, measures were taken to return the repatriated people to the legal atmosphere, namely the restoration of documents as well as access to state social services. The duration of this stage was more than 6 months.

Additionally, the third stage is the further reintegration of repatriated people through training in professional skills as well as employment, education and long-term medical care (for persons with disabilities). The consideration of this survey is precisely the second (partially) and third stage of work with repatriated people, since the first stage was successfully implemented because of the short-term goals as well as objectives, particularly the participation of highly qualified specialists. The issue caused by the need for this survey is that service providers at the level of assistance have not had prior training in working with this target group, and, accordingly, find it difficult to plan and provide high-quality comprehensive long-term assistance that allows repatriated individuals to restore social ties, and decision makers to assess the success of programs for the reintegration of women and children into society.

GOALS AND OBJECTIVES OF THE STUDY

The purpose of this survey is to collect and analyze successful practices and difficulties/barriers in the process of reintegration of women and children returned from the zones of armed forces in Syria and Iraq so as to improve universal methodological recommendations for all social service providers involved in the process of reintegration of repatriated individuals in society.

THE RESEARCHERS HAD THE FOLLOWING TASKS

- Overall overview of the situation related to the processes of providing assistance to repatriated individuals.
- Collection of information in the context of areas in which repatriated individuals interact or accept public services.
- To study the trends taking place in work with repatriated individuals in order to make recommendations to decision makers in order to review, amend and add to programs / roadmaps in work with this target group.
- Drawing up a socio-demographic portrait of a team of repatriates.
- Studies of neuropsychological, emotional and other adaptation processes.
- Measure expert opinions for further development of approaches.

According to the plan of research as well as analytical work, a psychological study was conducted aimed at studying the level of intellectual, psycho-emotional, social and adaptive development of women and children who returned from the zones of military operations to Uzbekistan. Based upon a representative sample, 193 repatriates were studied (including 3 (2 husbands, 1 wives) persons replacing parental functions), of which 47 families of repatriates and 3 families with guardianship, or guardianship by court decision, of which 32 (including 1 family of guardians) with Namangan and 18 (2 families of guardians) from Surkhandarya, 49 - female representatives and 1 representative male guardian, among children the total number is 143, of which 70 are girls and 73 are boys, by age structure differentiation from 0-4 years among girls is 9 and boys 13, from 5-18 years among girls 61 and boys 60.

Adaptation of children is one of the most significant and urgent problems of child psychology, which solves it together with pedagogy, psycho-hygiene, biology, sociology.

The process of adaptation is the moment when a child becomes a subject of social activity. This is mainly because in the course of adaptation the child acquires orientation in the system of behavior, which for a long time determines the further share of its improvement. Also in the course of this process, the main ways of interacting with a certain level of socio-psychological cohesion are formed. Relationships with the social institutions of society are a strong means of attracting the child's personality to new social functions, cultures, along with norms of behavior that are characteristic of the new environment.

According to regional variation among children, the following structure is observed: in Namangan, the total number of children is 84, of which 42 are girls and 42 are boys, according to the age category from 0-4 years old among 7 girls and 10 boys, from 5-18 years old among 35 girls and boys 32. In Surkhandarya, the total number of children is 59, of which 26 are girls as well as 28 are boys, according to the age category from 0-4 years old among girls 2 and boys 3, from 5-18 years old among girls 26 and boys 28.



“Individual psychological characteristics of repatriates”

Description of the technique

The test - the questionnaire of G.Shmishek, K. Leonhard is wished for diagnosing the type of personality accentuation, published by G.Shmishek in 1970 and is a modification of the "Methodology for studying personality accentuations of K. Leonhard". The technique is intended for diagnosing accentuations of character as well as temperament. According to K. Leonhard, accentuation is the “sharpening” of some individual properties inherent in each person.

Character accentuation is an excessive expression of individual character traits and their combinations, representing an extreme version of the mental norm. In some people, some character traits are so pointed (accentuated) that under certain circumstances this leads to the same type of conflicts and nervous breakdowns. When character is accentuated, a person becomes vulnerable not to any (as in psycho-pathology), but only to certain traumatic influences addressed to the so-called “place of least resistance” of this type of character whilst remaining resistance to others. Accentuations can turn into each other under the impact of different factors, among which an important role is played by the characteristics of education, social environment, professional activities, and physical health.

Empirical data analysis: Analysis of the results of the study of repatriates according to the Shmishek method showed that the majority of respondents have difficulties in controlling emotions and maintaining emotional stability.

Separate character traits of repatriates become significantly pronounced, more accentuated, as a consequence of which a significant vulnerability to some psychogenic influences is manifested, while excellent resistance to others is shown.

To date, the study of character accentuations is the most complex social, psychological and medical problem. Many repatriates have abnormal manifestations of character, this is expressed in their behavior in society, in interaction with others, is reflected in work activities, etc.

Therefore, the data in the table make it possible to identify the main dominant indicators, according to the nature of accentuation, they are distributed between such types as "Emotive" 16 respondents and "Affective-exalted", 17 respondents, which shows that repatriates of the "Emotive" type have a weak nervous system, which affects more acutely in response to situations where someone is in danger, scenes of violence cause them strong shocks, which are not forgotten for a long time and can lead to a violation of the psycho-emotional state. A poorly developed self-control system leads to an inability to get rid of negative emotions in time, accumulating them leads to reactive depression or suicidal thoughts, which increase the chance of suicide. Whereas people with the Affectively Exalted type are often prone to argument, they have a habit of not bringing things to open conflicts. In conflict conditions, there are both active and passive parties. They are attached to friends as well as relatives, altruistic, have a sense of compassion, good taste, show brightness and sincerity of feelings. They can be alarmists, subject to momentary moods, impulsive, easily move from a state of delight to a state of sadness, and have mental illness.

Under the impact of unfavorable conditions, character accentuation can lead to changes in the behavior of repatriates, as well as to pathological disorders. To mitigate unfavorable conditions and maintain repatriates in a state of harmony, a long-term as well as complex work of a psychologist together with other specialists is needed.

DISCUSSIONS AND CONCLUSIONS

Depending on the micro-society in which the repatriate is located, on social conditions, on the state of his mental health, the period of formation of the “I-concept” ends either with a stable positive I-concept, which is characterized by a positive attitude to oneself, self-esteem, self-acceptance, a sense of one’s own value, or, the formation of a negative I-concept, a negative attitude towards oneself, rejection of oneself.

The presence of pronounced typological character traits importantly aggravates the process of personality formation, the development of mental processes, affects the level of self-esteem, as well as the level of upbringing and behavior of the repatriate. Relationships with others suffer. Possible psycho-emotional manifestations affect the psychosomatic state of the individual.



At the present stage, psychologists dealing with problems in this area argue that psychopathic features in a not pronounced form are characteristic of almost all people. The sharper the individuality is expressed, the more characteristic it is, and the accentuated features are expressed in it, this is confirmed by the relationship between character accentuation and genius.

It should be noted that a pronounced character accentuation is an extreme degree of the norm and, under the influence of adverse conditions, can lead to pathological disorders and alterations in personality behavior, due to psycho-pathology.

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ASSESSMENT OF THE DENTAL STATUS OF CHILDREN WITH CHRONIC TONSILLITIS

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SUMMARY

Conducted studies have established a very low local immune status of children with chronic tonsillitis. Careful observation of children made it possible to evaluate the significance of each of the numerous clinical symptoms. By collecting subjective and objective data, it is possible to provide timely diagnosis of not only chronic tonsillitis, but also its clinical forms, which is extremely important, as it makes it possible to choose and carry out specific treatment tactics.

KEY WORDS: *chronic tonsillitis, acute tonsillitis, microbiological research.*

INTRODUCTION

According to the state statistical reporting of the Republic of Uzbekistan, the pathology of the ENT organs occupies the first ranking place in the structure of the incidence of the child population, among which the development of chronic tonsillitis predominates in preschool children - 45.2% [1]. The features of the clinical picture, the duration of the course of this disease, as well as the direct anatomical and functional relationship with the oral cavity necessitate the study of the relationship between damage to the organs of the maxillofacial region with this ENT pathology in children. Chronic tonsillitis (CT) is in children [1, 2, 4]. Infection in the palatine tonsils [6, 7]. From one of the most common tonsils, it is often a triggering temporary and reliable diagnosis of diseases of the upper respiratory mechanism for pathological chronic tonsillitis in many ways, since the subsequent course of the disease occurs in 4-10% of changes in the cardiovascular system [5]. Analysis of subjective clinical symptoms among children with various forms of chronic tonsillitis.

The palatine tonsils consist of lymphoid tissue, which performs a protective function [6]. The tonsils are pierced by deep and complex channels - crypts, which end on the surface of the tonsils with lacunae - special recesses through which the contents of the lacunae are brought out. On average, there are 2 to 8 lacunae on the amygdala. It is believed that the larger the size of the gaps, the easier and faster the discharge is removed. In addition to the palatine tonsils, there are other formations in the pharynx that perform a protective function: the lingual tonsil is located on the root of the tongue, adenoid vegetations (adenoids) are located on the back wall of the nasopharynx, and tubal tonsils are located in the depths of the nasopharynx around the auditory tube. Inflammation of the tissues of the palatine tonsils is called tonsillitis, and a protracted inflammatory process is called chronic tonsillitis [8].

PURPOSE OF THE STUDY

To assess the dental status of children aged 3–10 years with chronic tonsillitis to justify the need to prevent dental caries, periodontal disease and dentoalveolar anomalies in this group.



MATERIALS AND METHODS

Parents were questioned about the course of pregnancy, the frequency of the child's morbidity per year, the presence of signs of oral or mixed types of breathing, and the features of hygienic care for the child's oral cavity. In the course of a clinical study, a study of medical records, a survey and a clinical assessment of the state of the oral cavity of 49 children (34 boys and 15 girls) aged 3–10 years were carried out, who are under dynamic dispensary observation for chronic tonsillitis with varying degrees of severity. The examination was carried out in the children's city polyclinic No. 30. During the study of medical records, attention was paid to the period of the child's stay at the dispensary, a clinical examination was carried out according to the WHO methodology (1989). The state of hard tissues of temporary teeth was assessed using prevalence rates (%), intensity of dental caries (cids); oral hygiene - according to the Yu.A. Fedorova - V.V. Volodkina (1971). To record the survey data, specially designed medical records of the dental patient were used.

RESULTS

The survey revealed that about 70% of children brush their teeth once a day and irregularly, that 100% of the surveyed have a high level of carbohydrate intake in their daily diet, only 11% of children drink clean water or rinse their mouths after taking cariogenic food. Assessing the state of oral hygiene, in the group of children with concomitant pathology, it was determined that it was unsatisfactory and amounted to 2.3 points. Caries was detected in 22 children, which corresponds to a prevalence of 44%. In the course of a clinical study, 31 children were diagnosed with dentoalveolar anomalies (63%) and 29 children with oral breathing (82%).

CONCLUSIONS

In children with chronic tonsillitis, a deterioration in the state of oral hygiene, a high prevalence of caries and dentoalveolar anomalies, and a predominance of mixed or oral types of breathing were revealed. Our research necessitates the development and implementation in practical healthcare of complex methods for the prevention of dental pathology in this group of patients.

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CLASSIFYING WEATHER BASED VISUAL DATA USING NOVEL HYBRID APPROACH

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ABSTRACT

Aspects such as the climate play a significant part in the expansion of businesses in the current period, in which companies from a variety of sectors are collaborating to fulfil the objectives of commercial enterprises. The climate not only has an impact on our day-to-day lives, but it also plays a significant role in a wide range of businesses, including retail, construction, and supply chain management, among others. Aside from that, it also has an effect on the functionality of a great deal of visual systems, such as those used in vehicles to assist drivers, outdoor video observation system, and so on. The presence of fog in the weather poses a significant risk for automobile accidents. The impact of the severe weather that has been affecting the region can also be observed in India. Although there is a significant amount of study that is now being conducted in the topic of "Weather Analytics," there is still a significant amount of research that needs to follow the role of A.I. in this particular field. This research work presents a specific study that has been done to fill the void. The aim of this research is to investigate potential applications of combining various deep learning models known as convolutional neural networks for solving weather detection issues. Expensive sensors are required for the more conventional methods of determining the current state of the weather. This article provides a strategy using computer vision to detect real weather conditions with precise accuracy in order to keep the costs to a minimum.

KEYWORDS—Computer Vision, Weather Classification, Image processing, Deep Learning, Ensemble Learning, Accuracy

I. INTRODUCTION

Computer vision has only recently begun to explore the concept of weather recognition. In contrast to other challenges involving object or scene recognition, the recognition of weather requires an understanding of the intricate phenomena of refraction and reflection as well as the overlap of various particles in the air on the surface of things and the overall picture. The weather has a significant role in each of our lives. The topic of instantaneously collecting information on the weather is an empirical one that has a significant impact on society. Images provide a wealth of information that can be used to better comprehend the weather. Images also have other distinct advantages, such as high acquisition with advent of big data at a relatively low cost.

The methods that are now used to monitor weather rely on sensors, which are really rather pricey. There is a chance that artificial intelligence can be related to the identification of weather conditions. This is because the world is shifting toward the implementation of AI systems in every industry. A computer vision solution that makes use of deep learning technology has been presented as part of this body of work as a method for determining the weather condition from an input image. By making use of the CCTV surveillance cameras that are already in place, it could be able to identify weather using a computer vision system in a cost-effective manner.

It is still not easy to classify the weather using only one picture, despite the fact that it is useful. Because of the one-of-a-kind qualities of the weather, the challenge arises from the fact that many of the global and local invariant traits that are useful for object detection and classification are rendered ineffective. Methods for weather recognition are also noticeably distinct from object recognition since the variation of object in various meteorological situations, rather than the structure of object themselves, needs to be examined. This requires a significantly different set of computational resources.

In this research paper we are attempting to combine various state-of-the-art convolution neural network architectures using weighted average as an ensemble method to accurately analyze the image and classify in into 11 distinct categories as listed in the table 1.1. The ensemble learning can be extended to wider extensive deep learning methodologies to help the trained model avoid overfitting and generalize better to complex real-world data.

**Table 1.1 Different classes in the data**

DEW	
FROST	
HAIL	
RAIN	
RIME	
SNOW	
FOG SMOG	
GLAZE	
LIGHTNING	
RAINBOW	
SANDSTORM	

II. LITERATURE SURVEY

Nayar [1] presented the earliest works about the observable manifestations of various weather situations. “Lu”. [2] was the first to attempt to classify picture weather data into two classes (cloudy and sunny). They concentrated on characteristics such as clear sky, hazy shadows, refraction of light rays, and contrast. Using Support vector machines on their experiment, they attained 53% normalized accuracy. Their model failed to interpret certain scenarios, such as extremely cloudy or sunny day or a low-intensity, sunny day. “Elhoseiny”. [3] also experimented with the categorization of two-class weather images and obtained superior results using a deep convolutional neural network. They attained a normalized classification accuracy of 82.2%.

“Chaabani ”. [4] suggested a artificial neural network model for estimating range of visibility in dense, foggy or hazy conditions,. Providing a device capable of detecting the fog's density and visibility range. The most recent publication [5] conducted experiments with their own Multiple Class Weather Image dataset. They suggested a method free of external factors for identifying the weather in a single photograph. Their image data contains 20,000 photographs that are primarily focused on the entire weather state, as opposed to any particular object in the image. To extract features, HOG similarity, color space, the intensity histogram, and other methods have been utilized. After obtaining the features, the work applied the Multiple Kernel Learning technique, discovering the ideal combination of kernels which is linear in nature and achieving a score of 71% for the resulting technique. “Guerra”. [6] also studied weather identification, primarily focusing on employing new data augmentation technique, and then experimenting with various neural layers using the enhanced dataset.

All these previous works came a long way into effective classification of images for weather applications. However these researches yet not utilized the prospects of convolution neural nets which are adept at handling advanced computer vision problems. These architectures along with ensemble shows remarkable promise for accurate future weather classification tasks.



III. DATASET AND METHODOLOGY

1) Dataset

The model is built using multiclass weather image dataset, which consists of 6,856 images having 11 distinct categories of dew, frost, hail, rain, rime, snow, fog smog, glaze, lightning, rainbow, sandstorm. Further the distribution of the categories is highly uneven as demonstrated in the figure 3.1. The dataset is a subset of Weather Phenomenon database (WEAPD) [7], published in the Harvard Dataverse by Xiao and Haixia. The data is collected from geographical ranges throughout the Europe and United States. For the purposes of this research, 225 representative and random samples are collected from each class for precise weather classification task.

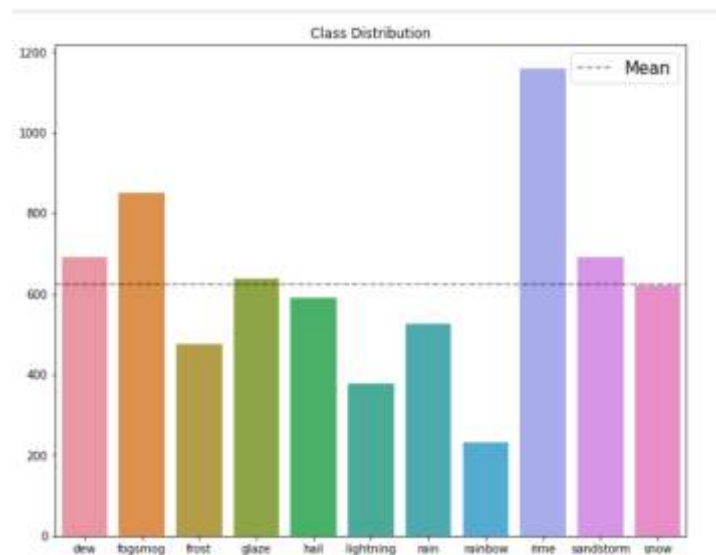


Figure 3.1. Class Distribution in the dataset subset

2) Methodology

The architectural diagram in the figure 3.2 illustrates the working of the entire process which can be divided into 2 particular phases namely – preprocessing stage and training stage. The models used are ResNet150V and Xception and they are combined using weighted average method to provide a higher accuracy.

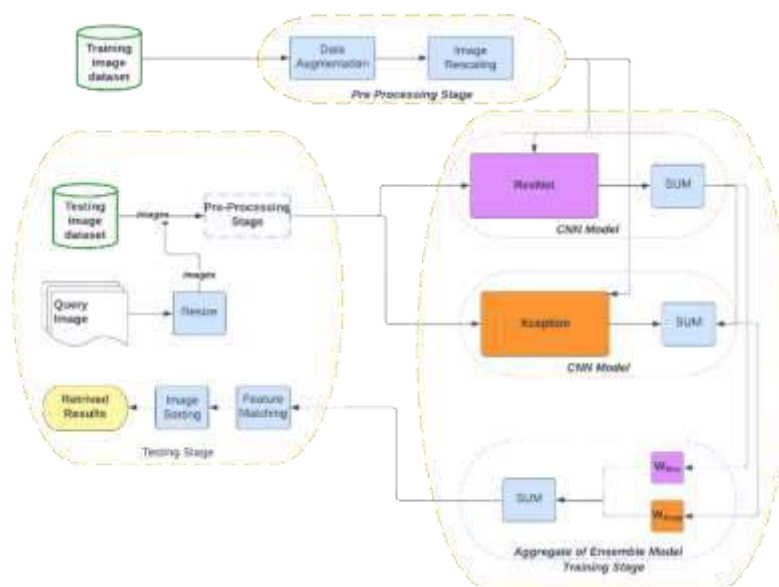


Figure 3.2 Architectural Diagram illustrating the methodology



Pre-Processing Stage

The dataset acquired is imbalanced and contains images with varying sizes in RGB format. The first step is to resize the images to a specified size (256 x 256) and rescale the pixels to a value between 0 and 1 which are accepted by the convolution neural networks used in this literature. The next step is to split the data in 80-20 ratio for training and testing purposes and perform data augmentation on the training data. Data augmentation helps overcome the challenges posed by the small size of the dataset by generating artificial images which are representative of the current domain. The size of the training set can be increased by a factor of ten or more using this strategy and make the model much more resilient (overcome overfitting) and practical for real-life scenario. The optimal parameters for data augmentation can be derived using hyperparameter tuning as well as studying the variance of different images to understand the measures of central tendency.

Training Stage

CNN [8] has been successfully used to a variety of real-world issues, including object identification, classification, and feature extraction, among others. Recent developments in CNN have proved significant in resolving numerous difficult classification and identification issues. CNN usually has the following four features which makes them effective for computer vision applications:

- 1.) Convolution : CNN use a kernel or a filter which when applied on the matrix of pixel, in which images are represented can convolve the image to extract various feature. The key aspect of kernel is its ability to understand the correlated pixels as well as tolerate the slight shifts in the augmented image data.
- 2.) Non- Linearity : We use rectified linear unit (ReLU) to introduce non linearity in the neurons which helps the model fit to complex image data.
- 3.) Pooling : The pooling layer aggregates the feature map obtained after convolution to retain the most significant features. This in turn help reducing the number of inputs to the neural network and optimizing the training time for faster computations. We utilize Global Average Pooling in our architectures for reducing the feature map.
- 4.) Classification Layer : After Pooling operation is performed the resulted feature map is flattened to a single array of values which are then fed to a densely connected neural network. At Last the full connected layers is attached the classification layer which uses a softmax function to output the probability based on the given input and is ideal for multi-classification tasks.

The two CNN architectures used in our research are described below:

- 1.) ResNet150V2[9] : Residual Nets are one of the most powerful convolution neural nets which can overcome the problem of vanishing/exploding gradients by using skip connections. Activations on one layer can be connected to those on subsequent layers via the skip connection, which bypasses those layers in between. This results in a residual block being formed. The formation of resnets involves the successive stacking of these residual blocks. The 150V2 architecture is the variant which uses a stack of 6 layers to decrease the training time and model complexity at larger depths. In addition to the base model we add two densely connected layers with drop-out to increase accuracy and decrease the validation error.
- 2.) Xception[10] : Extreme Inception (Xception) uses depth wise separable convolution layers. The exception is based on decoupling of cross-channel and spatial correlations in the feature map. It consist of 36 convolution layers having residual linear connections. By separating the channel and image region xception basically performs training on 2D and then 1D , instead of entire 3D images which makes learning much faster. Hence it is an optimal pick for ensemble learning which requires computationally less models as its base models. Similar to ResNet we add dropouts and densely connected layers to increase the validation accuracy and avoid overfitting.

Ensemble Learning[11] : Ensemble Learning is advanced machine learning methodology which is used to combine various different models in an effort to create an entirely new model which can outperform all the base models used in its architecture. The idea of using ensemble learning for convolution neural networks stems from the idea that weather images have intricate features each of which have significant characteristics and are difficult to be captured by a single CNN architecture. Hence it is much more efficient to train separate networks which can recognize specific regions and combine them to produce a more effective output. To aggregate the two models we use weighted average as represented by the formulae below:

$$S_i^{mix} = W_{ResNet} S_i^{ResNet} + W_{Xception} S_i^{Xception}$$

Where S_i^{mix} is the feature vectors of the aggregated model , W_{ResNet} is the weight associated with ResNet and $W_{Xception}$ is the weight given to xception model.

IV. EXPERIMENTAL RESULTS

The CNN classifier was employed to solve this problem. Accuracy score and was used to evaluate the experiments. The effectiveness of each model has been compared and aggregated in one final models. The models displayed in this experiment were trained with 10 epochs, and validation was performed using a validation sample created from the train data. The validation data is also resized and rescaled and a batch size of 32 is used for each epoch iteration.



This experiment was implemented in Python [version 3.8]. The tools utilized for this project are listed below. NumPy, Keras [version 3.7.2] utilizing TensorFlow [2.10.1], sickit-learn, OpenCV, Operating System, Pandas and plotting libraries such as Matplotlib and Seaborn

Result Analysis: Table 4.1 shows the accuracy of different CNN architectures on the train and test set of weather image data. ResNet 150V2 outperform Xception Net on the validation data and by combining both of them a 3% increase in accuracy is achieved.

Table 4.1 Accuracy and Loss Scores of different experiment

CNN Model	Accuracy Score(Validation Data)	Loss Function Score
ResNet150V2	87.07%	0.403
Xception	83.47%	0.465
Aggregated CNN Model	90.03%	0.372

V. DISCUSSION AND SCOPE

In this study, we investigate how the classification accuracy is affected by a variety of convolutional neural network topologies as well as possible application of integrating various networks together. The work being done here is distinct from other deep learning problems such as object recognition, categorization and tracking etc. In stark contrast to these problems, which rely mostly on low-level features of an image, this latest challenge is concerned with higher-level aspects within a picture. Using different architectures we were able to capture different high level aspects of the image and then combine them together to help analyze the whole image resulting in higher accuracy. On the basis of contrast, frost, hail, rime and snowy weather are essentially identical to one another. The model is very good at identifying photographs that are exhibiting dew, rain or sandstorm, but it has a tendency to misclassify images that are rime and fog smog. Sometimes photographs depicting rime are mistakenly categorized as being frost. The model suffers from all of these flaws. The efficiency of the neural networks can have their performance improved by making the data set more extensive, increasing the number of epochs or ensemble a higher number of less complex convolution neural network. However each of these will have a significant increase in the computation time.

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A REVIEW ON PHARMACOLOGY OF HEDYOTIS HERBACEA

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ABSTRACT

The chemical components and their pharmacological effects of Hedyotis herbacea Willd were compiled. Anthraquinones, terpenoids, steroids, flavonoids, organic acids, and polysaccharides are all recognised components of this plant. Hedyotis herbacea Willd has been shown to exhibit a range of pharmacologically significant properties, including anticancer, anti-inflammatory, immunostimulatory, antioxidative, neuroprotective, and hepatoprotective, cytotoxic, antibacterial, antifungal, antioxidant ones.

KEYWORDS- *Hedyotis herbacea, anti-inflammatory, flavonoids, Anti mutagenesis, Hepatoprotective activity*

INTRODUCTION

The name of the plant is Hedyotis herbacea, in Sanskrit is called CHAYAPARPATIKA. It is grown in mild open sunny location. It grows in very hard soil also. It has tiny white colour flower, and another identifying feature of this plant is its stem are quadrangle, sharp edged four gonodes.

When you can touch you can feel the angular structure of the stem, it has some small-small leaves. Hedyotis herbacea whole plant is useful and its first taste is bitter and second taste is sweet. It provides also cooling sensation, also reduces fever and gives anti-inflammatory also stomach ache, expectorants it's a tonic herb, tonic means it can be nontoxic and it can be used in small quantity and make some home remedy probably most commonly prepared tea can be made from this. This is mainly used in traditional medicine elephantiasis, fever, lack of appetite, gas issues, blotting, worm infestation, asthma, bronchitis, ulcers and all kind of inflammations.

Phytochemical research on Hedyotis species first was published in 1933 when H. herbacea's medicinal plant's active ingredients were studied. Since then, several members of the genus

Hedyotis have yielded approximately 50 new chemicals. Alkaloids, anthraquinones, flavonoids, iridoids, triterpenoids, sterols, lignans, and several more chemicals all have incredibly diverse structural makeups.

In the family Rubiaceae, the species Oldenlandia corymbosa L. and O. herbacea (L.) Roxb. belong to the genus Oldenlandia. In temperate and tropical areas of Africa and Asia, they are typical weeds. [1]

O. herbacea has a tangled, heavily branching stem that is frequently entwined. Small, linear-lanceolate leaves, solitary or in pairs of flowers on long stalks, axillary at the nodes, up to 5 mm in diameter, white or mauve, and small, round capsules are present in the fruits.

