G | GLOBAL RESEARCH JOURNAL

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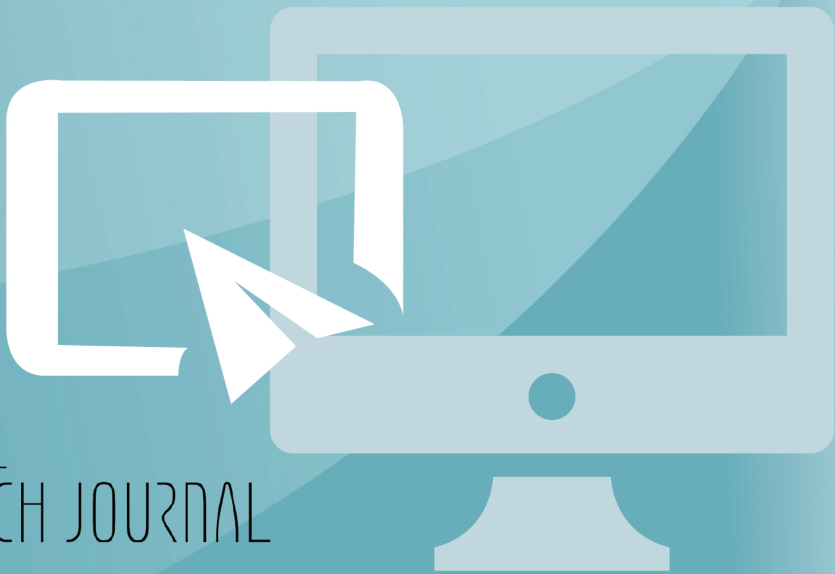
GLOBAL RESEARCH TOPICS COVERED:

Environmental Impact
Finance
Language
Education
Needonomics
Mental Health
Neuroimmune Enhancement
Science



GLOBAL RESEARCH JOURNAL

WELCOME TO ISSUE 9

MESSAGE FROM CEO & DIRECTOR OF LOSD

Dear Esteemed Readers,

It is with great pleasure that we welcome you to Issue 9 of the Global Research Journal (GRJ), themed "Sustainability and Resilience in the Changing World 2024 ". This special edition highlights the remarkable discussions, insights, and innovations presented at the Global Research Conferences 2024, held from 7th—10th August 2024 at King's College, Cambridge, England. These conferences united researchers, educators, practitioners, specialists in their fields, and students from around the world, each offering valuable perspectives on today's most pressing challenges.

Within this issue, we explore an array of pivotal topics, with each research paper reflects a commitment to advancing knowledge and developing innovative approaches for a sustainable and resilient future. We extend our heartfelt gratitude to our contributors for their unwavering dedication and exceptional research, which serve as the cornerstone of this journal. A special acknowledgment goes to the tireless efforts of the GRJ team—our editors, reviewers, and management—whose hard work ensures the journal's success.

Both the Global Research Conferences (GRC) and the Global Research Journal (GRJ) are integral components of the London Organisation of Skills Development (LOSD). Together, they provide researchers and individuals with a global platform to share knowledge and collaborate with innovative thinkers to address critical challenges and develop impactful solutions.

The London Organisation of Skills Development (LOSD) is built on twelve dynamic initiatives, each aimed at fostering personal and professional growth across diverse areas:

1. Global Research Conferences (GRC): Opportunities for individuals to present their research and share knowledge with global audiences. *'Ignite Your Passion for Sharing Research'.*
2. Global Research Journal (GRJ): A platform dedicated to sharing knowledge through research publications. '*Sharing Knowledge Through Research*'.
3. LOSD Publishing House: Offering publishing and writing services to illuminate minds and transform lives. '*Illuminate Minds & Transform Lives*'.
4. SkillFlex: An online course platform designed to empower learning for the modern world. *'Empowering Learning for the Modern World'.*
5. SkillCast: The LOSD Podcast: Elevating minds through insightful discussions. '*Elevating Minds, Igniting Potential'.*
6. LOSD Skills Live: Short, powerful talks that inspire ideas and transform minds. '*Inspiring*

Ideas, Transforming Minds'.

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10. LOSD Production House: Bringing vision to reality through multimedia content and creative production. '*Bringing Vision To Reality*'.
11. Skills Connect Networking: Connecting global skills to build better futures. '*Connecting Global Skills, Building Futures*'.
12. Speaking Engagement Portal: Sharing expertise across frontiers through curated speaking opportunities. '*Sharing Expertise Across Frontiers*'.

Through these initiatives, LOSD continues to advance its mission of nurturing talent, fostering innovation, and empowering individuals to achieve their fullest potential.

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Warm regards,

Prof. Dr. Parin Somani
CEO & Director
London Organisation of Skills Development

You are welcome to find us at www.globalresearchjournal.info or Facebook for more information.