O. herbacea is said to be anthelmintic, anti-inflammatory, expectorant, stomachic, and tonic throughout. Elephantiasis, fever, dyspepsia, flatulence, colic, asthma, bronchitis, ulcers, and hydrocele can all be treated with it. Organic substances known as secondary metabolites have no essential purpose in metabolic pathways. In other words, they play no direct role in a plant's typical growth and development. Plants are the main sources of bioactive molecules for the creation of novel medications since they naturally occur in plant tissues and are entirely dependent on their presence and level for medicinal purposes. Either the plant's components or the entire plant can be used to extract the active metabolites. [2]

Anticancer- Hedyotis herbacea has been utilised as an anticancer agent in eastern medicine for many years. Recently, it was asserted that H. herbacea inhibits the growth of human cancers such as hepatoma, cervical, gastric, and intestinal carcinoma. [4] According to earlier studies (Kim, 1997; Kim et al., 1998; 1999), [6] H. herbacea may have anticancer properties that can inhibit the proliferation



of some cancer cell lines. Additional research was conducted (Woo et al., 1998)[5] to examine the inhibitory effect of an oldenlandia herbacea methanol extract on the growth and differentiation of human cancer cell lines U937. [7]

By reducing the ability of HL-60 cells to form colonies through the cleavage of Bcl-2 and the activation of bax, *H. herbacea* decreased the malignant potential of these cells.[8] Oldenlandia herbacea extract significantly increased apoptosis and efficiently reduced the proliferation of all eight cancer cell lines, according to a recent study (Gupta et al., 2004)[3] on the subject. However, the extract had a minimal harmful effect on healthy pancreatic cells. Additionally, the animal model showed a considerable suppression of lungs metastases with no discernible side effects. These findings suggested that oldenlandia herbacea extract might have anticancer properties.[9]

Anti mutagenesis - Aflatoxins B1 (AFB1) and benzo (a) pyrene (Bap) metabolism, DNA binding, and mutagenesis were all suppressed by Oldenlandia herbacea,[12] indicating that it may have antimutagenic properties for both substances (Wong et al., 1993a; 1993b).[13] An unscheduled DNA synthesis (UDS) test was used to investigate the antimutagenic benefits of a few Chinese herbal remedies and green tea's ability to combat the effects of cigarette tar (Han et al., 1997).[14] The effects of the total particles material (TPM) extract from cigarette tar on lymphocyte DNA damage were shown to be reduced by 125 g/L of *H. herbacea*. [15]

Hepatoprotective activity- In a CCl₄ and D-galactosamine (D-GalN)-induced liver damage model, Taiwanese researchers (Lin et al., 2002) investigated the hepatoprotective properties of *H. herbacea*. [16] The hepatotoxic effect of *H. herbacea* was assessed by evaluating serum glutamate oxalate transaminase (sGOT) and serum glutamate pyruvate transaminase. The findings showed that *H. herbacea* had a substantial impact in lowering sGOT and sGPT's acute rise. [17]

24 hours after the hepatotoxins were administered intraperitoneally, concentration and reduced the severity of liver injury [18]

Neuroprotective activity- Using primary cultures of rat cortical neurons that have been glutamate-insulated as a screening system, a search for neuroprotective substances from natural sources was conducted (Kim et al., 2001).[19] In an in vitro test technique, *H. herbacea* extract shown considerable neuroprotective efficacy against the harmful effects of glutamate.

Cytotoxic and other bioactivities - A cytotoxic agent is defined as a material that can destroy cells, particularly cancer cells, in the National Cancer Dictionary. These substances might prevent cell growth or shrink tumour cell size. Numerous studies have shown that *Hedyotis* plant species have the ability to act as an anticancer agent by preventing tumour cell growth, migration, metastasis, and invasion before they worsen. The compound's mode of action may involve altering the tumour cell's growth-related signalling pathway, cell immunity, and antioxidant activity (Han et al. 2020).[20]

Antibacterial and antifungal activities - microbial origin, interest in plant bioactives as a high-potential source of antimicrobial molecules has recently increased (Gomaa et al. 2019; Belfarhi et al. 2020).

Other species, such as Oldenlandia herbacea, shown strong effectiveness against *S. aureus* and *Escherichia coli* despite the lengthy history of uses of microorganisms. The presence of 1,2-dihydroxy anthraquinone (Alizarin), which was detected in all antimicrobial bioactive fractions, was thought to be responsible for the antibacterial activity (Ahmad et al. 2005).[21] Another study revealed that Oldenlandia herbacea's methanolic extract has potent, broad-spectrum antimicrobial properties against Gram positive and Gram negative bacteria, including *Bacillus* species, *Escherichia coli*, *Klebsiella* species, *Proteus* species, *Pseudomonas* species, and *Staphylococcus aureus*, with very little antifungal activity against *Candida albicans* (Hussain and Kumaresan, 2013; Das et al. 2019).[22]

Antioxidant properties - Despite the numerous historical uses of products with microbial origins, according to a 2005 study by Ahmad et al., *Hedyotis* species have more antioxidant effects than Vitamin E. The further investigation of the in vitro antioxidant activity of *Hedyotis corymbosa* (L.) Lam was carried out by Sasikumar et al. (2010). In this work, the aerial portions were obtained by extracting the plant materials using methanol as the solvent.[23]

According to Christudas et al(2013) [24]'s study, *H. herbacea* extract is more capable of reducing than butylated hydroxytoluene. More powerful than the hexane and ethyl acetate extracts was the *H. herbacea* methanolic extract. With more samples, the extract's potency rose.[25]

H. herbacea showed a promising antioxidant capability against free radicals, according to a recent study by Das and Bharali (2020). Seven *Hedyotis* species' methanolic extracts were examined for their antioxidant potential as well as their cytotoxic, anti-inflammatory, and antibacterial properties.[26]

CONCLUSION

Only 13 species of the genus *Hedyotis* have yielded more than forty novel compounds up until recently. The goal of this review, the first for the genus, is to demonstrate the extremely biological importance of these substances as well as the many



structural traits shared by members of this genus. These antioxidant qualities, which in turn may be connected to the anti-inflammatory, cytotoxic, and neuroprotective actions, may explain why some of the plants from this genus are used as significant components in Chinese herbal remedies. We have also observed that various phytochemical studies on the methanolic fraction of *K. herbacea* from different parts of the world, such as Korea, China, Taiwan, and Malaysia, have produced the same type of compounds, demonstrating in this case that climatic conditions did not affect the phytochemical components of the plant.

The quercetin derivatives, which have been shown to be superoxide radical scavengers, are among the antioxidative components. The active acylated iridoid glycosides (in the presence of cinnamoyl, coumaroyl, and feruloyl groups) and flavonol glycosides are the neuroprotective components in the genus.

The two most frequent triterpenes identified in *Hedyotis* are ursolic and oleanolic acids, both of which have been shown to have cytotoxic effects. Although bioactivities on the anthraquinones isolated specifically from this genus have not been described, several anthraquinones from the same family have well-established antileukemic, cytotoxic, antiviral, and antibacterial characteristics. *Hedyotis* plants are known to have strong antioxidant components, according to our findings and data from other sources. *Hedyotis herbacea* Willd's chemical make-up and its pharmacological effects were gathered. This plant is known to contain anthraquinones, terpenoids, steroids, flavonoids, organic acids, and polysaccharides. It has been demonstrated that *Hedyotis herbacea* Willd possesses a variety of pharmacologically significant traits, such as anticancer, anti-inflammatory, immunostimulatory, antioxidative, neuroprotective, and hepatoprotective ones. It also possesses cytotoxic, antibacterial, antifungal, and antibacterial properties.

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PUBLIC LEADERSHIP ROLES, PROFESSIONAL IDENTITY, AND QUALITY OF WORK LIFE: A STRUCTURAL EQUATION MODEL ON SATISFACTION OF EMPLOYEES IN THE LOCAL GOVERNMENT

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ABSTRACT

This non-experimental quantitative study established the best-fit structural model for employee satisfaction (ES) with public leadership roles (PLR), professional identity (PI), and quality of work life (QWL) as the exogenous latent variables. The stratified random sampling method selected the four hundred local government employees in Region XI to participate in the survey. Data analysis yielded the following results: The mean statistic showed very high levels of professional identity and employee satisfaction compared to the high levels of public leadership roles and work-life quality. Pearson r revealed a significant and positive relationship between public leadership roles, professional identity, quality of work-life and employee satisfaction. The multiple regression analysis revealed that public leadership roles, professional identity, and quality of work-life significantly influence employee satisfaction by 58.6 percent. The Structural Equation Modeling (SEM) bared that two exogenous latent variables predict employee satisfaction: public leadership roles (indicated by network governance and political leadership) and professional identity (characterized by knowledge and philosophy of the profession, attitude, engagement behavior, and interaction are predictors of employee satisfaction). In addition, employee satisfaction has these indicators: leadership and planning, corporate culture and communication, role in the organization, work environment, training, development and resources, pay and benefits, and overall employment experience. These findings are relevant to Human Resource Management Offices in the public and private sectors, with implications for employment policies, especially for employees' career growth.

KEYWORDS: public administration, local government employees, public leadership roles, professional identity, quality of work-life, employee satisfaction, SEM, Philippines



INTRODUCTION

Employee satisfaction is a real issue in the public sector [1]. In Canada, a survey on the satisfaction of employees revealed the most discouraging results as 74% are dissatisfied with the working conditions, and 60% were dissatisfied with their salaries [2]. Therefore, organizations should give due attention to employee dissatisfaction; otherwise, employees will get demotivated and look for a better work environment.

Satisfaction is the root of all positive work outcomes, such as commitment, loyalty, and increased work productivity. Therefore, employee satisfaction is an essential topic that human resource management should address in all aspects of employment. It is crucial to retain and attract well-qualified workers. Workers who are satisfied at their workplaces are more innovative and help in the continuous quality improvement of their company. They also show positive attitudes in their homes, make a psychologically healthy society, and are happier than dissatisfied ones [3], [4], [5].

Conversely, dissatisfied employees are more likely to quit their jobs than those satisfied employees [6]. Also, sometimes workers quit from their public employment to get employment from the private sector and vice versa. At other times, the movement is from one profession to another, and people tend to migrate to better jobs [7], [8]. Researchers notice that when a productive employee quits, organizations lose productivity and social capital and suffer customer defection [9], [10], [11], [12].

Many researchers have already conducted employee satisfaction studies. However, no study used structural equation modeling using public leadership roles, professional identity, and quality of work life as the exogenous variables, especially concerning the satisfaction of employees in the local government units in Region XI. Therefore, there is a research gap on this topic. So, this study is timely and relevant. Furthermore, this study could provide research-based data for solving the issue of poor employee satisfaction in some organizations.

OBJECTIVES

This study aimed to determine the best-fit structural model for employee satisfaction. In addition, the researcher wanted to investigate whether or not public leadership roles, professional identity, and quality of work life are determinants of employee satisfaction. Moreover, specific objectives guided this study:

1. To describe the level of public leadership roles of local government employees in the local government units of Region XI in accountability, rule-following, political loyalty, and network governance.
2. To assess the level of professional identity of local government employees in terms of knowledge and philosophy of the profession, roles and expertise, attitude, engagement behavior, and interaction.
3. To ascertain the level of quality of work life of LGU employees in Region XI regarding adequate and fair compensation, use of capacities at work, occupied space by the work in life, working conditions, opportunities at work, constitutionalism at work, and social relevance and importance of work.
4. To ascertain the level of employee satisfaction among local government employees in selected cities in Region XI concerning leadership and planning, corporate culture and communication, role in the organization, work environment, relationship with immediate supervisor, training, development, and resources, pay and benefits, and overall employment experience.
5. To determine the relationship between public leadership roles, professional identity, employee satisfaction, quality of work life, and employee satisfaction.
6. To determine the significant influence of public leadership roles, professional identity, and quality of work life on employee satisfaction.
7. To determine which independent variables in this study can best predict employee satisfaction.

HYPOTHESIS

1. There is no significant relationship between public leadership roles and employee satisfaction, professional identity and employee satisfaction, and quality of work-life and employee satisfaction.
2. There is no significant influence of public leadership roles, professional identity, and quality of work life on employee satisfaction.
3. There is no best-fit structural model for employee satisfaction.

METHODS

This quantitative study examined the interrelationships of the variables. It used descriptive statistics, such as the mean and standard deviation, to describe the levels of the variables. Also, it used inferential statistics, like the Pearson r to determine the significance of the relationship between variables and multiple regression analysis to determine the strength and significance of the



predictor variables to the relationship [13], [14]. The study utilized Structural Equation Modeling (SEM) to generate the best-fit model for employee satisfaction. Studies that wanted to build structural models use structural equation modeling [15], [16]. SEM can attribute the relationships of variables between the observed and unobserved constructs and provide valid and meaningful results [17], [18], [19], [20]. Aside from attributing relationships of variables, SEM can also find out the factors that establish the causal relationship between and among dependent and independent variables in varying scale levels using mathematical models and theories [21], [22], [23], [24], [25]. SEM provides consistency in research where the goodness of fit is necessary [26], [27], [28], [29].

Through a stratified random sampling, the researcher recruited 400 regular government employees in the LGUs of Davao, Digos, Mati, Panabo, Samal, and Tagum to participate in the survey. The study included only the regular employees because they were the ones who could give accurate answers to the questionnaire considering their length of service. Moreover, included were only those employees under the office of the local chief executive.

RESULTS AND DISCUSSION

Table 1
Public Leadership Roles of Local Government Employees in Region XI

Indicator	Mean	SD	Descriptive Level
Accountability Leadership	4.40	0.52	Very High
Rule-Following Leadership	4.33	0.52	Very High
Political Loyalty Leadership	4.01	0.58	High
Network Governance Leadership	4.01	0.53	High
Overall	4.19	0.48	High

The data on the public leadership roles of LGU employees in Region XI are in Table 1. Accountability leadership and rule-following leadership got very high mean scores, ($M=4.40$; $SD=0.52$) and ($M=4.33$; $SD=0.52$), respectively. The result denotes that their supervisors knew of their accountability as leaders and followed the organization's rules. However, the high mean scores in political loyalty ($M=4.01$; $SD=0.58$) and network governance leadership ($M=4.01$; $SD=0.53$) indicate that their supervisor encouraged them to be loyal to the political leadership and policies they implement. In addition, although their supervisors gave them the freedom to decide on the issue of loyalty, their supervisor encouraged them to build a network of human connections inside and outside the organization.

Statements under accountability leadership have this gist: the supervisor explains employees' actions, behavior, and way of working with stakeholders. On the other hand, statements regarding rule-following leadership have centered on the importance of obeying laws, rules and regulations, and government policies and procedures. Likewise, statements under political leadership include support for political decisions, good relationships with political heads, implementing political decisions, and defending political choices despite downsides and shortcomings. Finally, supervisors encouraged employees to build contacts outside their organization under network governance.

Meanwhile, the high mean score in public leadership roles suggests that somehow employees shy away from accountability, rule-following leadership, political loyalty leadership, and network governance leadership. Research shows that accountability is essential in all societies and organizations in this world. However, corporate scandals happen because of accountability failures. Business leaders have to be accountable [30], [31].



Table 2
Professional Identity of Local Government Employees in Region XI

Indicator	Mean	SD	Descriptive Level
Knowledge of the Profession	4.64	0.39	Very High
Philosophy of the Profession	4.49	0.43	Very High
Professional Roles & Expertise	4.33	0.49	Very High
Attitude	4.34	0.45	Very High
Engagement Behavior	4.47	0.41	Very High
Interaction	4.64	0.38	Very High
Overall	4.48	0.37	Very High

Table 2 exhibits the very high mean scores of professional identity data of local government employees in Region XI. The overall mean score is 4.48, with a standard deviation of 0.37. The result suggests that the respondents always believed and demonstrated the behavior stipulated in the survey statements. Moreover, the standard deviation scores depict that responses were almost the same in all the statements because the standard scores are small, suggesting that they are not far from the mean.

Professional identity has these statements. Under knowledge of the profession (M=4.64; SD=0.39), it talks about the profession's origins, milestones, ethics, similarities and differences from other professions, and familiarities with the laws and regulations of the profession. The philosophy of the profession (M=4.49; SD=0.43) says that the respondents always believe that public service is a noble profession, fair treatment of clients, giving the public quality service, positive interaction with clients to produce positive results, and respect for clients.

Additionally, the manifest variable, professional roles, and expertise got a very high mean score of 4.33, with a standard deviation of 0.49. The result denotes that respondents strongly value professional roles and that regardless of their role, their goal is always the welfare of their clients. Moreover, under attitude (M=4.34; SD=0.45), the respondents strongly agreed that their profession provides unique and valuable services to society and are optimistic about their profession's advancement and future. They strongly feel that their life revolves around their profession and that their personality and beliefs match their characteristics and values. As for engagement behavior, it got a very high mean score of 4.47 and a standard deviation of 0.41. Interaction also got a very high mean score of 4.64, with a standard deviation of 0.38. The results indicate that respondents have always interacted with others in the workplace.

Moreover, the exceptionally high premium that employees put on professional identity affirmed the findings of other studies. Research shows that professional identity is essential because it can affect the ethics of decision-making [32]. Without knowledge of the profession, philosophy, professional roles, expertise, attitude, engagement behavior, and interaction, employees can go wrong in performing their job or decisions. Professional identity does not mean confinement within the boundaries of the profession without sharing knowledge from the outside. Empirical evidence proves that dismantling professional boundaries and collaborating with other professionals can lead to more innovative ideas and higher success rates [33]. A high-level professional identity can hinder turnover mediated by job satisfaction [34].

Table 3
Quality of Work Life of Local Government Employees

Indicator	Mean	SD	Descriptive Level
Adequate and Fair Compensation	4.54	0.49	Very High
Use of Capacities at Work	4.33	0.54	Very High
Occupied Space by the Work in Life	3.89	0.60	High
Working Conditions	3.89	0.66	High
Opportunities at Work	4.15	0.63	High



Constitutionalism at Work	4.16	0.58	High
Social Relevance and Importance of Work	3.89	0.66	High
Overall	4.12	0.47	High

Table 3 shows the data on the quality of work life of the local government employees. Unlike the first two indicators that got very high mean scores, the quality of work life's overall mean score was high only (M=4.12; SD=0.47). This mean score signifies that the respondents have often been satisfied with the quality of their work life.

However, looking at the individual results, two got very high mean scores of the seven manifest variables for quality of work life. Adequate and fair compensation (M=4.54; SD=0.49) and use of capacities at work (M=4.33; SD=0.54). The results indicate that the respondents have always been satisfied with their salaries, the rewards they received from the company, and the extra benefits the company offers. Moreover, they were delighted with their autonomy at work, tasks, performance feedback, and responsibilities.

On the other hand, five of the seven indicators of quality of work life got high mean scores: occupied space by the work in life (M=3.89; SD=0.60), working conditions (M=3.89; SD=0.66), opportunities at work (M=4.15; SD=0.63), constitutionalism at work (M=4.16; SD=0.58), and social relevance and importance of work (M=3.89; SD=0.66).

As for the quality of work-life, the result was high only. The result signifies that the employees long for adequate and fair compensation, use of capacities at work, occupied space by the work in life, working conditions, opportunities at work, constitutionalism at work, and social relevance and importance of work. Research shows that the work environment impacts the quality of work-life and job satisfaction [35], [36].

Table 4
Satisfaction of Local Government Employees

Indicator	Mean	SD	Descriptive Level
Leadership and Planning	4.55	0.49	Very High
Corporate Culture and Communication	4.65	0.46	Very High
Role in the Organization	4.47	0.48	Very High
Work Environment	4.48	0.51	Very High
Relationship with Immediate Supervisor	3.92	0.65	High
Training, Development, and Resources	4.50	0.50	Very High
Pay and Benefits	4.45	0.50	Very High
Overall Employment Experience	4.52	0.46	Very High
Overall	4.44	0.40	Very High

Table 4 presents the data on the satisfaction of local government employees. Again, the overall result was very high at M=4.44, with a standard deviation of 0.40. The standard score indicates that the responses were almost identical, so the data is around the mean. Only one of the eight satisfaction indicators got a high mean score of 3.92, with a standard deviation of 0.65. This result denotes that the respondents were not very satisfied with their relationship with their immediate supervisor.

However, for the rest of the indicators, they rated them very highly, which means that they are delighted with the leadership and planning (M=4.55; SD=0.49), corporate culture and communication (M=4.65; SD=0.46), role in the organization (M=4.47; SD=0.48), work environment (M=4.48; SD=0.51), training, development, and resources (M=4.50; SD=0.50), pay and benefits (M=4.45; SD=0.50), and overall employment experience (M=4.52; SD=0.46).

Employee satisfaction is crucial because it increases productivity, responsiveness, and service quality [37]. For decades researchers have investigated the factors that could predict employee satisfaction, suggesting the importance of the subject matter in the organization's sustainability. Moreover, employee satisfaction comes with job involvement as it increases the quality and quantity of work results [38]. Thus, employees must get the chance to participate in decision-making, task interdependence, and get workgroup support to result in satisfaction. Satisfied employees become loyal to the organization and abandon their plans to leave it [39], [40].



Table 5
Relationship between the Exogenous Latent and Endogenous Latent Variables

Exogenous Variables	Endogenous Variable (Employee Satisfaction)								Overall
	LAP	CCC	RIO	WET	RIS	TRD	PAB	OEE	
Leadership	.505**	.477**	.514**	.484**	.452**	.485**	.492**	.409**	.605**
Roles	.000	.000	.000	.000	.000	.000	.000	.000	.000
Professional Identity	.618**	.583**	.561**	.534**	.447**	.632**	.603**	.572**	.716**
Quality of Work Life	.468**	.436**	.474**	.476**	.433**	.395**	.454**	.426**	.565**
	.000	.000	.000	.000	.000	.000	.000	.000	.000

Legend: LAP – Leadership and planning

RIS – Relationship with immediate supervisor

CCC – Corporate culture and communication

TRD – Training, development, and resources

RIO – Role in the organization

PAB – Pay and benefits

WET – Work environment

OEE – Overall employment experience

Table 5 displays the result of the correlation test between the exogenous and endogenous latent variables. The data in Table 5 show the significant correlation between all three exogenous variables with employee satisfaction. The data show that all exogenous variables, namely, leadership roles, professional identity, and quality of work life, correlate significantly with employee satisfaction. Professional identity and employee satisfaction have a correlation coefficient of .716 at p-value .000. This means that the increase in professional identity thru its manifest variables, namely, knowledge of the profession, philosophy of the profession, professional roles of expertise, attitude, engagement behavior, and interaction would also increase employee satisfaction. Similarly, the increase in leadership roles would also increase employee satisfaction, as indicated by its correlation coefficient of .605, with a p-value of .000. The same is true for the quality of work life. The correlation coefficient between the quality of work life and employee satisfaction ($r=.565$; $p\text{-value}=.000$) suggests that employee satisfaction also tends to increase as the quality of work life increases.

Public leadership roles and employee satisfaction are significantly correlated, just as professional identity and employee satisfaction. Similarly, the quality of work-life and employee satisfaction are correlated. For example, Tummers and Knies (2016)[41] found accountability leadership, rule-following leadership, political loyalty leadership, and network governance leadership as the four scales of public leadership roles. In addition, leadership styles contribute to employees' satisfaction, which is congruent with leadership roles [42].

Furthermore, professional identity can enhance job satisfaction and work engagement. With job satisfaction, employees forget about turnover [43], [44], [45]. Even in the medical field, professional identity strongly correlates with job satisfaction, even with a commitment to the organization [46], [47].

Moreover, the quality of work-life is one crucial factor of job satisfaction [48]. Asharini, Hardyastuti, and Irham (2018)[49] also affirmed the role of work-life quality in attaining job satisfaction. These two would also result in better job performance. That is because employees experiencing the quality of work-life become motivated to work and perform better [50]. In any field of employment, quality of work-life is a function of job satisfaction and job performance, even for organizational commitment [51], [52], [53], [54].

Table 6
Influence of Leadership Roles, Professional Identity, and Quality of Work Life on the Employee Satisfaction among Local Government Employees

Exogenous Variables	Endogenous Variable (Professionalism)			
	B	β	t	Sig.
Constant	.686		4.272	.000
Leadership Roles	.150	.180	4.007	.000
Professional Identity	.543	.508	12.296	.000
Quality of Work Life	.169	.202	4.851	.000
	R	.766		
	R ²	.586		
	ΔR	.583		
	F	187.217		
	ρ	.000		



Table 6 presents the influence of leadership roles, professional identity, and quality of work life on employee satisfaction. The data in the table suggests that the combined influence of the exogenous latent variables is 58.3 percent ($\Delta R = .583$). The adjusted R-square becomes necessary because the model has three independent variables for a more detailed correlation view. The presence of more variables in the model adjusts the value of the r-squared. Notably, the adjusted R2 (ΔR) is always lesser or equal to the value of the R2.

Moreover, the coefficient of determination (R^2) suggests that each independent variable can explain the variation in employee satisfaction by 58.6 percent ($R^2 = .586$). R-squared helps analyze data with slight or no bias, usually with a single independent and dependent variable. The coefficient of correlation ($R = .766$) affirms the solid linear relationship of the independent variables with employee satisfaction.

Essentially, the F-value of 187.217, with a p-value of .000, ensures the predictive capability of the exogenous latent variables (leadership roles, professional identity, and quality of work life) in influencing the satisfaction of the local government employees. Furthermore, the F and p-values also reject the null hypothesis of no significant influence of leadership roles, professional identity, and quality of work life on employee satisfaction. Simply put, the value of F (187.217), which is significant at $p < 0.5$, reveals the capacity of leadership roles, professional identity, and quality of work life to influence employee satisfaction.

Public leadership roles, like accountability, influence employee satisfaction [55]. Although, accountability pressures can diminish employee morale because it undermines the goals of improving performance and equity in the workplace [56]. Schwarz, Eva, & Newman (2020)[57] declared that accountability, rule-following, political loyalty, and network governance leadership could significantly influence public service motivation, job satisfaction, and job performance, suggesting that managers encourage public employees to initiate access to relevant information technical expertise, and resources not available within the organization.

Congruently, professional identity influences employee satisfaction and enhances job performance [43],[13], [45]. Also, the quality of work-life influences job satisfaction [49], [35]. Sari et al. (2019)[50] claimed that employees experiencing a quality work-life become motivated to do their tasks. Expectedly, adequate, and fair compensation can influence employee satisfaction [58], [59]. Jabeen, Friesen, and Ghoudi (2018)[60] found that the quality of work-life such as adequate and fair compensation, use of capacities at work, occupied space by the work in life, working conditions, opportunities at work, constitutionalism at work, and social relevance and importance of work have a positive influence on employee job satisfaction and a negative effect on turnover. In other words, having a quality work-life will abandon the plans of leaving the job for another because employees find security, growth, and development in their work.

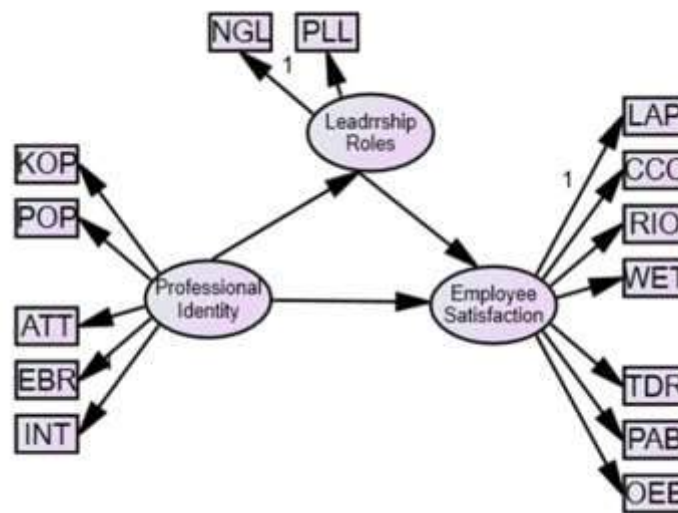


Figure 1. The Best-Fit Structural Model for Employee Satisfaction

**Legend:***ALP – accountability leadership**RFL – rule-following leadership**PLL – political loyalty leadership**NGL – network governance leadership**KOP – knowledge of the profession**POP – philosophy of the profession**PRE – professional roles and expertise**AAT - attitude**EBR – engagement behavior**INT – interaction**LAP – leadership and planning**CCC – corporate culture and communication**RIO – role in the organization**WET – work environment**TDR – training, development and resources**PAB – pay and benefits**OEE – overall employment experience***Table 7**
Values obtained for the Best-Fit Model

INDEX	CRITERION	MODEL FIT VALUE
Probability Value (P-value)	> 0.05	.115
Chi-Square/Degrees of Freedom (CMIN/DF)	0 < value < 2	1,245
Goodness of Fit Index (GFI)	> 0.95	.978
Comparative Fit Index (CFI)	> 0.95	.998
Normed Fit Index (NFI)	> 0.95	.988
Tucker-Lewis Index (TLI)	> 0.95	.995
Root Mean Square of Error Approximation (RMSEA)	< 0.05	.025
P of Close Fit (P-Close)	> 0.05	.992

Figure 1 displays the best-fit model for employee satisfaction, having met all the goodness of fit criteria presented in Table 8. The model displayed in Figure 3 shows only public leadership roles and professional identity as predictors of employee satisfaction. SEM analysis discarded the quality-of-life variable from the equation. The model's manifest variables of public leadership roles are political loyalty leadership (PLL) and network governance leadership (NGL). In contrast, the manifest variables for professional identity are knowledge of the profession (KOP), philosophy of the profession (POP), attitude (ATT), engagement behavior (EBR), and interaction (INT). These two exogenous variables with their manifest variables could only predict employee satisfaction with these indicators: leadership and planning (LAP), corporate culture and communication (CCC), role in the organization ((RIO), work environment (WET), training, development, and resources (TDR), pay and benefits (PAB), and overall employment experience (OEE).

CONCLUSION

LGU employees have very high levels of professional identity and employee satisfaction, while their public leadership roles and quality of work-life levels are high. Public leadership roles, professional identity, and quality of work life have positive, strong, and significant relationships with employee satisfaction. Also, the combined rate of influence of public leadership roles, professional identity, and quality of work-life on employee satisfaction is 58.3%. Public leadership roles (indicated by NGL & PLL) and professional identity (indicated by KOP, POP, ATT, EBR, & INT) are predictors of employee satisfaction.

The findings suggest that there should be regular monitoring of employees to check whether they are functioning according to their roles. In addition, the HRMO may need to revisit employees' job descriptions for proper alignment. Moreover, regular updating of employees' dossiers is vital so that even if employees do not apply for ranking and reclassification, the HRMO can determine whether an employee needs reranking and reclassification to enjoy the benefits. This process can motivate employees to work harder and happier. Additionally, organizations must give all employees equal opportunities to grow and become motivated to serve the public. They can do this through seminars and training, benchmarking, and scholarship grants for advanced studies. Moreover, other researchers can replicate this study in other regions to test the consistency of this study's employee satisfaction model.

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STUDY THE PHYSIO-CHEMICAL PROPERTIES OF CLAY SOIL OF KANDORA VILLAGE OF JASHPUR DISTRICT, SURGUJA DIVISION OF CHHATTISGARH, INDIA

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ABSTRACT

Soil is one of the major foundations of life on Earth, Serving as a reservoir of water and nutrients, as a medium for filtering and breaking down harmful wastes, and as a means of transporting carbon and other elements through the global ecosystem. It is necessary for us to know the properties of soil. We will study the Physo-chemical properties of clay soil in our research, the black soil on which we are doing research is found in Kandora village, Kunkuri clay of Jashpur district of Chhattisgarh. We will study the Physio-chemical properties of this soil in our research, which element is found in it, what is its physical properties. During this we will study the physical properties like that Conductivity, pH-value, percentage of Carbon etc. We will study the chemical properties like presence and quantity of Fe, Cu, Zn, Ca, Mg, S, N etc. And try to reach some conclusion.

KEYWORDS: Clay soil, Conductivity, Resistive, pH-value, Physical properties, Chemical properties etc.

INTRODUCTION

Research Area Kandora Village, where we will study the physico-chemical properties of the clay soil found, this place is located at a distance of 6 km from Kunkuri block of Jashpur district. This clay is used for making status and toys. Rice and maize crops are good in this soil. Research area Kandora village is 120 Km away from Ambikapur, the headquarter of Surguja division and the distance of this place is 447 Km from Raipur, the capital of Chhattisgarh. and geographical location position of the this research area is at 22°46'21.623"N latitude and 84°0'25.761"E longitude and no research has been done here.





Electrical Conductivity

Soil electrical conductivity, referred to as EC, is the ability of soil to conduct (transmit) or attenuate electrical current. EC is expressed in milliSiemens per meter (mS/m) or at times is reported in deci-Siemens per meter (dS/m). Over the years, soil scientists have used EC to measure soil salinity. However, soil EC measurements also have the potential for estimating variations in soil physical properties where soil salinity is not a problem, including texture, moisture, depth of top soil plus others. The important aspect to remember is that anything that affects conductivity in the soil will influence measurements, so it is important to ground reference to understand the driving variable(s) for soil EC measurements[1],[2].

pH-Value

Soil pH is a measure of the acidity or alkalinity of the soil. A pH value is a measure of hydrogen ion concentration. Because hydrogen ion concentration varies over a wide range, a logarithmic scale (pH) is used: for a pH decrease of 1, the acidity increases by a factor of 10. It is a 'reverse' scale in that very acid soil has a low pH and a high hydrogen ion concentration. Therefore, at high (alkaline) pH values, the hydrogen ion concentration is low. Most soils have pH values between 3.5 and 10. In higher rainfall areas the natural pH of soils typically ranges from 5 to 7, while in drier areas the range is 6.5 to 9. Soils can be classified according to their pH value. 6.5 to 7.5—neutral, over 7.5—alkaline, less than 6.5—acidic, and soils with pH less than 5.5 are considered strongly acidic[3]

LITERATURE REVIEW

According to EDELBERT VEES and HANS F. WINTERKORN, "Engineering Properties of Several Pure Clays as Functions of Mineral rftype, Exchange Ions and Phase Composition" concluded that The different exchange ions favor the formation of different types of structures but the extent to which these are actually formed and influence engineering properties depends on the type of clay mineral and even more on the history and the treatment of the particular sample. This is comparable to the role played by carbon in steel. The primary effect of a particular exchange ion on an individual clay crystallite is a modification of its interaction with water and determines the effective size and properties of the clay micelle. Among the properties affected is the elasticity or springiness of the crystallities, which is especially important if they are fibrous or needle-shaped. This effect may counteract or even exceed that on the size and turgidity of the micelle[4].

In 2015, the research paper of SS Kekane, RP Chavan, DN Shinde, CL Patil, SS Sagar "A review on physico-chemical properties of soil" it is concluded that study of soil quality can be carried out by different parameters. Most of the parameters are quite higher or lower than acceptable limits. Therefore, it is very important to put a total ban on the human activities which are responsible for soil quality deterioration[5].

In 2015, the research paper of V.K. PHOGAT, V.S. TOMAR AND RITA DAHIYA "Soil Physical Properties" concluded that Physical properties have significant influence on the behaviour of soil for agricultural and engineering uses. Soil texture and structure determine the total porosity and the size distribution of pores which influence water, heat and air relationships in the soil. Soil texture is a static property but structure may be manipulated through management practices. It is essential to carry out the tillage operations at optimum soil moisture to avoid deterioration in soil structure. Management of physical, chemical and biological factors can help in maintaining proper soil physical conditions for plant growth. Soil aeration and soil temperature affect the quality of soils for plants and other organisms. Soil water has a major influence on both soil aeration and temperature. It competes with soil air and moderates soil temperature. Soil consistency, plasticity, compaction, strength etc., help in determining the stability of soil against loading forces from traffic, tillage or building foundations. Looking at the current stress on soil as a natural resource for food security and safety, due emphasis is needed for maintaining soil physical fertility by adding organic materials, introduction of legumes in rotation, adoption of conservation tillage, etc.[6]

In 2017, the research paper of Prof. A. Balasubramanian Centre for Advanced Studies in Earth Science, University of Mysore, Physical Properties of Soils concluded that Soils contain a lot of mineral and organic constituents. Soil types are described according to these main constituents. A soil with a lot of sand is called as a sandy soil; soil with a lot of clay is called as a clay soil; and soil with a lot of organic material is called as an organic soil. Along with soil structure, the texture of soil is also important to determine the water-holding capacity, water movement, and the amount and movement of soil air in a given soil. All of these physical properties are very important to the health and type of plants and other organisms that can exist in a particular soil. The physical properties of soils is a major aspect of study in soil science, civil engineering and agricultural engineering.[7]



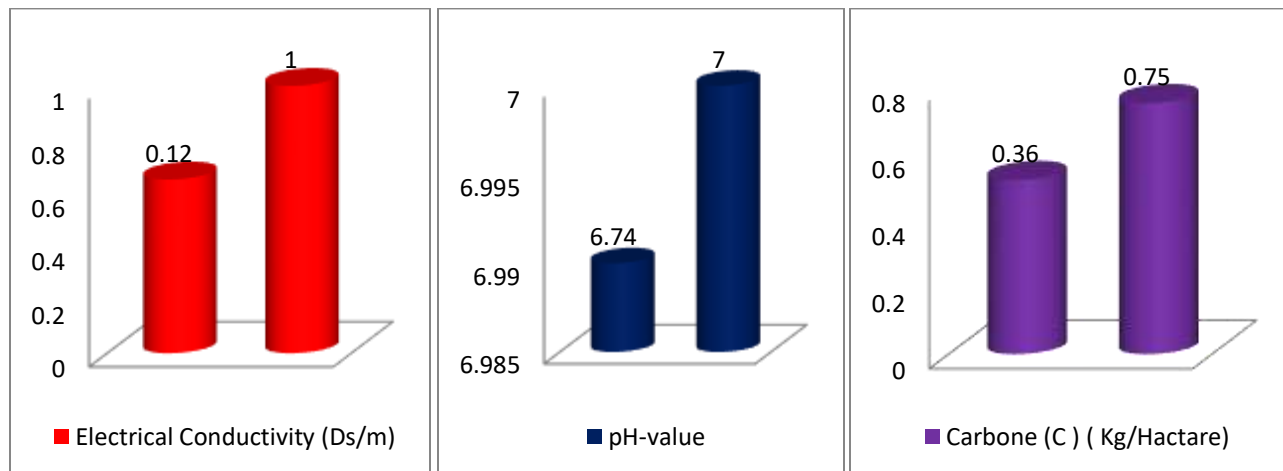
MATERIAL & METHODS

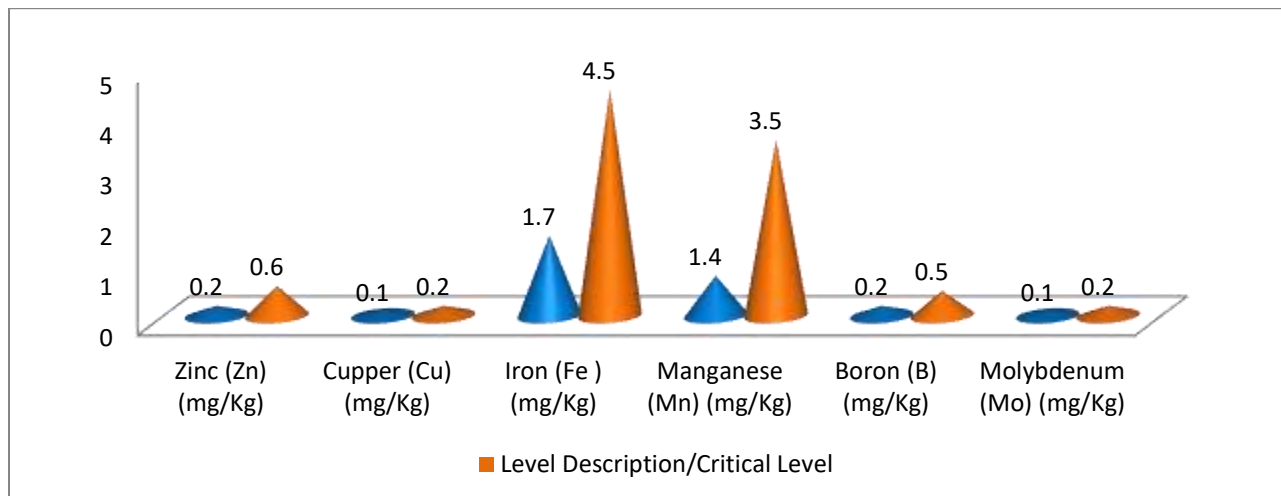
We have used experimental Method in our Research as Methodology. During this time we took a Clay soil sample 6 cm deep in the research found in the Kandora village, Block Kunkuri, district Jashpur. Determined the presence and quantity of Physio-Chemical properties such as Fe, Cu, Zn, Ca, Mg, S, N conductivity, pH-alue, etc. of the sample taken which are as follows-

Sl.No.	Physio-chemical properties	Unit	Value in salt Soil	Level Description/Critical Level
01	Electrical Conductivity	Ds/m	0.12	Less than 1.0-Normal
02	pH-value	pH-Scale	6.74	Neutral 7
03	Carbone (C)	Kg/Hactare	0.36	Less than 0.50- Lower
04	Zinc (Zn)	mg/Kg	0.2	0.6
05	Cupper (Cu)	mg/Kg	0.1	0.2
06	Iron (Fe)	mg/Kg	1.7	4.5
07	Manganese (Mn)	mg/Kg	1.4	3.5
08	Boron (B)	mg/Kg	0.2	0.5
09	Molybdenum (Mo)	mg/Kg	0.1	0.2

RESULT & DISCUSSION

The conductivity of the Hair wash soil found in the Kardana village is much lower than normal only 22% of critical level of conductivity, so this soil will not be a saline soil. Obtained a pH-value of 6.37 which means that the Hair wash soil found in it is neutral. The amount of organic carbon was obtained in range of the lower value 0.50.





The chemical properties of Hair wash soil found in the Kandora village were tested when Zn content was found to be 50% less than the critical level, Cu was obtained only by 50% compared to the critical level, Iron was obtained only 37.7% compared to the critical level. Happened, Similarly Mn, B, and Mo obtained only 22.8%, 40% and 50% as compared to critical level. The amount of all these chemical elements is very less.

CONCLUSION

The nature of the Clay soil found in the Kandora village, district Jashpur is not saline as well as neutral. The amount of iron and magnesium in the clay soil here is very less. Copper and molybdenum are likely to be found in Hair wash soil.

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COMPOSITION OF PEST SPECIES MET IN LICORICE (GLYCYRRHIZA GLABRA) IN THE CONDITION OF KARAKALPAKSTAN, BIOECOLOGICAL DEVELOPMENT CHARACTERISTICS

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ANNOTATION

*The article presents data on the species composition and bioecological characteristics of the main pests of licorice (*Glycyrrhiza glabra*-L.). As a result of our research, in the case of Karakalpakstan, three of the licorice (*Glycyrrhiza glabra*) first-level pests were found in the plantations of 24 species. These are the main pests of makeup and cause considerable damage to the makeup.*

KEY WORDS: *insects, phytophages, entomophages, acariphages, ticks, agroecosystem, insect fauna, sucking pests.*

INTRODUCTION

The high level of development of the economy of the Republic of Uzbekistan depends in many ways on the protection, reproduction and rational use of natural resources, including plants, without disturbing its historically established balance, relying on scientifically based indicators.

There are more than 4,500 types of plants in the territory of our republic, of which the licorice plant is the most important among the raw and medicinal plants for industry (750 species) and has a wide range of uses.

Therefore, decisions of the President on 2017.05.16. No. 2970 [11], as well as UzRCM No. 63 on 2018. 05. 16. [12] and 2019. 02. 15. No. 138 [13] were adopted.

Also, other decisions of the President and UzRCM related to this field, especially the President's decision PQ-4670 of April 10, 2020, and the establishment of the Scientific Production Center for the Cultivation and Processing of Medicinal Plants by the decision of November 26, are very relevant for this field.

Decree of the President of the Republic of Uzbekistan "On increasing the cultivation and industrial processing of licorice in the Republic of Uzbekistan" (№PP-2970 May 16, 2017) [11], "Measures for the further development of licorice and other medicinal plants in the Republic of Uzbekistan and industrial processing" on measures" (No. 63 January 27, 2018) [12], on additional measures of the Cabinet of Ministers of the Republic of Uzbekistan "On effective organization of cultivation and industrial processing of Kyzilmia and other medicinal plants" (No. 138 January 15, 2019 -February) [13] decisions were made. These documents define the tasks for the development of the cultivation of sweet products in our country.

Licorice (*Glycyrrhiza glabra*-L.) is a perennial herb belonging to the Fabaceae family.

The distribution area of Licorice is very wide, it is spread in the European part of the former union, Crimea, Caucasus, Siberia, Asia Minor, Iran, Afghanistan, North Africa.

Since the 1960s, scientists of Uzbekistan [1, 2, 3, 4, 5, 6, 7, 8, 9, 10] have begun to comprehensively study the licorice plant.

The product obtained from this plant is widely used in medicine, food, cosmetics, light industry and agriculture.

The growing demand for it is causing the reduction of existing natural areas.



METHODS OF THE RESEARCH

Our research was conducted in licorice plantations of Nukus district, Republic of Karakalpakstan in 2020-2022. General entomological methods were used in the research process. As a result of the conducted research, it was found that licorice (*Glycyrrhiza glabra*) is a habitat for the following pests during the period of growth and development.

Pests of generative organs of licorice. Licorice seed pests are divided into 2. The first specialized pests are seed-eating bruchophagus (*Bruchophagus mutabilis* Nik.), grain-eater (*Bruchidius glycyrrhizae* Fohr., *B.tuberculicauda* Luk.et T.-M., tychius long-nosed - *Tychius rufirostris* Gyll.(*T.glycyrrhiza* Beck.)). The second is omnivorous - alfalfa beetle - *Adelphocoris lineolatus* Goeze, *A. seticornis* F., *Carpocoris fuscispinus* Boh., *Dolycoris penicilatus* Horv., *Cellobius abdominalis* Jak., *Aphis craccivora*., *Oxytrea cinctella* Schaum.

Seed pests. The seed-eating bruchophagus (*Bruchophagus mutabilis* Nik.) is one of the serious pests. It causes up to 30% damage to licorice seeds. The seed-eater overwinters in the larval stage inside the seed scattered in the fields. In nature, it leaves the village at the end of March, beginning of April. When the average temperature of the air is 9-12°C, the larvae turn into cocoons. In the first decade of May, their imagos fly. The emergence of imagos coincides with the period of mass flowering of sweet. From the moment they fly, they feed on flower nectar and juicy waste from the leaves

Females of the first generation lay their eggs in the pods of licorice during the milk ripening phase.

At the beginning of June, the wintering generation dies, and in the second quarter, the second generation flies. The launch of this generation will last until the end of August.

The incubation period of eggs is 5-6 days, larvae - 8-10, and pupae develop in 6-7 days. The interval from egg to imago phase lasts 19-23 days.

The clutch of the seed-eater reaches 25-30 eggs.

Larvae feed on seeds. Only the surface of the seed is healthy, and the inside is covered. During the feeding period, the larva does not move from one seed to another. In order to fly out, the mature insect gnaws and punctures the seed.

This bruchophagous seed-eating pest also has natural traps that reduce the number of pests by free feeding during the larval stage. Eater is active from mid-May to the end of July.

Grain eater (*Bruchidius glycyrrhizae* Fohr., *B.tuberculicauda* Luk.et T.-M.) is one of the dangerous pests of licorice seeds. Larvae of different ages overwinter in the seed. The appearance of corns in sweet fields, that is, their emergence from the winter, is observed at the beginning of April when the air temperature is 8-10°C and lasts until the middle of May. Egg laying, hatching of larvae, turning into a pupae, emergence of the next generation are different. 50-65% of females were ready to lay eggs two days after mating. 80% of females of the second generation reach sexual maturity immediately after emergence. Overwintering females have 2 times more than males. Males and females of the first generation are equal in number. In August and September, male individuals reach 65-70%. Fertility reaches 25-30 eggs.

All stages of development of grain eaters take place inside the grain. It takes 3-5 days from egg laying until it turns into a larva of the first age (air temperature 23-25°C). It takes 8-12 days for the second instar larva to develop. It takes 4-5 days for the pupae to develop. The development of the grain eater from the egg to the imago takes 17-22 days.

In the first decade of June, the mass emergence of second-generation grain eaters is observed. The flight of the second generation of grain eaters will continue until August. 160,000 grain eater larvae were counted in 1 kg of licorice seeds collected at the end of September.

The larval stage is the most damaging stage of the grain eaters. During the growth period of licorice, the development of larvae takes place in only one seed. Larvae can move from one seed to another during the seed storage period in warehouses during the winter months when the temperature is optimal. Grains harvested from the field are less damaged than grains in warehouses.

There are also natural clutches of larval grain eaters. Larvae of the corn begin to attack during the period of mass emergence. The larvae overwinter in the imago state inside the licorice seeds. The efficiency of destroying the larvae of the cornworm reaches 5-12%.

***Tychius longnose* (*Tychius rufirostris* Gyll.(*T.glycyrrhiza* Beck.))** – damages licorice in the larval and beetle stages. The larvae damage the seeds, imago pods and flowers.

In the conditions of Karakalpakstan, *Tychius longnose* gives one generation. The beetle hibernates in soil at a depth of 20-25 cm.

The first appearance of the beetle is observed at the end of April, beginning of May during the licorice blossoming period. Beetles feed on chaff. After the appearance of pods, females lay 1-3 eggs on them. Larvae appear in the first decade of June. It takes 10-12 days from the egg stage of *Tychius* to adulthood.

Tychius larva destroys 2-3 seeds in pod during its development period. The larvae gnaw the pods and pupate in the soil. The incubation period lasts 5-7 days. After turning into a beetle, it stays in this place until next spring.



Damaged pods are slightly swollen and blackened.

During the period of ripening of the seeds, several species of beetles: *Carpocoris fuscispinus* Boh., *Dolycoris penicillatus* Horv., *Cellobius abdominalis* Jacques. attacks. Of these, *Cellobius abdominalis* Jacques. Is common. Imago causes damage during larval stages. Beetles suck bean juice. As a result, the pods fall off. The death of pods reaches 62%.

Flower pests. Flower pests include *Adelphocoris lineolatus* Goeze., *A. seticornis* F., *Aphis craccivora* Koch., *Mylabris* F., *Oxythya cinctella* Shaum.

Alfalfa aphid (*Aphis craccivora* Koch.) is one of the most dangerous pests of licorice. Appears in early April. Colonies are collected on stems and petals. The plant is damaged up to 60-75%. The development of generative organs is delayed in heavily infected licorice. The petals and flowers fall off.

Alfalfa beetle (*Adelphocoris lineolatus* Goeze.) - is collected in licorice in the middle of May, during the period of mass flowering of the plant. During this period, 10-12 grains were counted in one bush. Aphids and larvae accumulate in the flowers, causing them to fall.

Coleoptera family. **Licorice blue leaf-eating beetle** (*Haltica deserticola* Ws) - licorice suffers significant damage under natural conditions. Licorice is the main food plant of the blue leaf beetle. It is a monophagous insect.

The licorice blue leaf-eating beetle overwinters in the licorice field, as well as between leaf litters, up to 40-60 individuals during the beetle period. The beetle leaves the winter at the end of March, the beginning of April, when the sweet berries are just beginning to turn green. During this period, the air temperature is 13-17°C, air humidity is 52-58%. In cool, wet weather, the beetles gather in the soil, on the roots of the licorice.

In licorice, the beetles that have come out of hibernation come out until the end of April. Weeds are collected from 6-7 to 11-12 pieces in 1 plant. In the first decade of May, the death of wintering populations is observed, first of all, male individuals die. Beetles of the new generation differ from wintering beetles by their external color. The new generation of beetles reproduce mass at the end of June. Without mating, the beetles go into diapause in July. At the end of August, the beetles come out of diapause to mate and lay eggs. The majority of the population remains in the wintering.

Nutrition. When licorice begins to turn green, beetles damage growth points, young leaves. It gnaws holes in the leaves. Infected leaves soon wither. In the summer months, feeding is in the morning and in the evening. At noon, beetles hide under leaves to avoid heat. In the spring and autumn, they eat during the lunch hours of the day. In the spring, affected branches reach 80%, the damage is severe. After emerging from diapause in the fall, the beetles feed on 2nd or 3rd year nectaries and cause no significant damage. Worms severely damage only 1st-year licorice.

Manipulation. Mating of individuals leaving the wintering takes place immediately at the end of March, beginning of April. Mass mating takes place in the 2nd and 3rd decades of April. Females re-mating during egg maturation. At the end of July, beginning of August, the first generations of beetles that went into diapause mate and soon begin to lay eggs. A small number of second-generation beetles go to the village without mating. Beetles of the first and second generation also overwinter. This indicates a public appearance in the spring of next year. It is proved by the predominance of female individuals in the life of beetles. And the male will die.

Mating of female individuals with mature ovaries begins in the last days of March and lasts until the first decade of April. The number of eggs ranges from 14 to 27.

It takes 10-15 hours from mating to egg laying. Egg laying lasts from the first decade of April to the end of May.

Beetles of the first generation lay eggs in August-September. The beetles lay their eggs on the back of the licorice leaf. They group their eggs from 6-11 to 27-30 pieces, 2 or 3 rows and stick them together. It lays up to 80 eggs per day. Pinkness depends on the age of the female. One female has been observed to lay up to 550 eggs. Egg-laying in nature lasts up to 1 month for the first generation, and only a few days for the second generation. This shows that the life of beetles is short. The egg is oval in shape. The size of the egg is 1.24 mm. Newly laid eggs are orange in color. The color of the egg becomes pale as it approaches hatching. Eggs develop in 6-8 days at a temperature of 21-27°C. Hatched larvae remain here until the first stage. The 2nd-year larvae crawl to the upper leaves.

In autumn, the number of larvae per plant and the number of infected plants decrease. The reason is that the population of the 2nd generation will be less.

Larvae of the second generation appear in the second decade of August. The larval period lasts 25-30 days. The larvae of the last age fall to the underside of the leaf, settle in the soil, and turn into a fungus. The transformation of first-generation larvae into pupae occurs in May-June. The transformation of the larvae of the second generation into a mushroom occurs in September.

The pupae stage lasts 2-3 days in summer, and 7-10 days in autumn.

In nature, these insects are also natural predators, attacking them in the larval and imago stages.

In conclusion, *Haltica deserticola* Ws. develops by giving two generations. Monophagous - eats only licorice. It hibernates in the beetle or imago phase in licorice soil. Leaving the village takes place at the end of March, beginning of April, when the sweet cherry is already blooming. It causes damage during the larval and beetle stages. The female lays an average of 72-94 eggs.



It lays its eggs on the underside of the leaf. Eggs develop in 6-8 days, larvae in 25-30 days, pupae in 2-3 days. Its natural enemy, *Zicrona coerulea* L., produces two generations per season.

The flowers of licorice are greatly damaged by bronzovka and narivniki.

Golden bronze (Cetonia aurata) - occurs from the end of May to August.

Marble bronze (Potosia lugubris) - can be found on the flowers. Worms are found in rotten wood. A pest is an insect.

Family of rattlesnakes (Elateridae).

Wireworm (Agriotes meticulosus Cond.) - causes great damage. Worms gnaw the roots and stems, and the affected plants wither. If the damage is 2 pieces per m² of land, it is considered low, 3-5 pieces is average, and more than 5 pieces is considered strong.

Meloidae family. Red-headed sparrow (Epicauta erythrocephala Gebl.) – beetles damage. There are 40-58 pieces in one bush.

Curculionidae family.

Green licorice longnose (Megamecus viridanus Men.) – beetles damage licorice leaves and branches. Up to 25-50 beetles were counted in one bush.

We studied that the pests of licorice are those that cause damage to the vegetative (leaf, stem, root) and generative (stem, flower, seed) organs of the plant. The second of the weeds, i.e., those that damage the generative (stem, flower, seed) organs, are considered more harmful.

The accumulation of pests in licorice is also related to the age of the plant. In our research, 1-year-old licorices are less affected than older 3- or 4-year-old licorices.

Carpocoris coreanus iranus Tam. beetle appears in large numbers during the flowering and fruiting period of licorice. It appeared in May and sucked the juice of young leaves, stems and buds. At the end of May, she lays her eggs in 2 rows. Eggs are white at first, then turn brown. Pods are damaged up to 62%.

Porphyrophora odorata Arch. cutworm is a dangerous pest of licorice root. Mass accumulates at the root and causes the death of the plant. The development of licorice is delayed by 9-12 days, the death of plants in the flowering phase reaches 7-12%. Larvae feed on licorice root juice. Spread 10-12 cm deep in the soil. It becomes more active when it warms up to 16-22 degrees.

The giant red worm (*Drosicha turkestanica* Ar.) is the main pest of licorice root, causing damage by sucking root juice. Sometimes it also damages the stem. Larvae and mature females are harmful. It leaves one generation per year. It lays 220 eggs in the upper part of the soil, in the root joint from the beginning of August to the middle of October. The larvae hibernate in soil at a depth of 5-30 cm.

In order to control pests, it is necessary to pay attention to the seed-eating and grain-eating pests that winter inside the seed. Because, the worms cause the seeds of licorice to fail to grow when planted.

Seeds should be stored in dense bags. It is necessary to collect seeds on time.

CONCLUSION

As a result of our research, in the case of Karakalpakstan, three of the licorice (*Glycyrrhiza glabra*) first-level pests were found in the plantations of 24 species.

Psylla glycyrrhizae, *Haltica deserticola*, *Chaetocnema heikertingeri*, *Chiorophanus caudatus*, *Bruchophagus mutabilis* Nik., *Bruchidius glycyrrhizae* Fohr. (*B.tuberculicauda* Luk.et T.-M.), *Tychius rufirostris* Gyll.(*T.glycyrrhiza* Beck.), *Adelphocoris lineolatus* Goeze, *A.seticornis* F., *Coriomerus vitticolis* Reut., *Bathysolen nubilis* Fall., *Aelia acuminata* L., *Carpocoris fuscispinus* Boh., *Carpocoris coreanus iranus* Tam., *Porphyrophora odorata* Arch., *Dolycoris penicilatus* Horv., *Cellobius abdominalis* Jak., *Aphis craccivora.*, *Oxytyrea cinctella* Schaum., *Mylabris* F., *Zygaena truchmaena* Ev., *Drosicha turkestanica* Ar., *Megamecus viridanus* Men., *Epicauta erythrocephala* Gebl.

These are the main pests of licorice and cause considerable damage to the licorice.

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TRANSFORMATION OF RURAL MARKET WITH THE AID OF DIGITAL MARKETING

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ABSTRACT

India's economic growth is phenomenal over the past few years. The rural market has been rapidly expanding and is currently larger than the urban market because urban markets have reached saturation and the relative development slowed down in recent years. In India, roughly 70% of the population belongs from rural region, so it is crucial to recognize the value of marketing and advertising in rural areas. The majority of businesses and marketers have started concentrating on rural marketplaces. As the market expands, it is an imperative need to modernize, broaden and reinvent the marketing tools, channels and tactics. There are significant challenges with conducting business in rural markets and marketers are attempting to overcome these challenges by focusing more on Digital Marketing so it is becoming one of the key elements to influence the marketing strategies now-a-days. Nearly, each and every sector of India is affected by Digital Marketing platforms as it enables for the more efficient and effective reach of potential target groups. Social media marketing, Content marketing, Affiliate marketing, Influencer marketing, SEO, Email marketing etc. are different categories of Digital Marketing. The study focuses on how Digital marketing affects rural sector as well as the difficulties and potentials associated with rural marketing.

KEYWORDS: *Digital marketing, Rural Market, Economic growth, Difficulties and Potentials.*

INTRODUCTION

The Indian commodities market is divided into two separate segments: the urban market and the rural market. Around 900 million people live in rural India, which accounts for 64.61% of the country's total population, more than 7 lakh villages and 50% of the country's total GDP. Given its size and large customer base, the rural Indian market has more opportunities for marketers.

Rural marketing is the process of bringing particular goods and services to the regional market, encouraging trade between urban and rural marketplaces while simultaneously meeting customer needs and achieving organizational objectives. In order to understand and satisfy the needs of rural customers, rural marketing is done. Additionally, broaden the company's reach to achieve the organization's goal. Rural markets in India were relatively undeveloped in the early 1990s and were viewed as having too much scope and unrealized promise. Markets have been working hard for a while to keep the opportunity alive. Numerous tactics have been created and are still being created. Since that time, the rural market has played a significant role in the Indian economy. People's attitudes today are different from those of 20 years ago. People in rural areas are not being enticed by the low-cost tactics they are aware of the product's brand value. Rural spending and lifestyle have also transformed. People in rural areas are more conscious of the brand value of the product and are therefore less susceptible to low price techniques. In the past 20 years, rural lifestyle and demand have also undergone significant change. In facilities and services, patterns, awareness, and demand, rural lifestyle is becoming more similar to urban lifestyle. Infrastructure advancements brought villages and cities closer together. Rural India became more used to urban lifestyle as a result of mobile technology and, to a lesser extent, the internet. This encouraged rural residents to enhance their lifestyle and economic growth. Rural markets undoubtedly offer potentials and are very appealing to service providers. But it comprises with many difficulties and challenges. Therefore, the marketers must work hard to address these difficulties to gain a competitive edge.

Since we live in a digital age, it is impossible to ignore the enormous potential of digital marketing. Digital marketing features include social media marketing, email marketing, affiliate marketing, on-demand video streaming, websites, SEO, SEM, and more. The impact of digital marketing on the world's transformation is significant. When it comes to shopping, technology has completely altered the experience. In addition to online buying, stores have established a virtual presence. Digital transition is therefore apparent.



TYPES OF RURAL MARKETS

1. **Periodic Markets:** One of the key aspects of Indian rural marketing is the periodic market. Periodic markets are crucial for rural people's social lives and rural sector despite modernization and the expansion of retail stores. Fairs and weekly markets are two entities that handle periodic marketing.
2. **Mobile Traders:** In order to provide the limited needs of rural consumers, such as those for fruit and vegetables, clothing, cutlery, cosmetics, spices, stationery, and toiletries, there is another significant organization known as mobile traders. Mobile traders travel from one location to another selling goods that people in rural areas frequently require.
3. **Permanent Retail Outlets:** The population growth in villages results in an improvement in household income, a rise in the commodity demand and a daily expansion of brick-and-mortar shops. Conventional fairs, regular markets, or street vendors were unable to meet the demand, which prompted the growth and development of permanent retail stores.

APPROACHES TO RURAL MARKETING

Two key components make up rural marketing: one is rural, and the other is urban. The following explanations can help you understand how goods are exchanged between these two markets:

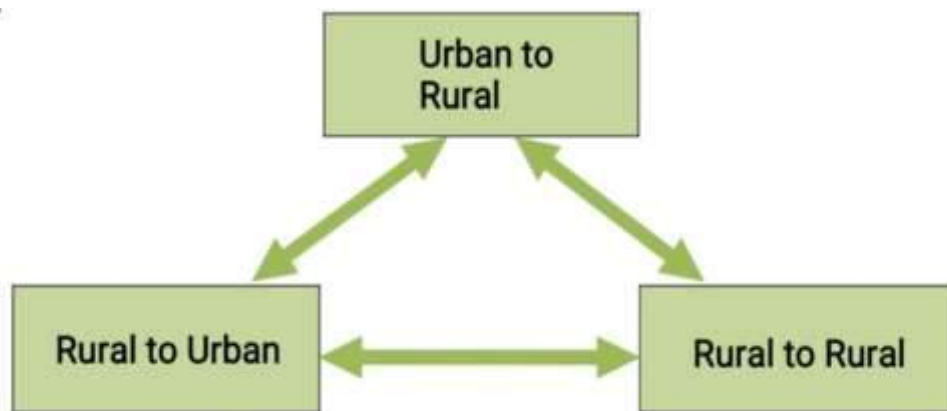


Figure 1

- **Urban to Rural:** It is the process through which urban marketers sell goods and services in rural areas. The majority of the items include FMCG products, consumer durables, pesticides etc.
- **Rural to Urban:** Goods produced or grown in rural communities or towns, such as crops and other agricultural commodities, seeds, handicrafts, pottery etc. are marketed to urban consumers. It is referred to as rural to urban marketing. This may or may not be done directly but in most of the cases middlemen, government co-operatives and different agencies take the effort to ensure that selling process run smoothly and at a reasonable or fair price.
- **Rural to Rural:** This marketing strategy is used when a rural producer offers goods to other rural communities, such as agricultural goods and equipments, cattle, ceramics, and carts.

RURAL MARKETING STRATEGY

It is also known as the four A's of rural marketing, or accessibility, acceptability, awareness, and affordability. These 4As are now required maxims for any marketer or firm to succeed while marketing in rural areas.

1. **Accessibility** - Reaching the consumer is the main difficulty in the rural market. Typically, they are low-wage workers that spend their money on essentials. Rural stores occasionally may not have easy access to certain products, which leads some customers to switch to an alternative. Businesses should make an effort to provide their items to customers earlier. Despite effective marketing, many business items are often out of date by the time they are sold. Most rural residents lack the infrastructure to travel far to get necessities. They favour the products and services that are easily accessible in their local areas.
2. **Acceptability** - To assist consumers in rural areas, products should be crafted to be user-friendly. Customers should perceive value in the product even if they have to spend more money on it, thus it should be designed accordingly. When using the product, customers should feel at ease and should take the plunge without hesitation. Customers in rural areas embrace products and services that meet their requirements and wants while also respecting local norms, values, and customs. The marketers



should therefore take such people's standards and values into account. Determine their needs, wants, and preferences, then promote the goods that these rural residents are most likely to buy.

- 3. Awareness-** The goal of a consumer awareness programme should be to change their way of thinking. To reach customers, advertisements on TV, radio, and billboards might be employed. For this reason, marketers must concentrate on the communications and entertainment channels that are prevalent in rural areas. By doing this, they will be able to connect with prospective consumers, build vital brand awareness, and entice sensible people to their products.
- 4. Affordability -** Rural locations typically have substantially lower salaries than urban ones. There, consumers frequently lack the means to purchase luxuries and instead prioritize necessities. Marketers must take into account rural consumers' ability to pay and their preference for low-cost goods. Always strive to create products that satisfy your customers' needs and stay inside their price range.

LITERATURE REVIEW

Deepti Srivastava (2010) demonstrated a trend whereby rural customers are not only purchasing to meet their basic wants but also their higher needs for leisure and socialization. Furthermore, as evidenced by the success of ITC's e-chaupals and Rediff's rural success, they have developed a strong technological aptitude.

Nizamuddin Khan & M. M. Khan (2012) discussed in rural India, there is undoubtedly a lot of potential, but the wise move would be to carefully consider the potential obstacles. As the rural consumer is still a closed book, businesses entering the market must do so for strategic rather than tactical reasons. Only through unwavering commitment will businesses be able to make a dent in the market. Therefore, it requires a different approach while taking into account the variety of consumer purchasing patterns and the unorganized market structure. It would be preferable for businesses to view the rural sector as an underserved worldwide market and service it using a polycentric rather than an ethnocentric approach.

Ashfaq Ahmed (2013) stated that the presence, ease of access, and pricing of these marketplaces should be the main objectives of any macro-level plan. Constant scanning and filtering of ideas and plans is crucial at all times. Focused attention needs to be paid to market research that goes on to lessen the unpredictability in dealing with these marketplaces. More precisely, demand is thought to be extremely price elastic in regard to rural areas. It's critical to breach the price barrier. The overall marketing mix structure for rural markets must put a strong emphasis on filling market niches with the right products, using value-for-money pricing, choosing the best distribution network, cultivating long-term customer relationships, and finally, leveraging the power of emotional brands.

Pradeep Kumar (2013) outlined to enter rural markets; one must have a thorough awareness of them and take methodical action. The various aspects that affect rural consumers' purchasing decisions must be taken into account by firms as they create marketing strategy and planning processes. Rising spending power, changing consumption habits, better access to information and communication technologies, infrastructure improvement, and increased government activities to support the rural economy all contribute to the development of the rural market. In the upcoming years, marketers will adjust their methods in light of the rural consumer. Despite all the challenges associated with rural marketing, India's rural environment is rapidly evolving. The needs of the rural markets will require the localization of conventional urban marketing tactics. In order to affect the intended behavioural change, it needs to connect with rural consumers and communicate to them on an acceptable level. In order to address new problems and challenges in key sectors including transport, telecommunications, infrastructure, finance institutions, and farm subsidies for better land and water management, the rural market in India needs government support. The rural market is undoubtedly where the future is.

Jayaprakash. K et al (2016) looked at the characteristics impacting rural customers' online shopping behaviour. The primary factors were time and money savings, trend, relaxed pace shopping, offers, seasonal discounts, and comparative features. These were followed by a wide selection of goods, easy payment options, replacement options, after-sale assistance, and free delivery services.

Vendrana Bojkic et al (2016) outlined although there is a lot of untapped potential for digital marketing in rural areas, there are currently no established methods for examining this market. Long-term, digital technology will contribute to a rise in rural India's consumption, as well as the creation of jobs and an increase in disposable income. These marketing chances to exploit unrealized potential in rural markets are shown by the current study.

Madhu Bala & Deepak Verma (2018) acknowledged that digital marketing techniques like search engine optimization (SEO), search engine marketing (SEM), content marketing, e-commerce marketing, influencer marketing, content automation, social media optimization, campaign marketing, social media marketing, e-mail direct marketing, display advertising etc. can be very beneficial for businesses. These techniques are becoming more and more common in our rapidly developing technological world. Social media usage is growing, which is giving digital marketers more options to reach clients online. Because it gives a deeper insight of what motivates consumers to write content about a brand or store, evaluating consumer motivations is crucial.

M. Renuka Devi & S. Swathi (2019) discovered that although there are many unrealized potentials in the field of digital marketing in rural areas, it is still largely understudied. Digital marketing offers some benefits, like being time-efficient, having a substantial impact, and being readily available. Additionally, technology is becoming more diverse. It creates the potential for social networking,



online learning, ticketing systems, and much more by increasing people's exposure. The rural market is more product-driven than service-driven, and by making product information available to customers in advance, the company is able to predict how the real product will behave before it is released, which helps with planning for the results.

K. Umamageswari & M. Krishnaveni (2020) investigated that farmers in rural locations benefit from digital marketing by being more independent and utilizing digital marketing tools than ever before. Agripreneurs use social media platforms to communicate ideas and viewpoints within their farmer groups in order to gain and distribute benefits to others. To evaluate the temperature, humidity, water level, and soil quality, progressive farmers have begun to use remote sensor systems. The bulk of the farmers utilize social media to distribute information and promote awareness. Social media enables us to offer solutions to the different agricultural marketing issues that farmers face.

Rakesh Pandit & Anshu Chauhan (2020) stated that people who live in rural areas now have a smarter method to get by due to digital marketing, which gives them the option to use the internet to transform their way of life. No matter if a person lives in an urban or rural region, smartphones have become a commonplace item that almost everyone can access. Everybody uses the internet, and they all conduct online shopping based on their needs. People are delighted with the ease with which purchases were shipped across India by online retailers including Amazon, Flipkart, Jabong, Snapdeal, Myntra, and Nykaa.

D. Deepa (2021) discussed that online retailers must guarantee quality, offer fair prices, and take appropriate safety precautions to deliver goods on schedule if they want to maintain their current position in the retail sector. The aggregate findings demonstrate that respondents had a favourable perception of digital marketing. Due to the growing number of prospective customers, this article's conclusion is that digital marketing is a brand-new way to purchase online that will take off in the near future.

Harsimran Kaur et al (2021) observed that the agriculture industry is making a steady transition to the digital platform. The use of digital marketing by agripreneurs and agri startups to connect with target clients is evident. As a result, they are more capable of conveying the core vision to their stakeholders and customers. It is becoming even more practical for them thanks to a variety of free and paid tools and methods. One can achieve excellent success by fusing agriculture with digital marketing in the future. Even the central and state level governments use digital marketing to connect with farmers, agribusiness owners, and other departments in order to efficiently disseminate information about programmes, initiatives, beneficiaries, etc.

Sagar Deshmukh & Sharvari Patil (2021) stated that farmers will have a lot more opportunities in the future because to digital marketing. Limited market information access, low farmer literacy, and numerous distribution networks for both farmers and consumers are all issues that need to be addressed. Final results revealed that students had very little interest in and knowledge of agricultural applications, agricultural marketing, and digital marketing.

DIGITAL MARKETING PLATFORMS

- **Search Engine Optimization:** The technique of enhancing a website's exposure when users search for goods or services is known as Search Engine Optimization. Optimizing your website for SEO generally means making it appear naturally or spontaneously in search results on Google, Yahoo, Bing, or any other search engine. To ensure that only relevant results are displayed, Google continuously adjusts its algorithms. Websites, blogs, and infographics are among the things that this strategy improves the most. Your website ought to cover the technical aspects of spidering, extracting, and analyzing non-text content, as well as content and query matching. Keep in mind that organic traffic to your business will be generated through the most cost-effective marketing plan.
- **Affiliate marketing:** Affiliate marketing is the practice of making money or receiving a commission by advertising the goods of others. Performance-based marketing is when one is compensated according to how much traffic they drive to a website. It includes things like YouTube Partner program and sharing affiliate links on your social media pages. You discover a product you enjoy, spread the word about it to other people (often through your webpage), and get paid a portion of the revenue from each sale you generate.
- **Pay per click:** Pay per click is a strategy that involves paying the publication each time a user clicks on your ads in order to drive traffic to your website. PPC ads are typically placed through search engines, which bill advertisers a predetermined sum each time one of their ads is clicked. With the pay-per-click (PPC) advertising model, advertisers can publish advertisements on a promotion platform and only pay the owner of the platform when their advertisement is clicked. Real time bidding (RTB), which is used by advertising platforms such as Google Ads and Microsoft Advertise, allows advertising content to be sold in a private automated auction utilizing real-time data.
- **Social media marketing:** It is the technique of advertising your company, item, or website on numerous social media platforms, such as Facebook, Twitter, Snapchat, LinkedIn, Instagram, Pinterest, etc. With the use of these channels, you may increase website traffic, build brand recognition, and produce leads for your company. Many people have extensive knowledge of social media as end users, but their understanding of social media marketing is often less extensive. Businesses can achieve their goals of increasing brand equity, enhancing customer service, attracting new clients, and gathering client feedback by utilizing social



media marketing. Businesses may communicate with their clients in a profitable way by creating social media content that benefits others.



Figure 2

- **Content marketing:** Content marketing is the creation and dissemination of pertinent, helpful content to both current and potential clients in the form of blogs, newsletters, white papers, social media postings, emails, videos, and the like. When executed properly, this content communicates knowledge and makes it obvious that a company values the customers it serves. Building and maintaining relationships with both current and potential clients is possible through the regular usage of content marketing. When a target audience views a business as a partner invested in their success and a reliable source of counsel and direction, they are more likely to stick with that business when the time comes to make a purchase. In essence, content marketing is a continuous process that emphasizes engaging with your audience rather than constantly pushing products.
- **E-Commerce website:** e-Commerce systems are advancing quickly. The best strategy to increase sales for any business is to develop an e-commerce website because it allows potential customers to research and comprehend the company from the comfort of their homes. On the website, the seller can present their whole catalogue of goods and services for customers to browse and purchase. To assist with the same, business owners should choose a reputable digital marketing firm that provides web building services. The website will assist the business owner in expanding their audience and building brand recognition.
- **Email marketing:** Using the email marketing strategy, one can reach out to both present and potential customers with promotional communications. It's a way to advertise to your audience things like information, deals, and events. Any company aiming to increase sales online has long relied on email marketing. It enables you to have direct touch with customers and attract potential customers to your website. You can quickly and easily send your consumers updates, great news, notifications, etc. by following a few simple steps.
- **Viral marketing:** Viral marketing is a method of advertising a good or service where customers assist in getting the word out about the product or service to other websites or when customers create an event that can result in exponential development. Viral marketing uses fast-moving communications that pass from person to person to increase interest in a company or product (and subsequently potential sales). The concept is that content sharing is a decision made by the users themselves. Social networks are the natural environment of this type of marketing due to their speed and the ease with which they enable sharing.

DIFFICULTIES OF RURAL MARKETING

Various business divisions have been attempting to corner the rural market in various ways. Rural markets undoubtedly offer prospects and are quite appealing to marketers. However, things are not as easy as they might seem. To enter and flourish in this



market in a seamless manner is not that easy. This market presents a number of difficulties; therefore, the marketer must work hard to address these difficulties properly. The difficulties related with rural markets are such as:

- ❖ **Inadequate Infrastructure Facilities:** The government is making every effort to give infrastructure, but still a lot more work is required to develop things to the maximum possible degree. Yet, proper banking services, power, etc. are still unavailable to rural residents. Rail transportation does not reach many remote places. Numerous roads had inferior surfaces and suffered significant damage during the monsoon. Even now, using bullock carts is unavoidable. Both the rural and urban sectors of Rajasthan and Gujarat employ camel carts.
- ❖ **Scattered and Dispersed market:** The rural population is dispersed over a huge land region. Dispersed market area makes it challenging for marketers to reach out to rural communities. This makes it difficult for marketers to use many of the promotional techniques to promote their goods. Additionally, guaranteeing a brand's accessibility across the nation is quite impossible. District fairs are sporadic and recurrent events. Such events are preferred by manufacturers and merchants as they provide better visibility and hold the interest of the target market for longer periods of time. Additionally, it is exceedingly expensive to advertise in a market that is so diverse.
- ❖ **Varying & Seasonable demand:** Demand in rural areas is described as seasonal and variable. As a result, businesses cannot focus on the rural market because planning is challenging. Similar to this, demand is influenced by rural consumers' income, which is extremely erratic because those consumers depend on agriculture, which in turn depends on the monsoon. They have a decent income if the agricultural season is favourable, but if it is not, they are unable to spend much money on many other items.
- ❖ **Communication barrier:** There are numerous languages and dialects, which differ from one state to another, from one region to another and likely from one district to another. Designing promotional policies for each of these regions is challenging for marketers since messages must be conveyed in the local dialect. In rural areas lack, there is lack of communication facility such as phone, telegram or fax etc. Even now, during the monsoons, most communities in the nation are inaccessible. The infrastructure for other forms of communication is also quite poor.
- ❖ **Lower literacy rates and per capita income:** In comparison to metropolitan areas, there is a lower degree of literacy there. This creates a communication issue in these rural communities. Due to its limited reach, print media becomes worthless and rather irrelevant. Compared to urban individuals, rural dwellers have a lower per capita income. Furthermore, the state of agriculture, which in turn depends on the monsoons, affects demand in rural marketplaces. As a result, the demand is not steady or predictable. As a result, rural areas have lower level of incomes in comparison to urban areas.
- ❖ **Deprived markets and deprived individuals:** The number of people living in poverty has not diminished significantly. Rural markets are thus characterized by poor individuals and as a result, undeveloped markets. The great majority of rural residents are bound by tradition, and they struggle with issues like erratic access to electricity, limited infrastructure, poor telephone service, and political-business ties that obstruct development initiatives.
- ❖ **Prevalence of fake brands:** There are numerous locally produced alternatives to any branded goods that are more appealing and less expensive. The buyer can scarcely distinguish a fake brand from an authentic one due to illiteracy. Rural consumers are careful when they make purchases and take their time making decisions. They typically try a product out before buying it again if they are completely satisfied.
- ❖ **Lack of Advertising Strategies:** Marketers are unable to meet the expectations of all rural residents when developing advertisements, sales promotions, and promotional methods. Promotional programs are never versatile. In rural markets advertisements can be used but other techniques are very hard to incorporate for marketing, such as sales promotion and personal selling, which are effective in urban markets but that marketers cannot implement in rural markets.
- ❖ **Sluggish lifestyle:** The most important problem for a marketer is a lack of enthusiasm for a new lifestyle. Product modification does not have desired and beneficial effects on rural people, since they are not easily persuaded to test, utilize, and accept particular products with improved quality and new characteristics. Their attitude is constrained by traditions, established beliefs, prejudices, etc. Unfortunately, the advocates of their opinion are not scientific. It is challenging to successfully introduce advanced and innovative items in rural regions.
- ❖ **Distinctive style of thinking:** The lifestyles of the people vary significantly. The rural consumer, who typically has two to three options, does not have access to the variety of brands that an urban consumer enjoys. As a result, rural customers have relatively straightforward thinking, and their choices are still influenced by traditions and norms. They are resistant to change and slow to warm up to trendy goods. It is challenging to get them to adopt new behaviour.
- ❖ **Insufficient marketing support:** Most of the time, producers and wholesalers do not offer traders in rural areas the same level of generous credit, financial support, and other amenities that they do to dealers in urban areas. Similar to this, retailers and rural customers are not given enough consideration when establishing an entire marketing strategy.



POTENTIALS OF DIGITAL MARKETING IN RURAL MARKETS

As mentioned above there are many difficulties marketers face while promoting their products in rural market but urban market is slowly saturating and rural market is very huge and lucrative to cater. So, in spite of the difficulties marketers with the help of digital marketing try to enter and capture the untapped rural markets. The digital marketing has the potential to remove the difficulties which the marketers face while promoting their products through traditional marketing.

- ❖ **Direct promotion:** Most of the rural consumers are dependent on middlemen i.e., wholesalers, retailers etc. and they charged extra price for the product as their profit is also included in the price. Marketers show actual price via digital marketing so it helps to attain transparent pricing. Digital marketing helps to remove those middlemen and reach out to the rural consumers directly. Digital marketing helps marketer to directly promote their products or services. Direct promotion helps to create awareness about products or services among the rural consumer base.
- ❖ **Simple consumer reach:** In today's world as the literacy rate of rural people have increased, not only youth but old age people also spending their time mostly on web. So, marketers can easily use web channels to advertise their products and attract the large masses easily. Utilizing different digital medias marketers can attract their existing as potential customers without much effort.
- ❖ **Cost reduction:** Traditional media marketing is much costlier than digital marketing. In offline stores products transferred from one place to another so, the transportation cost increases but in digital marketing no such costs arise. Now-a-days marketers are moving towards digital marketing because of its low cost as rural consumers mostly prefer inexpensive products. If marketers invest huge amount in advertising, then the cost of the product will also increase. So, rural consumers will not prefer such expensive products. To make a better reach in rural area, marketers should go for digital marketing as it is a better choice.
- ❖ **Accessibility:** For a proper reach to the consumers, marketers have to remind them consistently about their products or services. Digital marketing provides this facility to promote any product or service 24*7 & there is no time restrictions for the consumers to shop online. As rural markets are generally closed in odd timings, this is the best opportunity for marketers to reach out to their customers who are in need.
- ❖ **Purchaser's convenience to shop online:** As rural market is not well-developed; rural consumers sometimes don't get products according to their preferences from offline retail stores. Some of the consumers also don't want to communicate their needs to the sales assistant as they are hesitant to disclose about their needs. So, digital marketing can help to provide solution for convenient purchasing 24*7 & in online e-commerce websites there are plenty of choices or alternatives available to choose from. It also provides solution to consumers to shop without any sales assistant maintaining customers privacy as well.
- ❖ **Enables quick purchase:** Before introduction of digital marketing the rural consumers are dependent on traditional media marketing. They first saw the advertisements in TV, newspaper, radio etc. then afterwards they start searching for the respective products in rural markets. But rural market is not well-developed so most of the time they didn't find the product of the same brand or their choice. So this barrier can be reduced with the help of digital marketing as the advertisement and the shopping be done in the same portal, they need not to put extra effort to search as they get the products at their doorstep.
- ❖ **Quick feedback:** The main drawback of traditional marketing is that consumers cannot provide feedback to marketers about their likes or dislikes so the company was unable to modify the products according to the consumer's taste and preference. With the help of digital marketing consumer can easily share their response or feedback to marketers so, marketers get to know that who are interested or not interested in their products and what changes can make the product more desirable.

CONCLUSION

The Indian economy and country are expanding quickly. India's rural areas are likewise benefited by and benefiting from the nation's overall progress. With a rise in their wealth, rural consumers' standards of living are rising daily. As rural customers become more knowledgeable about the greater range of goods and services offered in the market and as information asymmetry decreases with time, demand for and expectations of high-quality goods and services rise. This has given marketers new opportunities to grow their businesses and gain an edge over rivals in the fierce competition. People from rural areas now have a clever approach to transform their way of life by using the internet due to digital marketing. Almost everyone today has access to a smartphone, regardless of whether they live in an urban or rural area. Smartphones have become a commonplace item in modern society. Because a large number of businesses are present online, either directly or indirectly through their own or other online websites, everyone uses the internet and conducts online shopping in accordance with their demands. There are a number of online retailers, like Amazon, Flipkart, Purplle, Snapdeal, Myntra, and Nykaa, that have no trouble delivering goods throughout India. Rural areas offer a lot of unexplored possibilities for digital marketing, but these areas still lack the tools to fully explore them. Being quick, easily accessible, and time-effective are some of the solutions for rural marketing difficulties. In the long run, digital technology will improve consumption in rural India, foster job opportunities, and raise disposable income, all of which will contribute to the nation's economic progress.



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A REVIEW ARTICLE ON THE ULTRA SOUND MEDIATED DRUG DELIVERY SYSTEM

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ABSTRACT

The delivery of the therapeutics Molecules (Drug molecules, Antibody growth factor, Nano-medicine formulation) to the central nervous system the blood brain barrier is the major barrier. When drug molecules are combined in the ultra sound can easily permeate in blood vessel of the brain known as the Sonoporation. By this method the therapeutics molecule easily penetrate in the brain and gives their effect. Here we described the principle of the ultrasound permeation, factor affecting , future out-look for the diagnosis and treatment of the various brain disorder.

KEYWORDS: *Ultra sound, Blood brain barrier ,Sonoporation.*

INTRODUCTION

The major challenges in the pharmaceutical research is that efficient delivery of the efficient therapeutics molecules in the brain due to the blood Brain barrier. The BBB restrict the permeation of the therapeutics molecules to the penetrate in the brain. BBB consist of the endothelial cell linked together by very tight junctions a thick basement membrane and layer of Astrocytes neurons and Pericytes. Which are only allowed the uptake of only small lipophilic drug, while preventing the vast majority of the drug molecules from entering to the CNS.(2)

Now a days there is the many updated approaches which used to overcomes BBB which leads to permeate the drug molecules to penetrate in the brain. The ultra sound mediated drug delivery system is the one of the best safe approaches to over comes the BBB. Its takes many attention for the opening of the BBB and improving the drug delivery.(3)

BLOOD BRAIN BARRIER

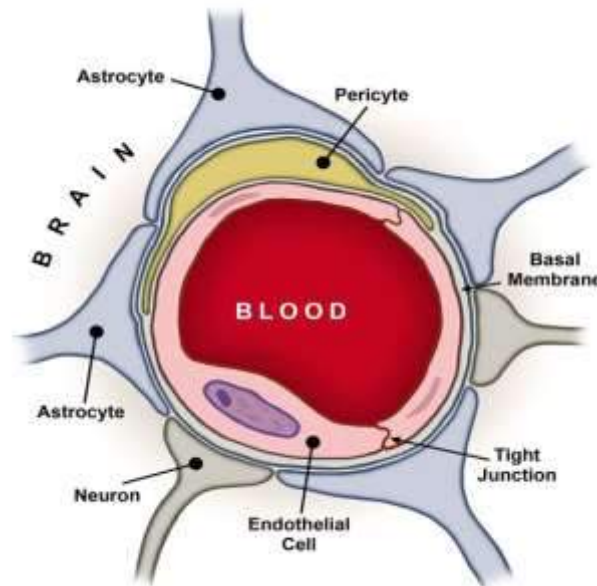
Blood-brain barrier discovery and existence has progressed over the years. It was first described by Ehrlich in 1885; he describe how dye injection into the blood circulation stained peripheral organs but not the spinal cord and the brain. Later in 1913, Edwin Gold mann showed that direct injection of trypan blue into the CSF stained cells within the CNS and not in the periphery. Reese and Karnovsky presented a solute exchange barrier between the blood and the brain by means of endothelial tight junction complexes. Development of the BBB is complex. It lies in the early communications of the embryonic endothelium with neural cells. BBB matures during fetal life and is well formed by birth.6,7 The BBB is structurally defined as specialised endothelial cells lining the intra luminal side of brain capillaries. It is a highly regulated interface that separates peripheral circulation and the central nervous system. It is estimated that every neuron has a capillary, human brain total length equals 650 km and capillary surface area available for molecular transport is as high as 20 m² (4)

Structural components of BBB

Components of BBB are neurons, Astrocytes, Microglia, Pericytes and blood vessels with specialised endothelial cells. The intimate contact between the above components and the functional interactions and signalling between them form a dynamic functional unit, known as the neurovascular unit. Neurons need a constant supply of oxygen and nutrients within 8–20 μm of distance



from capillaries. The brain homeostasis is critical and necessary because neurons are sensitive to many compounds and to subtle changes in their concentrations.(1)



Blood Brain Barrier

Neurons are also part of the neurovascular unit as their terminals arrive to all cells forming the BBB.13Endothelial cells Brain microvascular endothelial cells (BMVEC) are situated at the interface between the blood and the brain. They perform essential biological functions including barrier, transport of micro/macronutrients, receptor mediated signalling, leucocyte tracking and osmoregulation.(1)

- **Astrocytes**

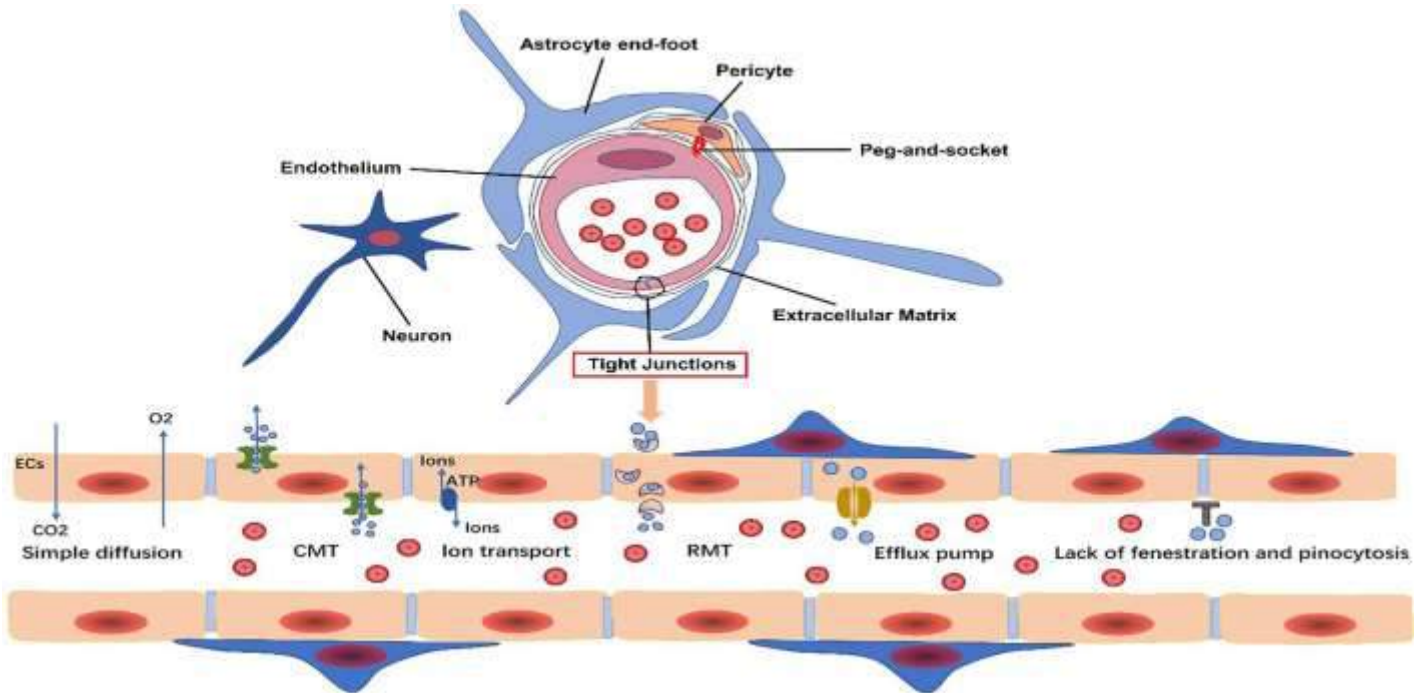
These are glia cells that envelop 99% of BBB endothelium. Astrocytes are essential for proper neuronal function and astrocyte-BMVE interaction in the neurovascular unit. They are seen as the nerve glue or cement part of the structure. Astrocytes also play a role in sonic hedgehog signalling in the brain which suppresses expression of inflammatory mediators in the brain endothelial cells.(1)

- **Pericytes**

These are flat, undifferentiated, contractile connective tissue cells that develop around capillary walls. Association of pericytes to blood vessels has been suggested to regulate endothelial cell proliferation, survival, migration, differentiation, and vascular branching.(1)

TRANSPORT MECHANISMS INVOLVED IN BBB

Essential substances cross the BBB via paracellular or transcellular pathways. This transport is strictly limited through both physical (tight junctions) and metabolic barriers (enzymes, diverse transport systems). Nutrients, ions and other molecules cross the BBB by paracellular diffusion through the junctional complex or by the transcellular pathway across the cells. Other factors that determine how easily the substance will passively diffuse through BBB include size less than 180 Da, fewer than 10 hydrogen bonds and lipid-soluble molecules. There are specific transporters that bring in essential nutrients. Essential nutrients, like glucose, are carried across the BBB by slc2a1 also known as GLUT1. Other transporters include slc16a1 for lactate and pyruvate, slc7a1 for cationic amino acids, and slc7a5 for neutral amino acids and L-DOPA.(2)



ULTRA SOUND

Ultrasound is an oscillating sound pressure wave with frequency greater than upper limit of human hearing range. thus not separated from normal sound based on differences in physical properties, only the fact human cannot hear it.although this limit varies from person its it is approx 20kilohertz in healthy,young adults. (7)

PHYSICAL PROPERTIES

Sound is a wave of energy that, unlike x-rays, must be transmitted through a medium. Sound waves can be described by their frequency, wavelength, and velocity. The frequency is the number of cycles or waves that are completed every second, and the wavelength is the distance needed to complete one wave cycle.

The frequency of the sound waves used in ultrasonography is well above the limit of the human ear (20,000 kHz) — usually in the range of 2 to 12 MHz (2 to 12 million Hz).

An inverse relationship exists between the frequency and the wavelength of a sound wave: the higher the frequency, the shorter the wavelength. This relationship affects the choice of frequency used in each patient undergoing ultrasonography. Higher-frequency ultrasound waves create higher-resolution images, but their shorter wavelength makes them unable to penetrate deeper tissues. Lower-frequency waves have better penetrating power, but because of their longer wavelengths, their resolution is lower. Weighing the need for higher resolution versus more penetrating power is always a consideration when selecting a transducer frequency. The velocity of an ultrasound wave is independent of the frequency. However, it changes depending on the medium through which the wave is traveling. For example, the velocity of sound is 331 m/sec in air and 4,080 m/sec in bone.² Within the soft tissues of the body, it is considered to be steady at about 1,540 m/sec.³ This medium-dependent variation affects the ultrasound image produced (discussed below). (6)

The following equation demonstrates the relationship between frequency, wavelength, and velocity:

$$\text{Velocity (m/sec)} = \text{Frequency (cycles/sec)} \times \text{Wavelength (m)}$$



WHY ULTRASOUND IS USED ?

- Ultrasound(US) is the most widely used imaging diagnostic tool in the world-wide.it is popular due the availability, speed, low cost and patient friendliness and no radiation. Applied in the urology,cardiology and obstetries. Ultrasound is a noninvasive diagnostic tool used to complement other imaging modalities.
- The degree to which the ultrasound beam penetrates the patient and the image resolution obtained depend on the frequency of the transducer used.
- Artifacts can be beneficial or detrimental to image interpretation.(8)

The Ultrasound Machine (8)

A basic ultrasound machine has a following parts:

1. Transducer probe: probe that sends and receives the sound waves
2. Central processing unit: computer that does all of the calculation and contains the electrical power supplies for itself and the transducer probe
3. Transducer pulse controls: changes the amplitude,frequency and duration of the pulse emitted from the transducer probe
4. Display : display the image from the ultrasound data processed by the CPU
5. Keyboard :inputs data and takes measurement from the display
6. Disk storage device: store the acquired images
7. Printer: prints the image from the displayed data
8. Transducer probe: probe that sends and receives the sound waves
9. Central processing unit: computer that does all of the calculation and contains the electrical power supplies for itself and the transducer probe
10. Transducer pulse controls: changes the amplitude,frequency and duration of the pulse emitted from the transducer probe
11. Display : display the image from the ultrasound data processed by the CPU
12. Keyboard :inputs data and takes measurement from the display
13. Disk storage device: store the acquired image
14. Printer: prints the image from the displayed data

FACTOR AFFECTING VESSEL PERMEABILIZATION

- Ultrasound parameter
 - Ultrasound frequency
 - Sonication time
 - Brust length
 - Transducer type
 - Pressure amplitude
 - Pulse repetition frequency
- Microbubbles
 - Concentration
 - Size
 - Nature (hydrophilic or lipophilic)
- Routes of administration
 - Intravenous bolus injection
 - Intravenous infusion

FUTURE OF THE ULTRASOUND MEDIATED DRUG DELIVERY (10)

- its improved clarity for use in cancer diagnosis
- increased therapeutics use to correct blood clots and kidney stones
- portability and veterinary uses
- joint and muscle treatment through cavitation.
- In the treatment of the brain disorder like parkinsons, alzemer and other complicated brain disorder.
- Pancreas treatment



CONCLUSION

The BBB remains to be one of the most insurmountable barriers in the drug delivery field. So that the therapeutics molecules cannot easily permeate this barrier. There are multiple physical principles, such as push-pull-mechanisms, microstreaming, microjets and shock waves, may contribute to US- and MB-mediated BBB opening, and non-invasive (MR) imaging may help to tailor efficient and safe sono-permeabilization. Ultra sound mediated drug delivery to brain may also become relevant for the treatment of neurodegenerative disorders, such as Parkinson's, Alzheimer's and Huntington's disease. To more efficiently and more rapidly move the field forward, concerted actions between several different basic and applied scientific disciplines are necessary, bridging biology, medicine, chemistry, physics and engineering, and involving input from both academia and industry, as well as from funding agencies, governmental bodies and health policy makers.

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A STUDY ON ASPECTS OF LEAN MANUFACTURING PARADIGM

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ABSTRACT

The industrial model is shifting dramatically globally. The way we design and create products and use technological advances has shifted. As per recent patterns in output, products are subject to less product life, often changed configuration, limited batch sizes, and minimal inventory constraints on the operation. The weakening of the economy accompanied a protracted phase of unparalleled development immediately before the development of this concept. It is challenging to persuade production managers in periods of prosperity that waste reduction, quality enhancement and cost reduction are needed. However, with the slowdown of economic development, producers are starting to explore means of change. Lean development principles are ideal methods for waste management and profit enhancement administrators. Even if an expenditure is needed to learn the changeover, the effects predicted may be persuasive. Studies on the benefits of lean manufacturing state that the in a large manufacturing facility, it improves job efficiency in the plant and cuts processing times. This article provides a systematic overview of lean manufacturing concepts and tools for novice and expert researchers.

KEYWORDS: *Kaizen ;Lean Manufacturing ; MUDA ;Kaizen Application*

1. INTRODUCTION

Currently, industrial organizations face the task of finding and introducing new operational and manufacturing strategies that help them succeed worldwide. Lean production is a proven and applied technique that needs to be taken into consideration for any business planning to remain successful. The production system originates in Lean Manufacturing; A model has been developed as a framework in other sectors and countries to become the associated quality management systems philosophy to the excellence in business. In brief, Lean is the systematic and normal implementation of a series of development technologies to improve manufacturing processes by eliminating all forms of waste, described as processes or practices utilizing more resources desired specifically; a new culture is a key to this model[1].

That tries to find a way to enhance the manufacturing facility both on the manufacturing side and in direct touch with everybody with the issues with which cooperation is treated as central and complete coordination with administrators, operators and managers. The main mission of Lean would be to improve the employee using the customer's goal as a focus. To achieve this goal, customers are provided with quality and reliable products that can be produced or services. The value of the company and product improvement is realized by eliminating waste in the organization. In other words, the organization uses its resources in the most efficient way possible [2].

DESCRIPTION AND HISTORY

The industrial revolution and the launch of mass processing could be a suitable period for starting a lean manufacturing context. The Technological Revolution has transformed civilization profoundly. In the early 1800s, the industrial revolution. Machine-built products decreased rural workers' wages, and the garment industry's mechanization decreased workers' earnings. Any professional employees were successful during the period, and most employers exploited refugees and low-wage women for cheap labour. Industrialization had many advantages during this period, such as decreasing the production price of certain products; nevertheless, the time was complicated since the work was uncertain, global circumstances had shifted continuously, and many citizens might find themselves out of a job. Any employees have been upset by employment cuts attributable to mechanization[3]. Life was both difficult and risky in early factories. Many factories had the staff, and moving machines had no security, which could harm workers. When an injured employee cannot expect funding from his workplace or the government, the accident could contribute to unemployment and hardship directly. The plant life throughout the industrial revolutions was harmful due to the long shifts of day, brief breaks, and the steady smell of Sulphur in the air. During the initial industrial revolution, many manufacturing



workers argued that staff was not used to the daily hours of factory labour and monotony. Many, though, were inspired by the compensation offered to the industry to give up agricultural work. Industrial labour offered an incentive for modest savings to grow and was less uncertain than farming, which left citizens relying upon conditions. Expert jobs at the early plants could gain a premium salary, and some companies kept their employees going in slack periods only to make sure they were there as demands for production grew [4].

Early factories have had preparation issues. Employees could barely interpret and, therefore, could not comprehend written orders. The training was normally oral, if any. Employees usually master the position by gazing at someone who has served for longer. The staff has sometimes rejected reforms, which was an issue as proposals were made to standardize parts common to industrial manufacturing. In early factories, the morale of employees was a concern. Many employers felt that high salaries would decrease production because employees would quit working as soon as they had enough income. Adam Smith rejected this conviction and claimed that people might work more if they could earn more from jobs. Many businesses, like textiles, have used a parts rate structure connected to demand [5]. This approach worked well in early textile mills, forming a direct relationship between work and development. It has yet to succeed in industries like mining, where team effort is required. Henry Ford founded the Ford Motor Company in 1903, and his company manufactured medium-priced vehicles. Ford was in 1907 developed a light and cheap automobile for the General people. The first T Model by Ford, which was sold in 1908, expanded annually till the First World War. Ford had a group of youthful and skilled developers and mechanics who could play with manufacturing techniques, operating layouts, quality management and material handling [6]. In preparing for the development of its Model N vehicle, Henry Ford started his study with the idea of interchangeability. He believed it to be necessary to increase production performance through interchangeability. The modules' manual fitting must be separated to do this. Ford went too far to boast about the exact make of the piece inside his vehicle. Although strict procedures have been carried out in the manufacturing industry since the 1450s, Henry Ford was the person who integrated a full development chain. He constantly matched interchangeable parts with regular work in 1913 with movement transmission to establish what he referred to as the flow output [7].

The Ford framework continued to fall and failed to alter the system as the world started to change. Ford's development, for example, relied on a labour force so anxious for resources and employment that it lost its integrity and self-esteem. The progress of the industry and the creation of trade unions brought tension with Ford's scheme. The development of goods has placed pressure on the Ford framework. The Ford factories could have reacted better to annual model updates, different shapes, and selections. General motors have adopted a more realistic stance and manufacturing methods for administering very large organizations. Around the 1930's, General Motors also became the leading automotive business company as Ford. However, even in the modern era, there were several aspects of Ford's production[8]. In the Allied success of World War II, the techniques of Ford were a key element. The T model was not just one hue. It was often restricted to a standard such that every Model T chassis was the same before development stopped in 1926. Virtually any system in the Ford Motor Business operated on a standard component number, and there were no changes. Ford seemed to miss his way as the universe needed diversity like product cycles for Model T. Other automobile producers replied to the need for a wide variety of products, each with several choices, but manufacturing processes, which have planned and produced measures with much more process time. Over time, they have been able to supply their manufacturing facilities with machines that operate faster, seemingly decreasing prices per process stage, yet constantly growing flow times and low inventory, such as engine machining lines. Moreover, the time gap between procedure phases and dynamic parts routing requires an increasingly advanced knowledge management framework resulting in the creation of computerized material requirement preparation (MRP) programmers [9].

Just after World War II, Toyota looked at this scenario, and a number of basic developments rendered it possible to guarantee both continuation of the process flow and a huge range of product offers. They revisited the initial Ford thinking and invented the manufacturing method of the Toyota device. This method effectively changed the manufacturer's attention from specific devices to the whole process into the flow of the component[10]. Via the installation of self-monitoring machines to guarantee efficiency, the lining up of machines in process series, the fast set up of each machine for producing small quantities of several pieces, and with every phase notifying the previous stage of their current needs of materials, Toyota concluded that it would also be possible to acquire low, high prices. Toyota concluded that control of details might be streamlined and even more detailed. Henry Ford was the first to genuinely incorporate the 'mass' production method, which generates vast volumes of standardized goods. Ford developed what he called the creation of flow, which requires the constant movement of components through the production phase. Ford used industrial manufacturing to produce and montage the parts of his cars. The industrial production method offers professionally equipped and interchangeable parts compared to craft manufacturing. This was a highly efficient operation Ford Motor Company manufactured many vehicles. The US military picked up the industrial manufacturing method of Ford after the Second World War [11].

Japan has played a significant part in the corporate world and has a good company culture with various continuous improvement tools for enhancing output (Kaizen tools). Toyota a couple of years after its establishment, it started making vehicles; the business was renamed Toyota and wanted to learn the established system Ford using, but the management of Toyota felt that the mass processing system implemented by Ford could not be used by Toyota while researching Ford's system of development. For mass manufacturing, at that time, the market of Japan was too limited and diverse[12]. The expectations of the consumer varied from small cars to luxury cars. The mass manufacturing method from Ford was based on development rather than consumer demand.



Toyota focused on designing a modern manufacturing process. They realized they could manufacture goods quicker, less expensive, improved quality, and more varied by using the correct machines with the actual volume needed and by incorporating new machines. They also confronted the dilemma of exchange between efficiency and competitiveness[13]. These experiments led to the developing of several innovative approaches recognized as the Toyota Manufacturing System. Lean development past had its beginnings in the industrial revolution and then the popular assembly line by Henry Ford. But Toyota produced the concept much later on with the method changes. Ford's concepts were extended by the Japanese car manufacturer, concentrating on cooperation and removing non-value-added practices. Lean production came into the full circle, mostly in the 1980s, with the fighting automakers recognizing the exponential rise of Toyota's productivity and importing their ideas with uneven engagement[14].



Fig1

The Japanese had the task of profiting from competitiveness. They started to research United States manufacturing processes, with special attention to Ford's efficient activities. In the sense of this survival, exactly, Toyota was the organization that utilized the quest for modern practical solutions most intensively. In 1949, following a lengthy strike, a market slump caused Toyota to lay off a large portion of its hand [15]. At the time, two young engineers from Lean Manufacturing were visited by the American automotive corporations, whom he considered to be the founder of Lean Manufacturing. At this point, the American framework called for cost savings by making vast cars but reducing the number of versions. They noted the static American structure did not apply to Japan and that the future would entail the development of tiny and low-cost vehicles. They concluded that all this would alone remove stocks and any excess, including the potential human use [16].

Starting from this laid the framework for the current management method, JIT/ Just in Time, also named TPS (Toyota Manufacturing System). The system articulated a very basic idea: produce what is required when customers ask for it. He recognized the necessity for constant flow transformation of the planned activities without delay, such that exactly what they need is delivered to the consumer, and his involvement in the schedule is minimized. Their first implementations were to dramatically decrease tool changing times and build the groundwork for the SMED method .Different techniques such as Kanban, Jidoka and the Poka-yoke method were established in line with JIT theory, which enriched the Toyota system. With the 1973 oil crisis and the losses of several Japanese firms, the JIT/TPS became prominent [17]. Toyota, which was emphasized by the other companies and the government of Japan, encouraged the concept to be applied to other industries as soon as a positive edge competently with the West continues to be taken by the Japanese industry. It should be remembered at this stage the JIT is a function of attempts to solve, increase competitiveness and eventually decrease prices, confirming that innovations emerge with more intensity in periods of crisis. Lean principles are given in Fig.1.Despite all this past, it was in the early 1990s that the Japanese model became great in the West. The manufacturing processes in Japan, Europe and the USA are systematic. The characteristics of a modern manufacturing method can be used globally in order to balance performance, versatility and consistency [18].

CONCLUSION

Technicians, instructors and specialists in the industries may look to processes which refer to Lean, a method formed in a socio-industrial world that is now extremely beneficial for both industries and employees. The first exercise in lean thought, to eliminate wastefulness in the exchange of ideas, would like to clarify and demystify the concepts denominations in concluding a definition of the roots of Lean Manufacturing. Lean Manufacturing originates a culture which continues unchanged until today in



the quest for obsessed ways to enhance the factory's post-works and manufacturing lines, all closely linked to the issues and with full coordination, participation and contact between management. In this hunt, the concepts of quality were embraced, and the psychological improvement produced constantly was made, which would only happen years afterward in the factories. It refers to change for the better or advancement. This is an attitude of self-improvement through innovation and development. Process improvement needs ongoing small improvements started by employees. All workers should constantly search for how to improve personal skills and with other colleagues to enhance job satisfaction. Kaizen allows employees to take responsibility for their work as well as improves their motivation. Kaizen is primarily a bottom-up strategy for improvement.

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SYNTHESIS AND STRUCTURAL ANALYSIS OF DIVINYL ETHER OF SALICYLIC ACID

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ABSTRACT

The article discusses the relevance of the chemistry of acetylene compounds, its derivatives, such as vinylacetylene, its interaction with salicylic acid, the conditions for the synthesis of vinylacetylene ester. The article also presents the results of the spectral (IR) analysis of the synthesized salicylic acid ester and the interpretation of the spectra of functional groups and the conclusions based on them.

KEY WORDS: acetylene, vinylacetylene, salicylic acid, salicylic acid divinyl ester, IR spectroscopy, DMSO (dimethyl sulfoxide), DMFA (dimethylformamide).

INTRODUCTION

Acetylene derivatives used in various sectors of the national economy and the chemical industry have an important role today. These are anti-inflammatory, antipyretic drugs, biologically active substances, insecticides and herbicides in agriculture, anti-corrosion inhibitors, etc [1,2,15].

The important role and high demand for compounds and derivatives of acetylene in various fields requires a thorough study of known and synthesis of new derivatives aimed at various sectors of the national economy. More than a hundred years have passed since the discovery of the Favorsky reaction, interest in the chemistry of acetylene derivatives does not lose its significance. During this period, a very large amount of work has been done in this area. A large number of acetylenic aldehydes and ketones, arylvinyl esters have been obtained, which are widely used in various fields.

In this regard, it is appropriate to note the scientific works of W. Reppe, B. A. Trofimov and J. J. Keynesper, which are devoted to the synthesis of vinyl esters of carboxylic acids [1,3,18]. F.M.Kimmich studied the technology of the interaction of benzoic acid with acetylene with the participation of a heterogeneous platinum catalyst, E.Drent proposed a technology for the synthesis of vinyl esters from branched carboxylic acids and acetylene with the participation of Ru-Cd-Cu salts at high pressure, M.L. Davis studied the process of cyclopropanization of vinyl ethers, S. Harrison - the process of polymerization of vinyl ethers, etc [4,5,17].

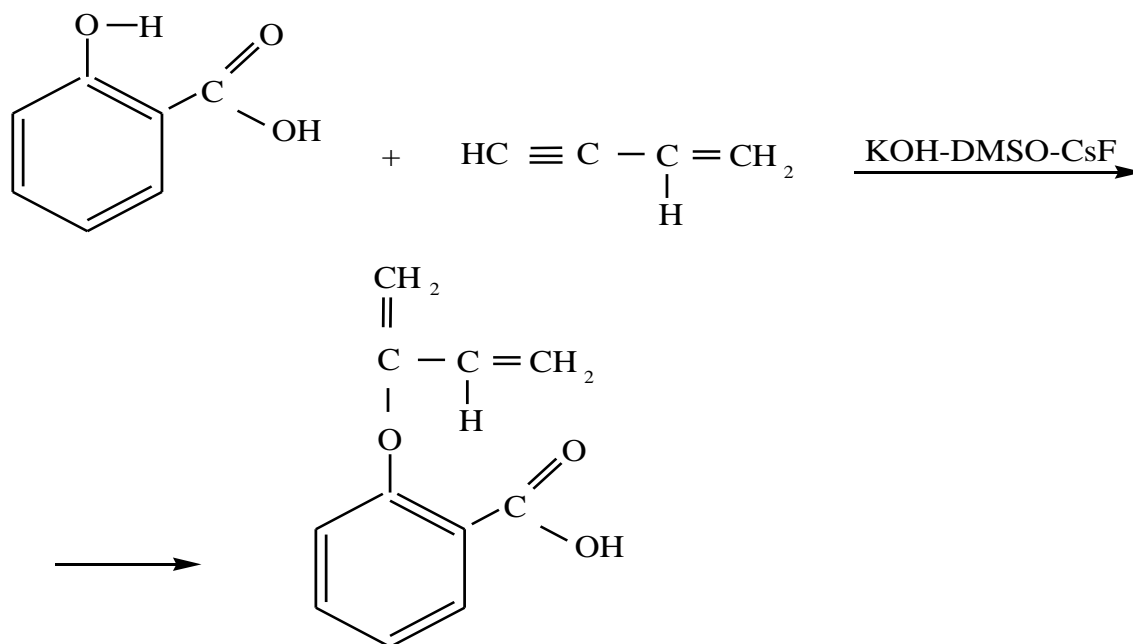
MATERIALS AND METHODS

The high interest in the chemistry of acetylene and its derivatives was the reason for our research in this area. The aim of our research was to study the process of synthesis of vinyl esters of salicylic acid by a homogeneous catalytic reaction and its derivatives with vinylacetylene, as well as the synthesis of vinyl esters of salicylic acid and its derivatives from vinylacetylene without catalysts, as well as to conduct X-ray diffraction analysis of the synthesized compounds to study the electronic structure of the synthesized compounds, in the subsequent study of their composition and properties, the development of technology for the production of divinyl ester of salicylic acid, as well as the identification of their scope [5,6,20].

Synthesis of complex divinyl ester of salicylic acid was carried out in the following order: 0.08 mol of 2-hydroxybenzoic acid is added to 100 ml of 35% potassium hydroxide solution and placed in a magnetic stirrer until a homogeneous solution is formed. The synthesized and cooled (to -3 °C) solution of vinylacetylene in o-xylene (or chlorobenzene) is combined with a Drexel flask with a solution of 2-hydroxybenzoic acid. When a solution of vinylacetylene is heated, the gas released from it passes into a solution of 2-hydroxybenzoic acid. The process continues for 55-60 minutes until the vinylacetylene solution is saturated



with 2-hydroxybenzoic acid (up to a maximum of 1.5 hours). After completion, the resulting reaction mixture was cooled, dissolved in 150 ml of water and extracted with diethyl ether. The extraction product is dried with anhydrous calcium chloride, and the solvent is distilled off in a rotary evaporator. In this case, β -divinyl ester of 2-hydroxybenzoic acid is obtained in crystalline form with the yield of the reaction product up to 66%. The molecular weight of β -divinyl ester of 2-hydroxybenzoic acid is 204 g/mol, the boiling point is 285.2 °C and with a melting point of 71.9 °C [7,8,19]. The process of interaction of salicylic acid with vinylacetylene to form salicylic acid divinyl ester can be expressed using the following equation:



Unlike the synthesis of this drug by other methods, the proposed method for synthesizing divinyl ester of salicylic acid is distinguished by its performance under mild conditions, that is, the synthesis is carried out at low pressure, temperature and without the participation of a catalyst. The synthesis is carried out in an alkaline medium. The study systematically studied the conditions for optimizing the reaction of salicylic acid with vinyl acetylene using the strongly alkaline systems KOH-DMSO and KOH-DMFA. [8,9,10,].

RESULTS

The most reliable way to determine the composition of a substance, the presence of certain functional groups and bonds in it is IR - spectroscopic analysis of a substance. We obtained IR spectra of both salicylic acid and divinyl ester of salicylic acid. The following are the results of the obtained IR - spectra of compounds: [11,12].

In the IR spectra of salicylic acid (Fig.-1), the absorption spectrum of the $\text{C}=\text{O}$ group is observed in the region of 1722 cm^{-1} , in the region of 1420-1330 cm^{-1} , stretching vibrations of acidic hydrogen of the hydroxyl $-\text{OH}$ group of phenol are observed and in the region of 3439 cm^{-1} there is a stretching vibration of the hydroxyl group.

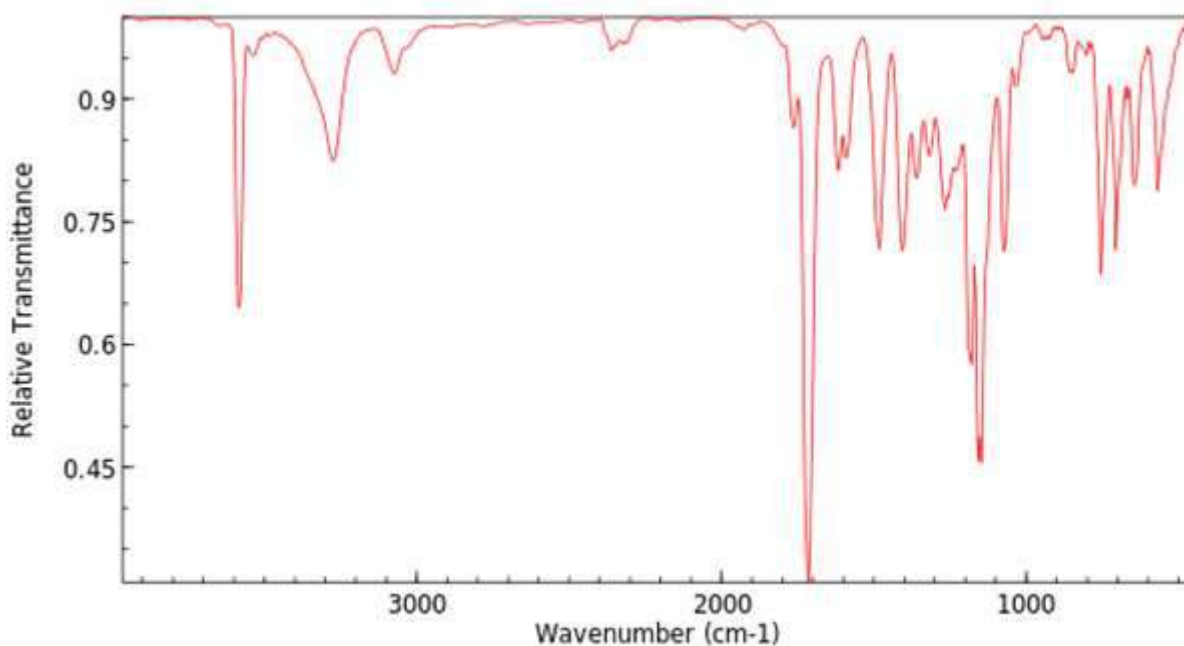


fig.-1. IR spectra of salicylic acid.

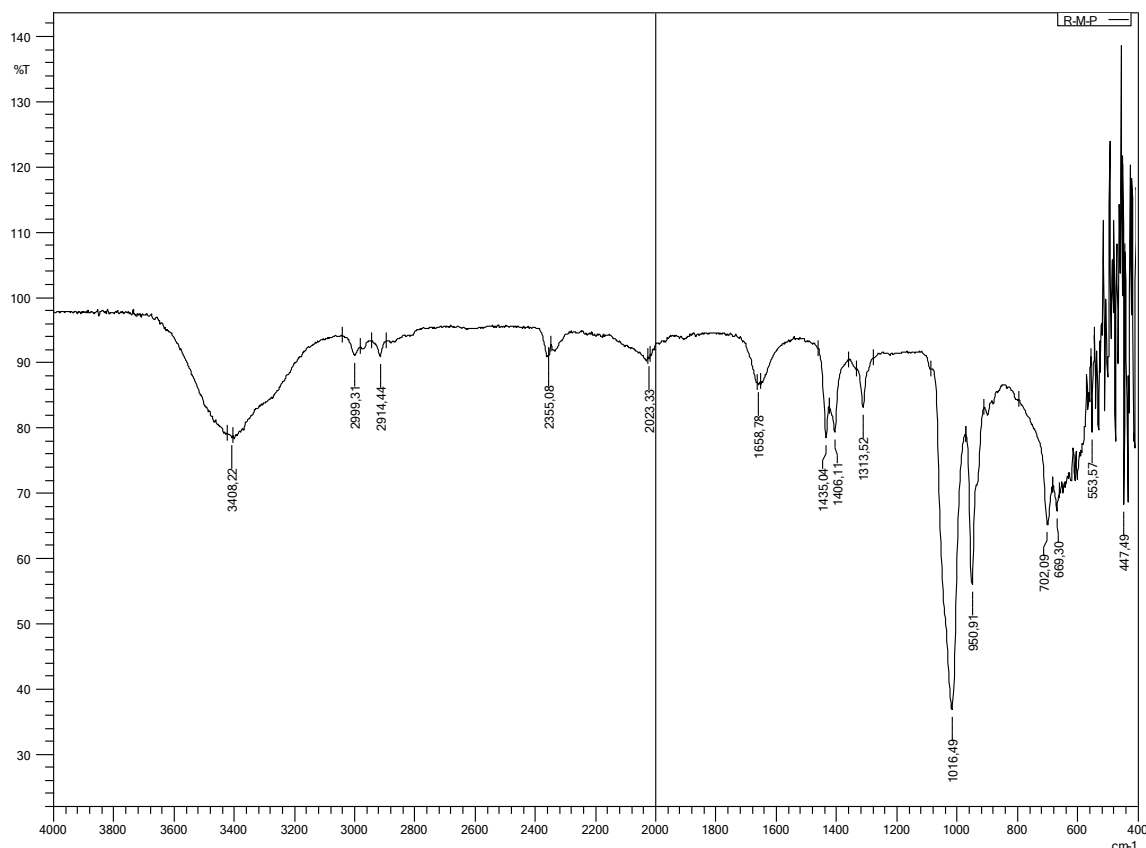


fig-2. IR spectra of divinyl ester of salicylic acid.

Interpretation of the stretching vibrations of the divinyl ester of salicylic acid (Fig-2), in contrast to salicylic acid, has bending vibrations in the region of 885 cm^{-1} related to the $=\text{CH}_2$ group, in the $2930\text{-}1409\text{ cm}^{-1}$ $\equiv\text{CH}$ group, in the region of 1075-



1020 cm^{-1} =C-O-C groups in the region of 1652 cm^{-1} stretching vibrations of the vinyl -CH=CH₂ group, which state that a chemical interaction has occurred between salicylic acid and vinylacetylene [13-21].

CONCLUSION

So, the data obtained indicate that, in fact, the reaction product, divinyl ester of salicylic acid, was formed from the reagents, as evidenced by the results of IR spectroscopy of salicylic acid and divinyl ester of salicylic acid.

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A REVIEW ON PHARMACOGENOMICS AND ITS IMPACT IN THE DEVELOPMENT OF HEALTHCARE SYSTEM

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ABSTRACT

Pharmacogenomics is the study of genomics/genetics and proteomics. It is the field of science which can make the goal of personalised medicine possible. This review article briefly explains about various genes associated with therapeutic activity of various Anti-cancer and Anti-retroviral drugs in humans. The need to perform PGx test to find the ADR's of these drugs and narrowing of these drugs which are used for the treatment of these diseases especially during their lethal stages. This is an critical review on why same drugs in same doses have different effects in different persons and how this field has been used in various health care systems over the period of time was described. This presentation also emphasizes the scope of pharmacogenomics in improving health care system.

KEYWORDS :-Pharmacogenomics, Pharmacogenomic test (PGx test), Biomarkers of Anti-cancer and Anti-retroviral drugs, Personalised medicine, Genetic polymorphism

INTRODUCTION

WHAT IS PHARMACOGENETICS AND PHARMACOGENOMICS ?

The term pharmacogenetics is associated with inheritance. Study of role of inheritance in inter-individual specific genetic variation related to drug response is known as pharmacogenetics. Study of genomics and proteomics information for identification of new drugs targets and their mechanisms of action is known as pharmacogenomics. Together pharmacogenetics and pharmacogenomics are represented as PGx¹.

The advancements in these field makes the development of personalized medicine or individualized medicine possible. Due to the introduction of highly sophisticated methods in genetic testing, diagnosis of the disease and identification of adverse drug reactions caused due to unidentified gene-drug variations made this approach to be used for various drugs which are having potent action. Apart from this It is also useful in identification of various genetic disorders in hereditary. By performing a genomic test known as PGx test. By using this test we can identify the potent action of various drugs on humans and identify the right drug in right dose for the right person at right time without any ADR's and narrowing of drug therapy can also be done by PGx test^{2,3}.

A BRIEF HISTORY

All of this has been started in the year 1990 when a Project has been initiated to identify all the genes present within the human body and this project was known as human genome project (HGP) and It was completed in the year 2003. Its Primary goal is to identify all the genes present in the human body and to demonstrate why the effect of same drug in same dose is different from one individual to other individual even though there is similarity was maintained in all the aspects while conducting trails^{4,5}.

This was explained after the completion of human genome project as per this project scientists have identified about 10500 genes in human body. Among which most of the genes are similar in all the individuals but the differences in effect is due to the folds present in the genes. Each gene is found to have about 100-150 folds in it. And about all the known genes are having these folds and there is slight difference in these folds from one individual to another individual and due to this their enzyme activity varies. Based on this they have categorized humans into four subgroups due to the differences in their enzyme activity^{4,5}.

1. Slow /poor metabolisers - they have reduced or no enzyme activity.
2. Intermediate metabolisers – they have reduced enzyme activity.
3. Extensive metabolisers – they have normal enzyme activity.



4. Ultrarapid metabolisers – they have high enzyme activity.

Due to these differences the activity of drugs varies from individual to individual even though same drug is given in similar doses. All of this is due to the success of human genome project and this knowledge of genomics has been used by various fields to identify better drug therapy for treatment, narrowing of drugs used for therapy and it is also to reduce many ADR's. Thus the usage of pharmacogenomics is not limited to a specific field and the following piechart representing various fields which are using pharmacogenomics in their therapy⁴.

VARIOUS PHARMACOGENOMIC BIOMARKERS of ANTI-CANCER DRUGS AS PER FDA DRUG LABELING^{6,10,11,12,13}

Disease	Biomarker	Therapy
BREAST CANCER	HER2	Trastuzumab, lapatinib, pertuzumab, ado-trastuzumab emtansine
BREAST CANCER	ESR1	Exemestane, letrozole, anastrozole, fulvestrant, tamoxifen
Colorectal	KRAS	Cetuximab, panitumumab
Colorectal	EGFR	Cetuximab, panitumumab
Colorectal	DPYD	5-Fluorouracil, capecitabine
Colorectal	UGT1A1	Irinotecan
Lung	ALK	Crizotinib, ceritinib
Lung	EGFR	Erlotinib, gefitinib, afatinib, osimertinib
Melanoma	BRAF	Vemurafenib, dabrafenib, trametinib
Acute promyelocytic leukemia	PML-RAR α	Arsenic trioxide, tretinoin
Chronic myeloid leukemia	BCR-ABL	Imatinib, dasatinib, nilotinib, bosutinib, ponatinib, omacetaxine mepesuccinate
Chronic myeloid leukemia	UGT1A1	Nilotinib
Cutaneous T-cell lymphoma	CD-25/IL2RA	Denileukin diftitox
Chronic lymphocytic leukemia	(CLL) del(17p)	Ibrutinib
Chronic lymphocytic leukemia (CLL)	CD20/MS4A1	Obinutuzumab, rituximab
Acute lymphocytic leukemia	TPMT	6-Mercaptopurine, thioguanine

These are various biomarkers available for anti-cancer drugs. Each biomarker is unique and differs in function from other biomarkers in metabolizing various anti-cancer drugs. One or more biomarkers are available for same cancer type. These biomarkers are given by U.S. FDA and are helpful in narrowing of drug therapy for patients diagnosed with lethal stages of cancer. This method was also proven to be very effective in identification of effective therapy for the patient without causing any ADR's while performing PGx test for specified cancer¹².



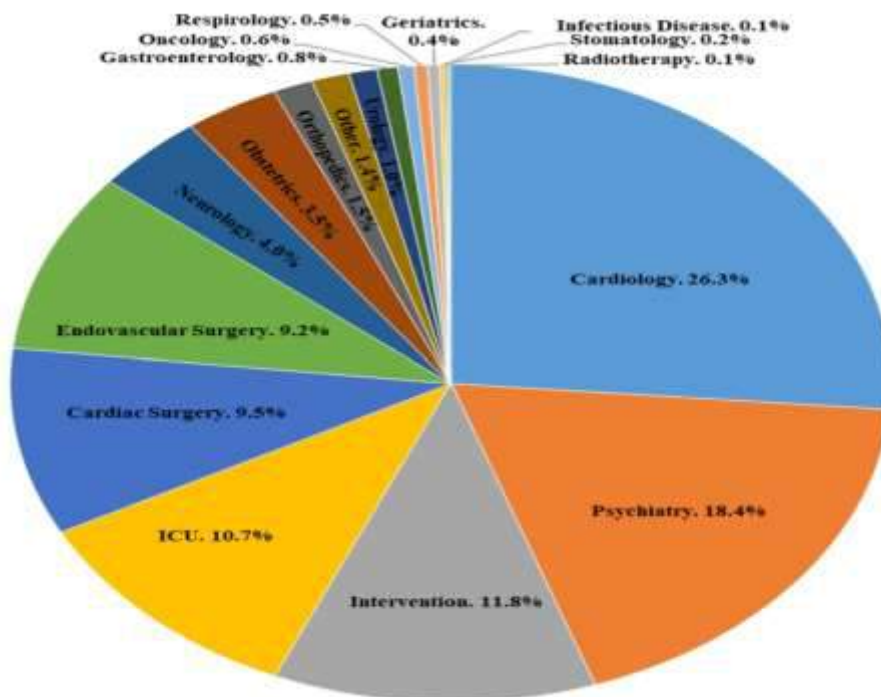
BIOMARKERS OF ANTI-RETERO VIRAL DRUGS¹³

BIOMARKERS	ANTI-RETERO VIRAL DRUGS
IL-6	Tenofovir,emtricitabine
	Abacavir,lamivudine
	Efavirenz
	Atazanavir
hs-CRP	Tenofovir,emtricitabine
	Efavirenz
	Abacavir,lamivudine
sCD14	Efavirenz
	Lopinavir/ritonavir
IP10	Atazanavir/ ritonavir
	Tenofovir,emtricitabine
MIG	Abacavir,lamivudine
	Lopinavir/ritonavir

Above mentioned are some of the biomarkers identified for the respective anti-reteroviral drugs. The identification of these biomarkers has helped to reduce the adverse drugs reactions the occurred during anti-reteroviral therapy. Performing of PGx test also helps in narrowing of drug therapy which will be a cost effective method in treating HIV patients when compared to other methods^{7,8}.

Even though a vast number of biomarkers are present above mentioned biomarkers are having major influence on drug therapy and these are recognized by U.S FDA and certain guidelines have been issued to conduct PGx test¹³.

VARIOUS FIELDS OF SCIENCE USING PHARMACOGENOMICS⁸





CONCLUSION

Pharmacogenomics is useful in development of personalized medicine for every individual and personalized medicine holds the promise that treatments will be one day tailored to your genetic makeup. Thus there is wide scope for the usage of pharmacogenomics in all the fields of life sciences for identification of a disease and also to minimize the adverse reactions which arises during their drug therapy .

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OR RESEARCH PAPER IN HEALTHCARE SECTOR

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ABSTRACT

It has become very challenging for governments, particularly those in developing nations, to provide their inhabitants with high-quality health services as a result of the limited resources and growing population. As a result, cutting-edge Operations Research (OR) approaches have been created for a variety of healthcare applications, including planning for the operating room, staffing the emergency room, screening for breast cancer, arranging radiation treatments, long-term care, and home healthcare. In addition to assisting hospitals in better patient management, medical research can also help these facilities deliver better care while maximising efficiency. In this research paper, applications of operations research in healthcare are discussed globally, with a focus on India.

KEYWORDS : *Healthcare; Operations Research; Decision making; Optimisation; Disaster management; Risk pooling; Scheduling.*

INTRODUCTION

Operations research and management science communities have been paying close attention to the healthcare management issues. In order to face the problems of an ageing population along with increased quality expectations due to technology advancements and a desire to cap or reduce budgets, the health care sector needs to employ resources more effectively and improve the quality of services. In this paper, we examine contemporary operational management studies of healthcare issues. In light of implications for management, we categorize the healthcare problems in the operations management literature from top to bottom management: strategic, tactical and operational. We explore past, present, and future directions for research in the healthcare sector as we draw to a close. Regarding the current trend in increased healthcare, healthcare providers have to consult operations management tools to make operations faster and cheaper. A wide-spread application of such tools will increase efficiency at hospitals and patients will experience more streamlined coordination of activities, improved predictability and regularity—getting a higher service levels and ultimately better quality of health care services.

LITERATURE REVIEW

Beverly D. Bradley and others in their research paper “Operations research in global health: a scoping review with a focus on the themes of health equity and impact” highlight a global overview of 1099 studies that talk about the geographic distribution of OR and common OR methods used. A narrative description of the use of OR across four main application areas of global health is also presented. We identify three key drivers for success in bridging the gap between OR and global health policy.

In the research paper, “Healthcare Management: Operations and Strategy” Ismail Civelek discusses the current literature and practice in healthcare problems, implications for management, future research opportunities and limitations. Healthcare decision-makers need more and more operations tools to cope with increasing costs in each step of providing health services. Almost all healthcare studies in the literature use a heuristic approach than providing an exact solution to an existing healthcare problem. The reason behind this approach is the intrinsic uncertainty of demand structure in the healthcare industry. Moreover, such policies dictated by the current studies by researchers and practitioners in the healthcare industry should be based on the evidence of its potential to tackle stochastic problems associated with demands and outcomes in such complex healthcare problems.

In the research paper “Empirical Research in Healthcare Operations: Past Research, Present Understanding, and Future Opportunities” by Diwas Singh KC and others, examines the published empirical literature in healthcare operations management over the last 20 years. It highlights the several unique characteristics of the research in healthcare operations, including a focus on operational and organizational variables, an interest in the underlying mechanisms that explain operational causal pathways, and an interest in economic and managerial implications. The study also identifies several key areas of future research, including personalized medicine, value-based healthcare, and connected health.



In the study “Models, algorithms and performance analysis for adaptive operating room scheduling” by Guanlian Xiao and others, we consider the scarcely researched common practice of making adaptations to the surgical schedule from the perspective of the operating room scheduling classification scheme of Cardoen, Demeulemeester, and research to better cope with uncertainty is provided by Tang and Wang (2015) who consider the tactical planning problem. Tang, and Fung (2014) consider a chance-constrained model for a closely related problem with multiple operating rooms. scheduling literature, a general analytic approach towards adaptivity in operating room schedules is lacking in the scientific operating room scheduling problems and present theoretical results on their relative performance.

The study “Healthcare operations management: a structured literature review” by R. K. Jha and others, reviewed research papers on healthcare operations management from reputed operations management and service management journals from 2000. The objective of the literature review was to identify key dimensions of healthcare operations management, highlight the present trend in research on healthcare operations management, and suggest areas for future research. The study found that a large proportion of empirical studies in the area of health-care operations management have been conducted in developed nations. This calls for more research in developing and underdeveloped nations because the management challenges of healthcare industry in developing and underdeveloped nations are quite different from those in developed nations.

In the research study “Introduction: Applications of Management Science and Operations Research Models and Methods to Problems in Health Care” by Michael W. Carter and various others, states that over the last decade or so, the health-care industry has started to solve important problems using traditional management science and operations research (MS/OR) methods. Results of modeling efforts have been significant and have begun to positively affect the delivery of health care. This special issue documents eight successful applications of MS/OR methods to solving actual problems in healthcare.

The paper “Using Operations Research to Reduce Delays for Healthcare” by Linda V. Green, describes the areas in which patients routinely experience significant delays and presents operations research models that have been developed to help reduce these delays. Discuss the opportunities, large and small, for using OR methodologies to significantly impact practices and policies that will affect timely access to healthcare.

METHODOLOGY

In this section, we explain the reasoning behind our search strategy. The exclusion criteria are also motivated, and we conclude the section that shows how we obtained the 25 articles that were analyzed.

We conducted a systematic search and review, which combines the strengths of critical review with a comprehensive search process. In order to determine how the literature describes waiting time and access time in healthcare, we conducted a preliminary journal article search by combining waiting time and healthcare search terms.

The research methodology-based classification used in the literature review is mainly based on the works of Meredith et al., Malhotra and Grover, Forza, Bertrand and Fransoo, Spens and Kovács, and Cooper et al. These papers were used for enlisting all major types of research methodologies relevant in the field of service OM relevant to healthcare operation management. During the literature review, selected articles were classified into research methodologies given below. In case of articles with two or more research methodologies, the primary research methodology used was considered.

- Empirical;
- Modelling/analytical;
- Simulation;
- Field research/action research;
- Qualitative research;
- Theoretical/conceptual.

S.No.	Research Paper	Authors	Methodology
1.	A predictive model for the post-pandemic delay in elective treatment	Romy Nehme, Alena Puchkova, Ajith Parlikad	Analytical methodologies; discrete time simulation
2.	Applications of Operations Research Techniques in Healthcare	Mehak Jain, Mudita Shah, Naman Sadh, Naomi Marfatia, Nishit Khandelwal	Demand Forecasting, proper; proper allocation
3.	Operations research in global health: a scoping review with a focus on the themes of health equity and impact	Beverly D. Bradley, Tiffany Jung, Ananya Tandon-Verma.	OR modelling, charting, Enhanced Two-Step Floating Catchment Area method, DES-optimisation model, HERMES (Highly Extensible Resource for Modeling Event-Driven Supply Chains) software
4.	Operational Research to improve Health Services	Desmond Tutu TB Centre	Tony Buzan’s mind mapping methodology



5.	Operations Research and Healthcare	Erwin Hans, Joris van de Klundert	Surgery sequencing, scheduling, Instrument tray optimization, Optimization of the reverse logistics chain of instrument sterilization (inventory locations), etc.
6.	The Healthcare sector needs more Operational Research	Tomas Eric Nordlander	Simulation for decision support; optimisation
7.	Using Operations Research to Reduce Delays for Healthcare	Linda V.Green	Queueing analysis, Stationary independent period by period(SIPP) approach, physician practice appointment system
8.	Practical Operations Research Applications for Healthcare Managers	Kiok Liang Teow	Resource utilization, bed management, Queueing Theory
9.	Operations research in healthcare	Xiaolan Xie & Mark A. Lawley	Operating room planning, emergency department staffing, radiotherapy treatment planning, home healthcare planning, long-term care planning and scheduling
10.	Operations research: A valuable resource for improving quality, costs, access and satisfaction in health care delivery	William P. Pierskalla	Mathematical programming, stochastic processes, data envelopment analysis (DEA)
11.	A Review of the Healthcare-Management (Modeling) Literature Published in Manufacturing & Service Operations Management	Pinar Keskinocak, Nicos Savva	Triage decisions (prioritization protocols), Operating room scheduling, Queueing model
12.	Healthcare operations management: a structured literature review	R. K. Jha, B. S. Sahay, P. Charan	Service scheduling, surgical scheduling, appointment scheduling, Management by walking around (MBWA) technique
13.	Healthcare Management : Operations and Strategy	Ismail Civelek	Geographical location-allocation simulation model, capacity allocation, patient assignment
14.	Empirical Research in Healthcare Operations: Past Research, Present Understanding, and Future Opportunities	Diwas Singh KC, Stefan Scholtes, Christian Terwiesch	Capacity sizing, patient scheduling, operational variables
15.	Exploring risk pooling in hospitals to reduce demand and lead time uncertainty	Gerald Oeser and Pietro Romano	Risk pooling (inventory pooling, virtual pooling, capacity pooling transshipments, etc.)
16.	Reducing Wait Times through Operations Research: Optimizing the use of surge capacity	Jonathan Patrick and Martin L. Puterman	Queueing theory, capacity planning, surge capacity management, Markov Decision Process (MDP) scheduling model, Approximate Dynamic Programming (ADP)
17.	Strengthening Health Research Capacity from within Samoa	Tamasailau Suaalii-Saun	Social research methods and epidemiological methods
18.	Managing Risks in the UK Healthcare Sector	M.I. Okorohy, P.P. Gombera and AM. Alani	Alexander's model of risk management, compulsory competitive tendering (CCT), market testing (MT) and private finance initiative (PFI)
19.	Introduction: Applications of Management Science and Operations	Michael W. Carter, Bruce L. Golden, Edward A. Wasil	Mathematical programming, decision analysis and simulation

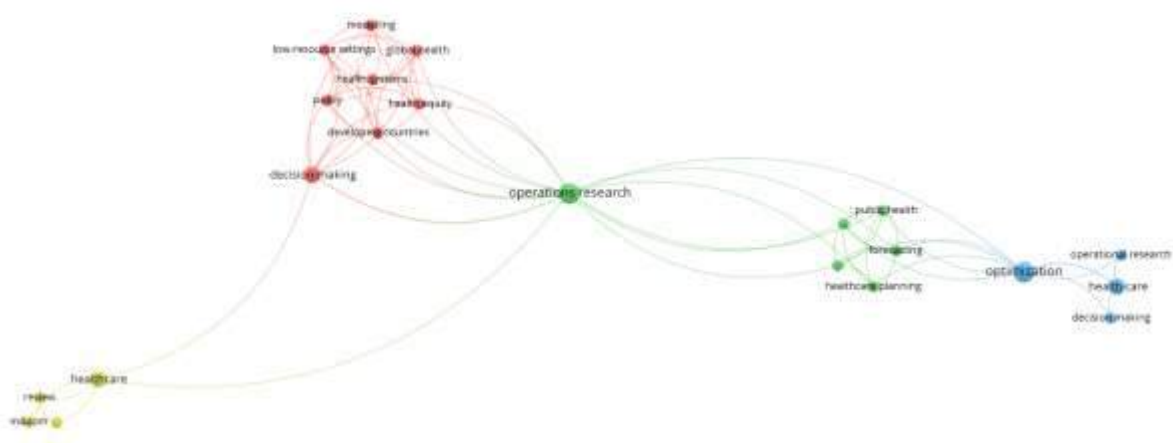


	Research Models and Methods to Problems in Health Care		
20.	Models, algorithm and performance analysis for adaptive operating room scheduling	Guanlian Xiao, Willem van Jaarsveld, Ming Dong and Joris van de Klundert	Combinatorial methods, stochastic OR scheduling, pseudo-polynomial algorithm for the static stochastic knapsack problem
21.	Optimizing vaccine distribution via mobile clinics: a case study on COVID-19 vaccine distribution to long-term care facilities	Samta Shukla, Francois Fressin, Michelle Un, Henriette Coetzer, Sreekanth K. Chaguturu	Assignment, scheduling, distance minimization

CRITICAL ANALYSIS

How much radiation is enough for a cancer patient? What is the best contract structure between blood banks and hospitals to minimize obsolescence of blood resources? When should elective surgeries be postponed to accommodate emergency surgeries? There are many articles that try to answer these questions in the operations management literature. It has important elements such as location selection, capacity planning, appointment scheduling, patient assignment, resource scheduling. They all play an important role in making effective and calculated decisions.

BIBLIOMETRIC ANALYSIS



- In the above given image, we can see that there are 3 colors which represent which are red, green, and blue.
- Red represents the areas in which the research had been done, for example – health equity, global health, health systems etc.
- Blue represents the areas in which the optimization needed to be done after the research, for example – Operational research, Health care, Decision making.
- Green represents the factors which we needed to consider for making those optimizations based on the researches which were conducted, for example – public health, forecasting, healthcare planning.

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PASSPORT TO AFRICA AND ASIA: A MULTIMODAL TEXTS IN AFRO-ASIAN LITERATURE

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ABSTRACT

This study was conducted to determine the effectiveness of Passport to Africa and Asia: A Multimodal Texts in Afro-Asian Literature, as instructional material in Literature 8 on the academic performance of select grade 8 students of Pedro Guevara Memorial National High School, School Year 2019-2020. The researcher developed instructional material which validated by five (5) Master Teachers before its evaluation. Seventy-five (75) English Teachers in Cluster 3, Division of Laguna evaluated the material in terms of its characteristics which includes, design, usability, suitability and consistency and its components in terms of objective, content, development and evaluation. Based on the findings of the evaluation, the material is found effective and is extremely acceptable. During the administration of the instructional material, two groups were used, the control group and the experimental group. Both groups consist of forty (40) learners. The sample was purposely chosen by the researcher for her convenience. A quasi-experimental control design was used in this study to determine the effectiveness of a multimodal texts in Afro-Asian Literature for grade 8 in the teaching and learning process. The researcher made use of arithmetic mean and standard deviation to determine the level of acceptability of the developed instructional material. It is also used to identify the level of performance of grade 8 learners through pretest and posttest and to determine the significant difference between the pretests and posttests of the two groups, the T-Test was utilized. The objectives of each lesson presented in the developed instructional material were congruent with its learning competency and content. The utilization of the multimodal texts contributes to an effective learning outcome. The provided tasks in the evaluation or application part were differentiated and based on the multiple intelligence theory and integrated in ICT. It satisfied the needs and interests of learners and improved their talents and skills. The pretest of the control group and experimental group had shown that both had the same knowledge prior to the utilization of the material was found statistically not significant. The academic performance of the control group based on the findings in posttest showed a satisfactory improvement even if not utilizing the multimodal texts, on the other hand the result of the posttest of experimental group which utilized the instructional material was found to be very acceptable which was statistically interpreted as significant. The multimodal text was effective because it helped the learners relate themselves and gave opportunities to improve their talents, skills, and aptitude, with the aid of individual practical exercises which were meant to improve one's skills at his/her pace.

1 INTRODUCTION

Education empowers people and strengthens nations. Thus, the Department of Education (DepEd), when it pushed for the adoption of the K to 12 program set goals to improve academic competencies and labor opportunities for the Filipino graduates. (Mateo, 2015), However, problems arise during the run through of the said curriculum. These include congested curricula, low budget allocation for new learner's material, inadequate and unavailability of instructional material, globally changing world, poor study habit, and diverse learning styles and intelligence of learners. (Cocal & Marcellano, 2017). Lack of learners' interest due to globalization and millennial stage is very evident, consequently, there is an inadequate actualization of educational goals.

Moreover, teaching and learning process is not as effective as Department of Education foresee it, when the

educational system adopts the K to 12 program due to diverse teaching processes delivered to learners without considering multiple intelligence of learners. Hence, educators find ways to improve quality education to meet the high demands of the future, to prepare learners in their life and work.

As a 21st century English teacher is a challenging task due to enormous problem on varied learning styles of young learners. They tend to feel reading literature as something tedious and worthless. Reading is not fun at all, it is a burden for them.

According to Tuzel (2013), in this century, literacy skills should be advanced and sense should be derived from texts, thus it is the foundations of literacy assertions should be humans and materials: within the scope of the 21st century concept of literacy, written words, oral communication, and visuals cannot



stand out from each other in communication; rather, it is important to make people literate in multimodal text structures in which all three elements are used together. (Wolfe & Flewitt, 2010).

Literature teachers conceptualize and innovate means to make the teaching and learning process be evidently effective. Teachers make use of differentiated teaching techniques and strategies that suit the learners' needs, interest and learning styles.

As a result, this reflected the choice of incorporating MI theory and multimodality in practices into education schemes as a brilliant and plausible action. It is fair and functional if an individual is assessed on its domain rather than be tested in General Intelligence. This would bring chances of every individual on its field of inclination, expertise and actual intelligence. Furthermore, the research was deeply founded on the glaring truth that many graduates were being under-

1.1 Objectives of the Study

The study determined the effectiveness of Passport to Africa and Asia: Multimodal Texts in Afro-Asian Literature on academic performance based on the statistical result of their pretest and posttest of select grade 8 students of Pedro Guevara Memorial National High School, District of Sta. Cruz, Division of Laguna, School Year 2019-2020. Specifically, it sought answers the following: Determine the level of acceptability of the teacher-made multiple intelligence based multimodal text based on its characteristics in terms of design, usability, suitability, and consistency. Assess the level of the acceptability of the developed multiple intelligence based multimodal text based on its components in terms of: objective, content, development, and evaluation. Identify the levels of academic achievement of control group and experimental group in terms of pretest and posttest. Compare if there is a significant difference between the pretest of control group and pretest of experimental group. Distinguish if there is a significant difference between the pretest and posttest of the control group. Evaluate if there is a significant difference between the pretest and the posttest of experimental group. Measure if there is a significant difference between the posttest of the control group and posttest of the experimental group.

2. LITERATURE REVIEW

In the 21st century young people live and learn in a technological world that is fast paced and in a constant state of change. As technology becomes more and more accessible outside of the classroom, educators are challenged to re-consider the literacy skills required to be successfully literate. Enacting literacy teaching and learning in and for the 21st century requires teachers to update their pedagogical knowledge, skills and contextual understanding of the world children live and learn in. Recent developments in the Philippines have prompted the Philippine government to push for a new basic education

employed, unhappy, inefficient and unproductive in their field for the social norms demands a certain skill notion that "everybody should have" and not what an individual has and yet to be discovered and not a globally competitive Filipino individual.

With the above discussion, the researcher was challenged to conduct a study on the effectiveness of a develop multiple intelligence based multimodal lessons in Afro- Asian Literature among grade eight students in Pedro Guevara Memorial National High School, District of Santa Cruz, Division of Laguna with great assurance that its findings will surely benefit DepEd officials, principals, teachers, students, and future researchers as solid ground for their resolute actions in the improvement of their respective concerns.

curriculum. Along with these changes is the adoption of the new English curriculum known as the Language Arts and Multi literacies Curriculum (LAMC). It examined the K-12 English Curriculum in the Philippines from a 21st century learning perspective.

The K to 12 curriculum focuses on the learner's acquisition of the 21st century skills (New Learning Goals). One of it is the learning and innovation skills. This includes adaptability, creativity, critical thinking curiosity, higher order thinking skills, managing complexity, problem solving, risk – taking, self-direction, and sound reasoning.

Multimodal literacy describes communication practices that use two or more modes of meaning. Multimodality has become a significant area of research given the broadened range of available designs and media forms in digitally networked and globalized textual ecologies. Language and literacy practices are inherently multimodal, because communication requires attending to diverse kinds of meanings, whether of spoken or written words, visual images, gestures, posture, movement, sound, or silence Yet, clearly, the affordances of people-driven digital media and textual production have given rise to an exponential increase in the circulation of multimodal texts in digitally mediated environments. (Mills, 2017)

Ashrafi (2013), asserted the fast growing availability and capability of emerging technologies have shaped enormous potential of designing developing and implementing pioneering pedagogy methods in learning environment. Applying interactive learning in current years has eccentric results on the student learning in their achievements, because the global technological scenario has covered the way to new pedagogies in teaching-learning process. On the other side methods by focusing on students and the ways of learning in them can illustrate logical ways of improving student achievement in English as foreign language.



A collateral write-up expounded by Kres (2016) focused on text and literacy in the broader sense. Text making or writing in a multimodal framework, and emphasized the importance of focusing on both the practice in which the text – making occurs and on the text design process which takes place through a range of media and modes.

The same line of write-up has been expounded by Bezemer (2016) where in a design process of multimodal text, the students give profile to interest, purposes and intentions by using different media, tools and modes. The design of text is becoming a more complex, multimodal means of communication, representing a shift from a traditional way of using printed text to more multimodal use of texts. The use of digital tools may also challenge students' perception of texts and their idea and recognition of multimodal text productions.

The version of Banerjee (2013) offered the core area of online digital hardware and software influences to students' learning experiences be in theoretical knowledge, practical skills or proper disposition in lifting up the instructional level of the latest audiovisual program for effectiveness of the instructional service delivery with respect to performance-based in the execution of sure action by teachers during their deployment of innovative teaching opportunities to learners from different walks of life.

Ganapathy (2016) greatly considered the marvelous exposure of learners in various multimodal texts due to their active participation in social media and frequent usage of mobile devices on a daily basis. Such daily activities advocate the need for a transformation in the teaching and learning of ESL lessons in order to promote students' capabilities in making meaning of different literacy texts which students came across in their ESL learning activities.

Technologies being developed especially in the education system where multimedia learning packages are used should accommodate the needs of the learners by determining the learners and the methods that will improve the learning process. The developed multiple intelligence based multi-modal lessons by the researcher carried these principles in the selection and creation of the learning materials.

Andambi, and Kariuki, (2013) assert that learning resources for the SEE are relevant when they are arranged in agreement to the objectives geared towards molding desirable behavior of the learner. This implies that a teacher can achieve his/her objectives by careful choice and use of learning resources for teaching. Teachers have a right to select those resources such as media could go a long way to influence students' behavior in the classroom. Therefore, educational resources are obligatory components to any learning process.

The above bibliographic citations helped the present researcher since, multimodal text through ICT is adapted in schools in promoting and improving the methods of teaching and how extensive it is in students' learning process.

Mirzazadeh, (2012) states that the theory of multiple intelligences postulated by Howard Gardner (1983) is a model of intelligence that categorizes human's intelligences into specific modalities; the different intelligences are understood as personal gears and a person may be more talented in some intelligences than in others, it focuses in individual differences. As such, through the MI theory, Gardner (1983) posits that every individual errands varying levels of intelligence and thus has an exclusive, unique intellectual profile; his theory defines intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural setting" (Gardner & Hatch, 1989). According to Yaumi, et al. (2018) multiple intelligence (MI) theory has concerned much attention in the field of education, although Howard Gardner as the inventor of this theory, does not intend to create it to apply learning and instruction. The theory was focused at the philosophy of developmental and cognitive psychology (Gardner, 2011) as a discipline he was interested in since the beginning of his career. Eventually, MI theory became popular in educational practice. The typical studies, which associate MI and education, are becoming multiple intelligences in school, multiple intelligences in the elementary school and multiple intelligences in the classroom. Later on, this study has evolved into a more specific discipline such as multiple intelligences and leadership, and the multiple intelligences in the reading and writing in the field of learning and instruction, MI theory has grown so popular, such as teaching and learning through multiple intelligences (Campbell, Campbell, & Dickinson, 1996) and multiple intelligences-based instructions (Yaumi, 2013). Here, multiple intelligences-based instructions are learner-centered learning approach, which focuses on identifying learners' distinct and innate intelligence, talent, and learning preferences and providing the best way for learning.

In the article entitled "Applying Multiple Intelligences in the classroom: A Fresh Look at Teaching Writing" by Fred C. Lunenburg & Melody R. Lunenburg, this article discusses the implication of multiple intelligences inside the classroom. Thus, with the manifestation of the new information of how educators teach and how learners learn, based on this study for the researcher will develop learning material which activities are aligned with the distinct intelligence of learner for every learner is unique. That will also enable the learners to apply their intelligences at the same time improve them. So that learning will be fun and easier for them.

A collateral study was launched by Chang (2015) on social media and its impact on high school juniors' knowledge formation, skills and disposition in selected secondary schools in New Jersey. Among others, his findings revealed the significant impact of juniors' exposure to social media wherein enrichment of the hardware and software systems had been installed in the correct knowledge formation vital for applying their skills in technology and livelihood programs as basis for correct



disposition in their daily walks of life in the school and in their respective communities where they belonged.

The findings of Christensen (2013) sounded supportive to the foregoing studies upon spearheading a study on digital social media, the case of seventh graders in selected elementary schools in Kentucky. He utilized the descriptive method of research in gathering and treating the data by means of systematic sampling technique as basis for issuance and retrieval of quality tested questionnaire of five-scale checklist inquiries.

Falk-Ross (2014) suggested that students reading difficulties will be motivated to read with the use of multimodal texts as they are more easily comprehended with the aid of other supporting modes such as visuals and sounds. Multimodal texts enrich students' learning experiences and provide them a wider grasp of knowledge and skills.

Kotzer and Elran, (2012) in their study suggested that the computer is a substantial part of the learners' daily lives. It is by now, inevitable that methods of teaching and learning should include E-learning components that are based on the computer environment and include proper practice for the 21st century which requires a "new pedagogy". This new pedagogy, in the case of Math and Science teaching and learning, employs: (1) High-order thinking and learning skills, (2) A constructivist approach to science teaching and learning, (3) information, communication, and scientific literacy skills using digital and advances technologies.

Tüzel (2013) conducted a quantitative study on the opinions of 61 prospective teachers and concluded that prospective teachers have a low awareness level of 56 Berker Bulut, Hacer Ulu & Adnan Kan multimodal text structures and multimodal literacy education. In the study, "Multimodal Literacy Scale: A Study of Validity and Reliability", of Bulut et.al. (2015) a scale designed to measure the multimodal literacy skills of future teacher was developed. In this way, teacher can identify the multimodal literacy skills during their undergraduate education, whereby educators can identify the prospective teachers without such skills and they can be trained in this respect.

According to Abella (2013), selection or creation of instructional materials must highly center on the consideration of students especially for the fact that student's generation changes from time to time. Instructional materials are the hearts of the classroom setting. Most teachers maintain control over the instructional material by the pronouncement about what is to be taught, what material and methods to be used and how much students will be allowed to interact and does it suit to the learning styles of the learners.

One study reiterated that teachers may adopt new innovations, techniques, strategies and other teaching approaches that aligned to the learners' multiple intelligence to use in their class in order to improve the ability and understanding of context (Tibay, 2014)

It recognizes the fact that teaching using Multimodal texts promotes students' engagement in learning by enhancing their meaning-making abilities with the supplement of ICT as a tool. It affirms that students' perception of Multimodal Texts lessons are described as highly engaging, self-directed, and learner-centered and promotes meaning-making with minimal guidance from the teachers.

Ibragimova (2011) carried out his study about "Multiple Intelligences Theory in Action in EFL Classes: A Case Study. The results of his study may have some practical and theoretical implications. First of all, it may

help language teachers in designing or adapting materials in terms of Multiple Intelligences Theory to better cater for the students" Multiple Intelligences and, as a whole, improve learning and teaching process.

Moreover, the framework can be used in various educational and cultural contexts to analyze textbooks of different levels. Finally, the findings of this study may contribute to the related literature regarding of the application of Multiple Intelligences in language classes.

Furthermore, Chauhan (2009:4) conducted his research about "Effectiveness of Multiple Intelligences Based Teaching in Teaching English for Primary School Students". He concluded that Multiple Intelligences Based Teaching is an effective method in teaching and learning English among primary school students. The collected data were subjected to the following statistical analysis to arrive the meaningful conclusion. It is inferred that in the control group, 20% students have low level, 70% of them have moderate level and 10% of them have high level of gain scores. In the experimental group, 10% of students have low level, 63.33% of them have moderate level and 26.67 % of them have high level of gain scores. Results showed that the students in the experimental group receiving MI-based instruction performed better than those in the control group. It proved that the research was successful to use effectiveness of Multiple Intelligences Based Teaching in Teaching English for Primary School Students.

Yalmanci and Gozum (2013) explored the effects of MI teaching approach on students' degree of accomplishment and their knowledge retention. For this study, two groups of science students were formed as the experimental and control groups, and MI-instruction was executed for the experimental group. Although no noteworthy difference was found between the two groups in the pretest results, regarding their information level about the subject under investigation, after the experiment, there was a significant difference between the groups in favor of the students who received MI-inspired instruction. Thus, the researchers concluded that the MI theory is effective in learning. Furthermore, a retention test was administered after three weeks from the research date and it was found that students from the experimental group could remember the information significantly better than those from the control group, and this



led to the conclusion that MI-inspired instruction also has positive effects on the retention of information.

Kok (2013) in a study on the correlation between learners' Listening comprehension performance and their Multiple Intelligence groups found no statistically significant difference between the experimental and control group students with regard to their multiple intelligence groups. Moreover, the results on the above mentioned area are rather inconsistent.

As an example, Adrian and Shagabutdinova (2012) proclaimed that logical, verbal, and spatial intelligences were the dominant predictors of multiple intelligences among 230 Russian college students; few studies have exclusively focused on exploring the impact of different intelligence abilities on the performance of private institute EFL learners. Accordingly, it seems that there is still a need to conduct more studies in the above mentioned area to get more consistent and conclusive results. The aforementioned result of the studies on multiple intelligence or MI based learning thrust the researcher to pursue the current study on multiple intelligence based multi modal lessons to support the theories and to determine the effectiveness of multiple intelligence based instructions. Furthermore, the studies mentioned above is connected to the present study for they provide pedestals on its content.

3. METHODOLOGY

Eighty Grade 8 students under the K to 12, Regular BEC curriculum were chosen as sample among the population of Pedro Guevara Memorial National High School. The respondents of the study were the students under the supervision of the researcher. These classes were assigned as Multiple Intelligence Based Learning (Experimental Group) with 40 students and another 40 students as Non-Multiple Intelligence Based Learning (Control Group). In addition, Seventy-five (75) English teachers from secondary public school in Santa Cruz, Pila, and Pagsanjan were purposively chosen as the respondents of the study and they were the ones evaluated the instructional material developed by the researcher. To determine the number of evaluator, Slovin's Formula was used by the researcher.

4. RESULTS AND DISCUSSIONS

The output of this study was the utilization of a developed multimodal texts in Afro-Asian Literature. Its efficacy was evaluated by means of pretests and posttests results of the control group and experimental group. The developed material was evaluated and validated by English teachers.

Table 1. Level of Academic Achievement of the Control Group and Experimental Group in Literature in terms of pretest and posttest scores.

Group	Pretest			Posttest		
	Mean	SD	VI	Mean	SD	VI
Control	20.68	8.398	S	33.53	7.535	VS
Experimental	20.03	9.225	S	39.1	6.254	VS

Legend:

Scale

40-49.99
30-39.99
20-29.99
10-19.99
0-9.99

Verbal Interpretation

Outstanding
Very Satisfactory
Satisfactory
Fairly Satisfactory
Did not meet expectation

Table 1 shows the respondent's in Literature in terms of pretest and posttest. The table also presents the academic achievement of the control group and the experimental group in terms of pretest and posttest.

The students in the control group showed satisfactory in pretest (M = 20.63, SD = 8.398) and very satisfactory in the posttest (M = 33.53, SD = 7.535). On the other hand, the students in experimental group showed satisfactory in pretest (M = 20.03, SD = 9.225) and very satisfactory in posttest (M = 39.1, SD = 6.254).

Based on the data, it shows that there is no significant difference between the pre-test of control group and pre-test of experimental group at 0.05 level of significance. It shows that

the null hypothesis stating that "There is no significant difference between the pretest of control group and pretest of experimental group" is accepted. It also shows that there is a significant difference between the pretest of control group and posttest of control group at 0.05 level of significance. It shows that there is a significant difference between the pretest of experimental group and posttest of experimental group at 0.05 level of significance.

This implies that both groups have the same level of knowledge about the topics prior to the start of the experiment. This is required for the study to be valid. This also implies a very satisfactory improvement on the performance of learners when they used the multiple intelligence based multimodal texts.

**Table 2. Level of acceptability of Passport to Africa and Asia: A Multimodal Text in Afro-Asian Literature on its characteristics**

Indicators	Overall Mean	Overall SD	Verbal Interpretation
Design	4.79	0.389	EA
Usability	4.84	0.344	EA
Suitability	4.81	0.376	EA
Consistency	4.80	0.380	EA

Legend:

Range	Verbal Interpretation
4.20-5.00	Extremely Acceptable
3.40-4.19	Very Acceptable
2.60-3.39	Moderately Acceptable
1.80-2.59	Slightly Acceptable
1.00-1.79	Not Acceptable

Table 2 shows the level of acceptability of Passport to Africa and Asia: A Multimodal Texts in Afro-Asian Literature on its characteristics; with the results of design with overall mean of 4.79, and with overall standard deviation of 0.389 which is verbally interpreted as extremely acceptable; usability with overall mean of 4.84, and with overall standard deviation of

0.344 which is verbally interpreted as extremely acceptable; suitability with overall mean of 4.81, and with overall standard deviation of 0.376 which is verbally interpreted as extremely acceptable; consistency with overall mean of 4.80, and with overall standard deviation of 0.380 which is verbally interpreted as extremely acceptable,

Table 3. Level of acceptability of Passport to Africa and Asia: A Multimodal Text in Afro-Asian Literature on its components

Indicators	Overall Mean	Overall SD	Verbal Interpretation
Objectives	4.85	0.335	EA
Content	4.84	0.355	EA
Development	4.82	0.396	EA
Evaluation	4.80	0.406	EA

Legend:

Range	Verbal Interpretation
4.20-5.00	Extremely Acceptable
3.40-4.19	Very Acceptable
2.60-3.39	Moderately Acceptable
1.80-2.59	Slightly Acceptable
1.00-1.79	Not Acceptable

Table 3 shows the level of acceptability of Passport to Africa and Asia: A Multimodal Texts in Afro-Asian Literature on its components; with the results of objectives with overall mean of 4.85, and with overall standard deviation of 0.335 which is verbally interpreted as extremely acceptable; content with overall mean of 4.84, and with overall standard deviation of 0.355 which is verbally interpreted as extremely acceptable; development with overall mean of 4.82, and with overall standard deviation of 0.396 which is verbally interpreted as extremely acceptable; evaluation with overall mean of 4.80, and

with overall standard deviation of 0.406 which is verbally interpreted as extremely acceptable,

The result of the evaluation made by the English teachers is extremely acceptable supported the study adequacy of instructional materials used by the teachers in teaching Afro-Asian Literature of Bolante, (2018). According to him an excellent instructional material has a big impact on the students learning since students learn most by doing. Engaging in hands on differentiated activities that suit to learners' multiple intelligence and interests gives the learners idea on how this



experience can be applied in a real life and improve academic performance.

5. CONCLUSIONS AND RECOMMENDATIONS

After gathering the findings, it was found out that the developed multiple intelligence based multimodal texts was evaluated extremely acceptable by secondary English teachers in terms of its characteristic and components had a positive effect on the students' learning performance on Afro – Asian Literature. It provides differentiated activities that suit to the diverse students' needs and interests and able to think learners critically. It is resulted a greater depth of understanding among learners by presenting multiple input of modalities and increasing motivation among learners. Therefore, the Department of Education may provide trainings for teachers on how to develop supplementary instructional materials like multiple intelligence based multimodal texts which are usable and suitable to the academic level of learners, consistent in content and design can fascinate the interest of learners. Teachers may develop multimodal texts anchored to grade 8 Competencies. The contents and objectives must be aligned with the content standard and learning competencies of the curriculum provided by the Department of Education. The development and assessment must be jived with the performance standard of the curriculum.

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IDENTIFICATION OF FATTY ACIDS IN ESSENTIAL VEGETABLE OILS MANUFACTURED IN KENYA USING GC- FID

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ABSTRACT

The aim of this research was to identify fatty acids using Gas Chromatography with a Flame Ionization Detector of edible vegetable oils manufactured in Kenya. Vegetable edible oils processed and refined in Kenya have not been characterized and hence it's impossible to distinguish between them. Sunflower, Corn and Soya bean vegetable oils by using physiochemical parameters dependently without an identification methods. Twenty two samples comprising of nine Sunflower of three different brand type, nine Corn oils of three different brand type and four Soya bean oils of two different brand type were collected from various supermarkets in Nairobi. The samples were transported, prepared and stored in the refrigerator at 4°C. GC-FID (Hewlett-Packard 6890 gas chromatograph - Agilent Technologies) was used for separation and quantification of FAMES. The GC-FID analysis was done under specific parameters and within the validation procedure linearity, precision and recovery, limit of detection (LOD) and limit of quantification (LOQ) were investigated.

KEYWORDS: sunflower oil, corn oil, soybean oil and Gas Chromatography with a Flame Ionization Detector (GC-FID)

1. INTRODUCTION

Vegetable oil is the key sub-sector of agriculture, currently there about 30 vegetable oil refiners in the country [16]. The larger companies include Bidco Oil Refineries, KAPA Oil Refineries, Pwani Oil Refineries, Palmac Oil Refineries and Unilever [18]. These companies engage in production of cooking oils, fats, edible oils, copra oil and corn oil among other oil products. [29] During extraction, purification and usage, oils undergo a variety of processing operations including heating, distillation and chemical modification which may alter their properties. To meet the quality and composition standards, oil and food industries use certain parameter to maintain the quality [11]. Free fatty acids content (acidity value) is one of the most frequently determined quality indices during the oil production, storage and marketing and it is often used to classify and /or evaluate oils. Other important parameter to be considered in oil analysis is the peroxide index. Peroxide is indicators of oxidative rancidity in foods. [5]

Around 14% of current oils production is used as starting material in manufacturing industry and around 6% are used as animal feed (indirectly)[18]. The remaining 80% is used for human food as spreads, frying oils, salads oils and cooking oils [23].

Sunflower is non- volatile oil expressed from sunflower (*Helianthus annuus*) seeds. The refined oil is clear and slightly amber – colour with a slightly fatty odour. Average oil content of the seed 40 – 50% of the entire fruit and 50 – 60% of the kernel only. The sunflower consist of phosphorus, wax, toropherols, carotenoids, chlorophlly, trace metals (Calcium, Magnesium and Iron). Sunflower oil has some unique characteristics that are popular with consumers, who use the oil in cooking and top dressing. [14]

Unlike many vegetable oils, corn oil (maize oil) is obtained from seeds (kernel). Production of corn kernel oil is costly due to low level of oils in the kernel because corn kernels contain high levels of starch 60 – 70%, a process of wet milling was developed to isolate pure starch efficiency from corn kernels. [19] Non starch portion of kernels are separated into four fractions: steep water soluble (about 70%), fiber (about 10%) corn gelatin meal (60%) and germ (7%). [22] Oil is usually obtained from dry milled corn germ by applying pressure. The level of total phytosterols in corn germ oil average a little more than 1%. [30] The corn oil consists of free fatty acids, tryacylglycerols, unsaponification and phytosteroids, tocophenola and tocotrienols and carotenoids. [22] Soya bean oil is a high- quality protein and valuable edible oil. It consist primarily of neutral lipids, which include tri-, di- and monoacylglycerols,



free fatty acids and polar lipids such as phospholipids[9]. It contains a minor amount of unsaponifiable matter that includes phytosterols, tocopherols and hydrocarbons such as squalene. Trace metals are found in soybean oil in ppm concentration. Soya bean oil has a high content of linoleic acids and a lower level of linoleic acid. [22] Triacylglycerols (TAG) are primarily neutral lipids in soybean oil. Due to high concentration of unsaturated fatty acid in soybean oil, nearly all the TAG molecules contain at least two unsaturated fatty acids, and di- and tri- saturated are essentially absent.

2. MATERIAL AND METHODS

Samples and sampling

Three types of Sunflower and Corn oils and two types of Soya bean oils were sampled. Out of each brand, 3 different batches were sampled at different supermarket. A total sample collected was 22 of 500ml size. Samples of vegetable edible oil: Sunflower oils (Table 2.1), Corn oils (Table 2:1) and Soya bean oils (Table 2:3) were collected from local supermarkets within Nairobi CBD during the period of October 2012 and February 2013.

Table 2.1: Sunflower oils

Lab code	Type of sample	Supermarket	Date of sampling	Batch No.	Expiry date
RS	Rinsun sunflower oil	Nakumatt	14/10/2012	6793913A	09/2014
		Naivas	07/11/2012	9612548C	12/2014
		Tuskys	13/01/2013	1253321F	01/2015
SS	Sungold sunflower oil	Tuskys	25/12/2012	02-34034	12/2014
		Naivas	07/11/2012	01-21650	08/2014
		Nakumatt	05/02/2013	05-25194	02/2014
ES	Equatorial naturals sunflower oil	Woolmatt	21/11/2012	1054A04T	10/2015
		Nakumatt	14/10/2012	1154G23L	06/2014
		Naivas	07/11/2012	851A24H	04/2015

Table 2.2: Corn oils

Lab code	Type of sample	Supermarket	Date of sampling	Batch No.	Expiry date
EC	Elianto corn oil	Woolmatt	21/11/2012	01-31018	06/2014
		Naivas	07/11/2012	01-26210	04/2014
		Tuskys	13/01/2013	03-15412	02/2013
CC	Captain corn oil	Nakumatt	14/10/2012	3515113A	12/2014
		Woolmatt	25/12/2012	4521627M	07/2014
		Tuskys	13/01/2013	54101225R	01/2015
DD	Chef corn oil	Tuskys	25/12/2012	A01/21524	07/2014
		Naivas	07/11/2012	A01/15133	09/2014
		Nakumatt	14/10/2012	A01/15467	02/2015

Table 2.3: Soya bean oils

Lab code	Type of sample	Supermarket	Date of sampling	Batch No.	Expiry date
SG	Soyagold oil	Woolmatt	21/11/2012	01-36638	06/2014
		Naivas	07/11/2012	01-26542	04/2014
HS	Hawaya soya bean oil	Tuskys	05/02/2013	B125045L	05/2015
		Woolmatt	21/11/2012	N16523J	03/2014

The sample was stored in plastic containers in the laboratory. To maintain the reactivity and the stability of the samples the following conditions was maintained:



Preparation of FAMES

Each of the vegetable oil of the samples was transferred to a screw –cap test tube and a known concentration of internal standard was added. FAMES were prepared by using 1ml of 2M NaOCH₃ in water bath at 60 °C. Drops of concentrated glacial acetic were added to neutralize the NaOH. After the solvent was removed under nitrogen gas flow, the samples were re-dissolved in 1ml of methanol: toluene (2:1, vol.), and 100µl of TMS-DM (2M) in n-hexane was added at 60 °C for 5 minutes. Drops of glacial acetic acid were added until the yellow colour disappeared to remove unreacted TMS-DM and the reaction mixture was diluted with 1 ml of 0.5% NaCl solution. Methyl esters were extracted twice in hexane containing the FAMES were pooled and dried under nitrogen gas before stored at - 20° C until GC analysis.

GC analysis of FAMES

FAMES in all the test tube samples were re-dissolved in 100µl hexane and 1 µl volume of each sample was injected five times into GC-FID (Hewlett-Packard 6890 gas chromatograph -Agilent Technologies) for separation and quantification of FAMES. The analysis was carried out using a SP-2560 column (100 m × 0.25 mm ID, 0.20 µm film) from Supelco (Bellefonte, PA, USA). The run was under an optimized temperature programme as follows: initial column temperature 100 °C for 4 minutes, programmed to increase at the rate of 10 °C min⁻¹ up to 160 °C and then at 3 °C min⁻¹ up to 220 °C. This temperature was maintained for 5 minutes, then at 10 °C min⁻¹ up to final temperature of 260 °C and held for 5 minutes. Injector and detector temperature were at 260 °C and 280 °C, respectively. Helium was used as the carrier gas at a flow of 1 ml min⁻¹ with a split ration of 30:1

3. RESULTS AND DISCUSSION

Table 3.1 indicates the retention time and coefficient of correlation (r²) for fatty acids.

Table 3.1: Linearity of the method

Fatty Acids	Retention time (min)	Coefficient of correlation (r ²)
Palmitic (C16:0)	22.759	0.99994
Palmitoleic (C16:1)	23.500	0.99990
Stearic (C18:0)	25.794	0.09987
Oleic (C18:1)	26.575	0.99994
Linoleic (C18:2)	27.320	0.99877
Linoleic (C18:3)	27.796	0.99886
Erucic (C22:0)	29.330	0.99992

About the data obtained from the examination of the fatty acid profile, arithmetic mean (X), standard deviation (SD) and coefficient of variation (CV) were calculated.

Table 3.2: Limit of detection and limit of quantification

Fatty acids	LOD (µg/ml)	LOQ (µg/ml)
Palmitic (C16:0)	0.05	0.21
Palmitoleic (C16:1)	0.09	0.24
Stearic (C18:0)	0.07	0.24
Oleic (C18:1)	0.09	0.31
Linoleic (C18:2)	0.08	0.24
Linoleic (C18:3)	0.06	0.28
Erucic (C22:0)	0.04	0.23

**Table 3.3: Repeatability, reproducibility and accuracy of the method**

Fatty acids	Repeatability RSD %			Reproducibility RSD %			Recovery %
	Oil sample			Oil sample			
	Sunflower n=9	Corn n=9	Soy bean n=6	Sunflower n=9	Corn n=9	Soy bean n=6	
Palmitic (C16:0)	1.26	1.28	1.74	2.19	3.55	4.23	98.21
Palmitoleic (C16:1)	1.57	1.49	1.59	2.47	3.91	3.92	98.95
Stearic (C18:0)	0.96	1.36	1.27	3.05	3.26	2.48	97.22
Oleic (C18:1)	1.98	1.89	1.84	3.14	2.09	2.91	96.83
Linoleic (C18:2)	1.79	1.25	1.28	2.91	2.74	2.65	102.26
Linoleic (C18:3)	1.26	1.06	1.57	2.15	2.75	3.49	100.13
Erucic (C22:0)	1.59	1.89	0.98	3.49	3.09	3.97	97.26

The individual fatty acid methyl ester standards (FAMES Palmitic (C16:0), Palmitoleic (C16:1), Stearic (C18:0), Oleic (C18:1), Linoleic (C18:2), Linoleic (C18:3) and Erucic (C22:0) acid were dissolved in n-hexane and added to the vegetable oil to the concentration of 1,000 ppm (w/v) and. Fatty acids were derivatized to fatty acid methyl esters (FAME) using BF₃/MeOH (14% boron trifluoride) and analyzed by GC according to AOAC 969.33 (16) with some modification. FAME was analyzed by Hewlett-Packard 6890 gas chromatograph (Agilent Technologies) with a FID, and a SP-2560 column (100 m × 0.25 mm ID, 0.20 μm film) from Supelco (Bellefonte, PA, USA). The oven temperature started at 100°C for 4 min, increased to 225°C at 30°C/min, and held at 225°C for 20 min. The temperatures of injector and detector were 225 and 285°C, respectively. The flow rate of helium carrier gas was 0.75 mL/min, the injection volume was 1 μL, and the split ratio was 1:200. Peaks of GC chromatograms were identified comparing the retention times of a mixture of standard fatty acid methyl esters. Each peak of fatty acid was quantified using an equivalent of the concentration of the internal standard. Samples were separately analyzed in triplicate.

The precision of the method was evaluated through repeatability and reproducibility and the results are expressed as the relative standard deviation (RSD, %) (Table 4.9). Repeatability of the method was established by six fold analyses of three different samples, while the reproducibility was established by three fold analyses of three different samples in three consecutive days.

The recovery (%) of the method was established by spiking a sample with a standard working solution at one concentration level (10.0 mg/ml), and assaying it in triplicate (Table 4.7). Accuracy of the method was verified through the recovery. The fatty acid composition of the vegetable oil samples are presented in Table 4.9.

Table 4.9: Fatty acid profiles for sunflower, corn and soya bean oils

Fatty acids	Samples											
	Sunflower				Corn				Soya bean			
		X	SD	CV		X	SD	CV		X	SD	CV
Palmitic (C16:0)	7.1	4.7	1.0	21.27	11.7	10	2.0	20.0	10.2	9.0	2.0	22.22
Palmitoleic (C16:1)	6.08	8.8	0.8	9.09	11.67	25.1	1.8	7.17	11.75	13.5	0.93	6.89
Stearic (C18:0)	3.26	2.0	0.4	20.0	1.85	3.5	1.5	42.86	3.7	4.0	0.9	22.5
Oleic (C18:1)	16.93	31.5	4.5	14.29	25.16	26.8	1.2	4.48	20.8	31.5	1.2	3.81
Linoleic (C18:2)	73.73	59.5	7.5	12.61	60.60	48	4.5	9.38	55.53	49.5	6.5	13.13
Linoleic (C18:3)	1.0	32.5	4.5	13.85	0.48	26.8	1.2	4.48	9.3	28.5	1.2	4.21
Erucic (C22:0)	0.9	59.5	7.5	12.61	0.3	48	4.5	9.38	0.2	57.5	2.2	3.83

4. CONCLUSION

In spectroscopic methods, the oils were analyzed by means of UV/Vis and IR spectroscopy. UV/Vis analysis was able to discriminate oils by differentiating in their λ_{max} absorbance. IR analysis revealed that each vegetable oil could be discriminated by looking at the pattern of each individual spectra.

UV/Vis spectroscopy was used to discriminate oils by the intensity of their λ_{max}. Sunflower, Corn and Soya bean oil had maximum wavelength as per Table 4.18. Sunflower oil, Corn oil and Soya bean oil samples showed similar values of maximum wavelength hence this disqualify out ultraviolet/visible spectroscopy for identification of different oil samples.



The results indicate that specific IR spectra regions prove to be very useful for identification of Sunflower, Corn and Soya bean oils. Vegetable oils contain the same type of fatty acids especially those C16 and C18 and triglycerides content is similar (C50, C52, C54), however, subtle spectral differences exist in Sunflower, Corn and Soya bean oils, so it is possible to identify the addition of foreign. The IR spectra for sunflower, corn and soya bean oil sample were distinguished by specific fingerprint. The use of infrared for analysis of edible vegetable oils is rapid because no sample preparation. Infrared spectroscopy can be used at the differentiation and classification stages of vegetable oils. This technique also allow for classification as well as determination of purity and authenticity of vegetable oils, such as corn, soya bean and sunflower oils

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A REVIEW ARTICLE ON THE NOVEL MECHANISMS FOR DELIVERY OF CANCER THERAPEUTICS

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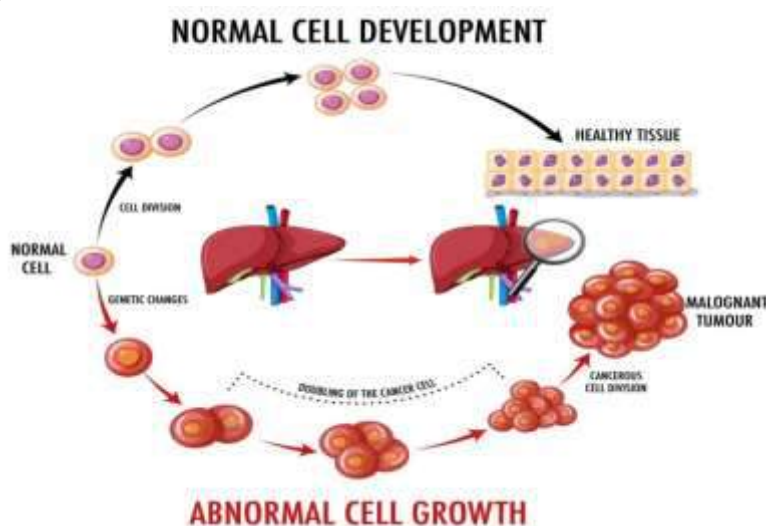
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ABSTRACT

The majority of cancer treatments used today focus on surgically removing the tumour mass. The rapid proliferation of malignant cells is significantly slowed down by physical and chemical therapies like radiotherapy and chemotherapy. Additionally, these treatments have a high level of toxicity and severe side effects, which decrease patient compliance. To improve treatment indices, new approaches to conventional cancer therapeutics, including cancer stem cell therapy, triggered release, intracellular drug targeting, gene delivery, magnetic drug targeting, ultrasound mediated drug delivery and photodynamic therapy have added new techniques for treating cancer. These methods have aided in the selective detection of cancerous cells, enabling their eradication with the fewest possible negative effects. This review discusses cutting-edge methods for administering chemotherapy more effectively in an effort to improve cancer prognosis.

KEYWORDS - cancer stem cells, photodynamic therapy, gene therapy, triggered release

INTRODUCTION



Cancer is a group of diseases involving uncontrolled growth and spread of abnormal cells. Such cells undergo transformations to obtain inexhaustible replication and thus traverse to other organs leading to malignancy. Cancer is becoming the second biggest cause of mortality worldwide due to the alarming increase in cancer incidence and treatment abnormalities. The overall annual economic toll of cancer is significant and rising. The causes of increased morbidity and death, in addition to the absence of effective curative treatments, include adverse treatment-related side effects, drug resistance, and tumour recurrence. The survival rate has substantially increased in the meantime. Wide-ranging improvements in cancer treatment have been made in



recent years with the goals of preventing cancer, achieving total tumour regression, reducing side effects, enhancing patient quality of life, and preventing tumour recurrence.(1)

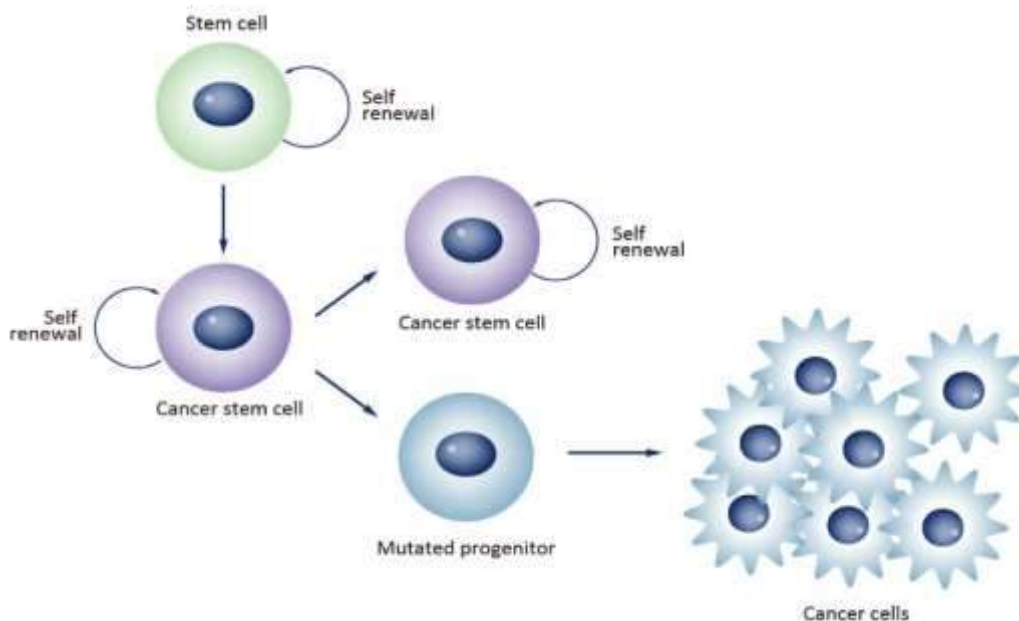
PHOTODYNAMIC THERAPY (PDT)

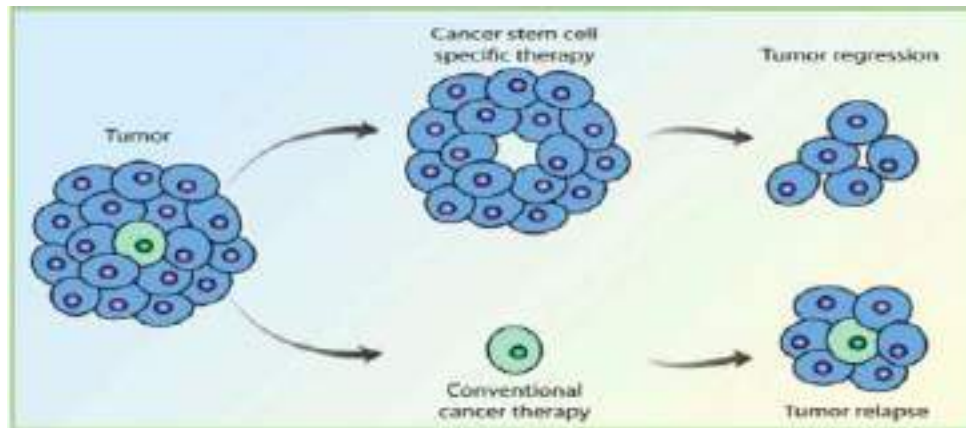
For the treatment of cancer, photodynamic therapy is a minimally invasive, dual-selective, and clinically- approved therapeutic method. Photosensitizer (PS), specific wavelength radiations (often in the visible or near infrared region), and oxygen are the three individually non-toxic components used in the procedure. These straightforward elements can be combined in a specific sequence to have complex cytotoxic effects on cancerous cells. The maximum absorption band (max) of the photosensitizer has the same wavelength as the radiations.³ PDT can have local anti-tumor cytotoxic effects, damage tumour vasculature, and induce systemic immunity by causing acute inflammation depending on the dose and type of photosensitizer used, the oxygen concentration in the tumour, the light dose, and the time interval between the administration of PS and irradiation. Delivering the targeted PS exclusively to the target malignant cells or tissue is made possible by tumour homing ligand grafting. The treatment is dual selective since the radiation is only spatially aimed towards the body's malignant mass area. The first PS for PDT was hematoporphyrin (an endogenous porphyrin), which the FDA approved in. (3)

CANCER VACCINATION

Cancer immunotherapy and cancer immunoprevention, respectively, relate to the use of vaccinations to treat or prevent the development of cancer. Innate (antigen nonspecific) and acquired or adaptive (antigen specific) immune systems interact in a complex way to produce immunity. The immune system's built-in immunity has the power to get rid of malignant cells. Normally occurring neoplastic cells are eliminated by the immune system. When the immune system's defences break down due to genetic and epigenetic abnormalities, cancers form. The essential elements of anticancer immunity are T-lymphocytes, which are capable of differentiating between healthy and malignant cells. Specific antigens or marker peptides are overexpressed by cancer cells as a result of oncogenes or DNA alterations. By identifying and eliminating cancer-specific epitopes attached to the major histocompatibility complex (MHC), activated T-cells can reject the malignancies. Antigen presentation cells (APCs), which identify, bind, and present lymphocytes with cancer-specific epitopes, are necessary for the stimulation of T-lymphocytes. Dendritic cells (DCs) are necessary for the formation of a powerful anticancer response because cancer cells perform poorly as APCs. These cells, which are generated from bone marrow, can recognise cancer antigens and present them to lymphocytes. Highly effective, DCs are known as "natural adjuvants" or "professional APCs" because they provide a connection between innate and adaptive immunity (8)

CANCER STEM CELLS





In tumour tissue, there is a clear hierarchy of cancer cells, according to recent studies. According to the cancer stem cell hypothesis, not all tumour cells in cancer are created equal. Cancers can only be started by a tiny population of tumour cells known as "cancer stem cells" (CSCs). This is a subpopulation of "Self-sustaining cells," which are multipotent, capable of self-renewal, and able to form diverse tumour masses. Additionally known as "Tumor starting cells" on occasion. The majority of the tumour is composed of "Transit Amplifying Cells" and "Post Mitotic Differentiated Cells." The former are cells that multiply quickly, whereas the latter are differentiated cells. Both cell types are descended from tumor-initiating cells and are not involved in the development of tumours. The "drivers" of local tumour recurrence and metastatic dissemination, according to current findings, are thought to be tumour initiators or cancer stem cells. Stem cells can be distinguished from the majority of cells in a tumour due to the presence of certain markers on their surface. Examples include the successful use of markers like CD133, CD44, and ALDH (aldehyde dehydrogenase) to identify highly tumorigenic cancer stem cells in HNSCC. Involved in cell adhesion and migration is CD44, a cell surface glycoprotein that serves as a hyaluronic acid receptor. (4)

LIGAND /RECEPTOR BASED TARGETING

Drug delivery via ligand/receptor targeting has proven to be successful. Chemotherapeutic drugs must be introduced into the cytoplasm of tumour cells or to subcellular organelles like the nucleus and mitochondria if they are to be more effective. Such targeting may be accomplished by careful ligand selection, customization, and design. It is important to clearly define the specificity of an antibody that targets an antigen that is overexpressed in cancer cells. In addition, a stable covalent bond must form between the ligand/receptor and the drug if a linker is present, such as in cell penetrating peptide (CPP) drug conjugates. But it's important to understand how drugs are released at the tumour location. Systemic toxicity could occur as a result of premature medication release. To target metastatic cells and prevent migration and invasion, researchers are looking into tumor-targeting ligands such as antibodies, aptamers, siRNA, and peptides. The two main types of targeted drug delivery are active and passive. Using a ligand to deliver medication is considered active targeting. These ligands may be surface-attached to a carrier system, such as nanoparticles, liposomes, or nanomicelles, or covalently conjugated to the active ingredient. (1)

GENE THERAPY

When working genes or genetic materials are injected into patients' cells during gene therapy, the damaged genes are either repaired or replaced at the molecular level. The oncogenes p53, bax, and other are mutated in the cancer cells. Gene therapy can therefore be extremely important in the treatment of cancer. Mechanism of gene therapy in cancer treatment includes delivering genetic material to cancer cells via viral carriers. After being delivered into cells, therapeutic genes work through a variety of ways, including silencing, up- or down-regulation, repair, or alteration of the specific target genes. Suicide genes may result in tumour necrosis or cell death. Cell development and tumour regrowth are inhibited by gene silencing. While gene editing might increase the effectiveness of various combo therapies (e.g. chemotherapy, immunotherapy, or radiation). Gene delivery can be done via Viral and Non-Viral vectors (9)

(i) VIRAL VECTOR

To assure the transport of genetic material, a vector is used as a carrier. The pathogenic portion of viral genes must be removed and replaced with therapeutic genes in order to use a virus as a vector. The therapeutic gene that makes up the viral vector is carried by the remaining non-pathogenic portions of the virus. (1)

(a) **Adenovirus (Ads)** are double-stranded linear viruses that are not enclosed. Ads are a very effective vector for treating glioblastoma multiforme (GBM) because they may cause transduction safely and high transgene expression. Squamous cell carcinoma of the head and neck can be treated with either medication. (1)

- (b) **Adeno-Associated viruses (AAV)** are tiny single-stranded DNA viruses with long-lasting expression, a broad host range, and a minimal immune response since they are not pathogenic. To treat tumours such prostate cancer, glioblastoma, cervical and breast cancer, nasopharyngeal carcinoma, and lung carcinoma, a number of AAV-mediated genes have recently been created. (1)
- (c) **Lentiviruses** are superior to conventional viral systems in several ways, including minimal immunogenicity and the capacity to transduce a wide range of cells. Many research teams have used lentivirus-mediated short hairpin RNA to knockdown PPM1D in colorectal cancer and lung. (1)
- (d) Herpes viruses are large enveloped DNA viruses that can carry large transgene.

(ii) NON-VIRAL

In comparison to viral approaches, non-viral techniques offer higher levels of transfection efficiency, lower immunogenicity, and superior large-scale production. (7)

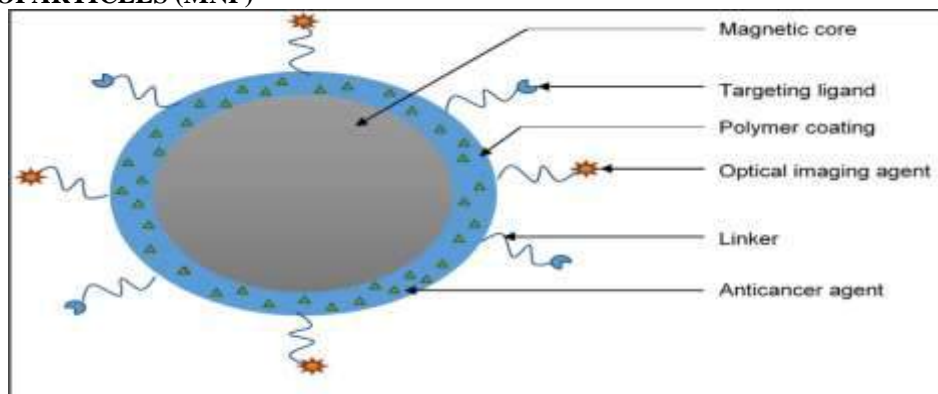
(a) **NAKED DNA:** The simplest method of delivering therapeutic genes is directly injecting free DNA into certain tissues, which causes the expression of the genes. DNA can be directly injected into the tumour or the tissues around it during cancer gene therapy to express tumour antigens that may serve as a cancer vaccine. This approach has a lower immunogenicity and is relatively cost-effective. (7)

(b) **ELECTROPORATION** (or electro-permeabilization) is a method that uses an electrical field to increase DNA's ability to enter cells. Numerous benefits of electroporation include precise therapeutic gene transfer, localised gene expression, and fewer side effects. 2004 saw the beginning of the first clinical trial. (7)

(c) **NANOCARRIERS** - These man-made non-bioactive nonviral vectors offer a reliable method of transferring genetic material to cells. Unique benefits of this strategy include low immunogenicity, reduced toxicity, and flexibility for chemical alterations. The fundamental disadvantage of this approach, however, is relatively low transfection efficiency. The preparation of the nano-vectors, such as nanoparticles or nanocapsules, typically uses biodegradable substances. These nanoparticles, which range in size from 10 to 100 nm, combine with genetic materials to produce a nano complex. These nano-vectors fall into two categories: inorganic nano-vectors made of silica, iron oxide, and gold nanoparticles, and polymeric nano-vectors made of dendrimers, lipids, PLGA, and chitosan. The transfection of the targeted genes is both safe and efficient. (7)

(d) **HYDRODYNAMIC** - It works by exerting a physical force that increases intravascular pressure.

MAGNETIC NANOPARTICLES (MNP)



The first magnetic microsphere was used by Widder and colleagues to target anticancer medicines to tumour tissue with the help of an external magnetic field. Magnetic nanoparticles (MNP) are adaptable systems that can be modified in a number of ways for therapeutic and diagnostic purposes. MNP have shown to be excellent magnetic resonance imaging (MRI) contrast agents because of their super paramagnetic properties. These substances are well tolerated and biocompatible. By covering MNPs with polymers, surfactants, inorganic metals, or oxides, this can be readily prevented. Magnetite (Fe_3O_4), maghemite ($\gamma\text{-Fe}_2\text{O}_3$), iron-based metal oxides (CoFe_2O_4 , NiFe_2O_4 , MnFe_2O_4), iron alloys (FePt and FeAu), rare earth metal alloys, and transition metals are some of the materials that are frequently utilised to create MNPs. As biomedical agents, cobalt, nickel, and chromium are less favoured due to their high toxicity and need for impervious covering. Materials made of iron oxide and iron alloys are often safer to use. (5)

TRIGGERED RELEASE

A magnetic field, light, ultrasound, or radio-frequency can be the external stimuli. The internal stimulation may be cellular enzymes, pH, temperature, or both. These response-triggered delivery systems allow for not only the precise administration of therapeutic drugs but also the regulation of the timing and volume of medication release into tumour cells. (1)

**(i) THERMO-RESPONSIVE RELEASE**

The physical properties of temperature-responsive or thermoresponsive polymers vary with temperature abruptly and discontinuously. These polymers can be functionalized with bind-specific biomolecule-binding groups. A slight temperature change can precipitate the polymer-biomolecules-conjugate out of solution.(1)

(ii) ENZYME RESPONSIVE RELEASE

Enzymes are important tools in the bio-nanotechnology toolbox because they have great bio-recognition abilities and catalytic activities. The resulting enzyme-responsive nanoparticles can be created to function effectively with selectivity for the triggering stimulus by combining certain physical features of nanomaterials. This potent idea has been successfully used in the creation of drug delivery systems that target the tissue of interest by releasing cargo in response to an enzyme's biocatalytic action. The nanomaterial can be configured to distribute pharmaceuticals via enzymatic conversion of the carrier when the enzyme activity linked to a specific tissue is expressed at higher concentrations at the target spot. Magnetic iron oxide nanoparticles (MIONPs) coated with MMP-sensitive PEG-hydrogel were created by Nazli et al.(1)

(iii) pH RESPONSIVE RELEASE

The pH sensitive system has been the most frequently used nano-system in cancer therapy among the many forms of stimuli. It is generally recognised that different tissues and organs, including the stomach and liver, as well as disease states like ischemia, infection, inflammation, and cancer, have drastically variable pH levels. Due to the high rate of glycolysis in cancer cells, tumours' lower pH and aerobic and anaerobic environments can be used to specifically target chemotherapy to these cells. While normal tissue has a pH of 7.4, tumours have been shown to have acidic pH values between 5.7 and 7.8. In order to create pH-responsive medication release, various strategies have been devised. Adding a "ionizable" chemical group, such as amines, phosphoric, or carboxylic acids, among others, to polymeric structures is one of the most widely utilised strategies.

ULTRASOUND

The delivery of anticancer drugs and non-invasive therapy have both been advised for ultrasound as a traditional diagnostic technique. There are three potential ways for how ultrasound can deliver drugs: heat effects, cavitation, and radiation forces. Ultrasound has been used to improve the overall effectiveness of the cytotoxic effects from carriers like microbubbles and nanobubbles as well as to facilitate the intracellular administration of a specific medicine. For the treatment of cancer, ultrasound as a component of a drug delivery system has the potential to be combined with a variety of drug carriers(6)

THERMAL EFFECT

The rate of thermal transport and conversion, ultrasonic intensity and frequency, and energy absorption all play a role in localised tissue heating. Even a slight temperature increase can considerably enhance blood capillary permeability and/or lead to fluidization of cell membranes. The most often researched ultrasound-responsive drug delivery system, temperature-sensitive liposomes, have been used to take advantage of the ultrasound's thermal effect. The administration of different anticancer medications to tumours was enhanced by thermosensitive liposomes when combined with localised hyperthermia under ultrasonography. The phospholipid membrane of liposomes transitions from a gel to a fluid phase, making them more permeable. This method permits non-destructive hyperthermia (39–41 °C) and fast drug release in the target area . (1)

CAVITATION

Under an ultrasonic field in a fluid medium, acoustic cavitation causes small stable gas bubbles to oscillate and collapse. The importance of this non-thermal ultrasonic process is regarded as being the highest. Especially for improving medication delivery, this method has the ability to cause cavitation in biological tissues. Combining gas-filled microbubbles has been shown to significantly improve cavitation. Acoustic cavitation activity can be divided into two categories: non-inertial (or stable) cavitation and inertial (or transient) cavitation. The non-inertial cavitation bubbles may continue for numerous acoustic cycles with stable oscillation. Microbubbles administered systemically cause alternating vascular wall invagination and distention via non-inertial cavitation. In turn, it damages the endothelial lining of the blood artery and briefly increases its permeability. improved distribution to the whole tissue and improved extravasation (10)

CONCLUSION

The leading cause of death in the world today is cancer. Despite being the cornerstone of the fight against cancer, conventional chemotherapy is linked to typical cell damage. Conventional cancer treatments frequently have harmful side effects and toxicities because they lack selectivity. The new cancer treatment is at the centre of such novel approaches. As a result, these innovative technologies present fresh possibilities for cancer prevention and treatment that are less hazardous to normal cells and can be implemented in clinical settings relatively soon. In this study, we explored several cutting-edge strategies for treating cancer cells, including ligand and receptor-based targeting, triggered release techniques and gene delivery. This review paper has covered a wide



range of contemporary methods for delivering cancer therapeutics, including intracellular drug targeting, cancer stem cell therapy, magnetic drug targeting, and ultrasound-mediated drug therapy. The survival rate has increased significantly, and cancer treatment is continually getting better.

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