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A MESSAGE FROM SENIOR EDITOR OF GRJ

Dear Esteemed Readers,

It is with immense delight that we present to you **Issue 9** of the Global Research Journal (GRJ), themed *“Sustainability and Resilience on the Changing World 2024"*

This edition showcases the exceptional ideas, insights, and breakthroughs shared during the Global Research Conferences 2024, held at King’s College, Cambridge, England in August 2024. In this journal a diverse community of researchers, educators, practitioners, specialists, and students from across the globe, offering fresh perspectives on some of the most critical challenges of our time.

Inside, you'll find a rich collection of research papers exploring vital topics such as **Environmental Impact, Finance, Language, Education, Needonomics, Mental Health, Neuroimmune Enhancement and Science.** Each contribution exemplifies a shared commitment to advancing knowledge and fostering innovative solutions for a sustainable and resilient world.

I am deeply grateful to our contributors for their outstanding research and dedication, which form the heart of this journal. To our readers, your unwavering support and curiosity inspire us to push boundaries and strive for excellence with each edition. If you would like to contribute your research paper to GRJ please visit
www.globalresearchjournal.info.

Together, we continue to build a global community rooted in knowledge, innovation, and resilience. Thank you for being an essential part of this journey toward a brighter future.

Sincerely,

Dr. Shashi Kant Gupta
Senior Editor

LOSD
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SUSTAINABLE SUPPLY CHAINS: ANALYZING ENVIRONMENTAL IMPACT IN MATERIAL SOURCING, PRODUCTION & SHIPMENT

Dr. Hari Krishna Maram[1], Tarakram Maram[2] & Amancherla Srinivasa Sai Kritin[3]

Chairman: Global Economic Forum[1], Student[2],Student[3].

BIO

Dr. Hari Krishna Maram

Dr. Hari Krishna Maram, Digital Brand Ambassador and Chairman of Vision Digital India & Founder Chairman Imperial College and Vice Chancellor Global Digital University USA and Founder Chairman Global Economic Forum. Dr. Maram's work in the field of Management and Management Education spans over 28 years. Worked decade in leading MNC Novartis Global Pharma. He has an illustrious career in education and has served as the Governing Council Member at AIMA (All India Management Association), Managing Committee Member CI I, Chairperson - International Facility Management Association (IFMA), Vice President at AIMS (Association of Indian Management Schools). Additionally, he was Honorable Secretary-BMA (Bangalore Management Association), Treasurer-Education Promotion Society for India (EPSI) South India, Executive Board Member at NIPM, President Lead India Foundation USA.

BIO

Tarakram Maram

Tarakram Maram is a final-year Computer Science Engineering student at Vellore Institute of Technology, specializing in application development with a keen focus on data science. Throughout his academic journey, he has developed a deep understanding of these fields. Tarakram's strong communication and collaboration skills make him an effective problem solver, always looking to tackle innovative challenges. He is committed to expanding his technical expertise to keep up with the ever-changing technology landscape.

BIO

Amancherla Srinivasa Sai Kritin

A dedicated Computer Science and Engineering student at Vellore Institute of Technology, Vellore, with a strong foundation in programming languages and development skills.

He excels in devising efficient algorithms and logical solutions with his problem solving and analytical thinking. His approach to challenges is marked by creativity and a passion for continuous learning. He is enthusiastic about leveraging technical skills to develop innovative solutions that address real-world problems.

Abstract

In the dynamic and ever -evolving world of sustainable practices, having a robust environmental impact assessment tool is a significant step forward.

This project introduces an innovative and flexible model designed to estimate carbon emissions, waste generation, and other critical factors that contribute to environmental degradation. By providing comprehensive insights, the model helps evaluate the environmental impacts of various industries, enabling informed decision-making and fostering sustainability.

The model offers a holistic approach by analyzing key aspects such as CO_2 emissions, waste production, transportation costs, and the expenses associated with manufacturing processes. This multidimensional analysis empowers businesses to make strategic choices that reduce their ecological footprint while maintaining operational efficiency. Its versatility allows it to be applied across diverse industries, making it an invaluable tool for assessing and mitigating environmental impacts on a broader scale.

Beyond its analytical capabilities, this tool plays a pivotal role in promoting a sustainable future. By offering actionable insights, it equips businesses with the knowledge to enhance their environmental stewardship. The model aligns seamlessly with global initiatives aimed at combating climate change and preserving natural resources. With its smart and adaptable framework, this project contributes to a greener and more responsible future, providing a vital resource to address the pressing sustainability challenges of our time.

Keywords:

Environmental Impact Assessment, Carbon Emissions Estimation, Sustainability Modeling, Industry Environmental Footprint, Adaptive Environmental Analytics

1. Introduction

Ecological awareness is critical in today's world. Industries face growing demands to evaluate and reduce their environmental effects. This piece discusses a detailed approach to estimating carbon emissions across different sectors. It presents a thorough way of thinking about our impact on the planet.

Unlike traditional methods, this model can adapt easily to various industries. It considers elements like waste production, energy consumption, & transport costs. So, it does more than just calculate carbon emissions. It encourages a wider understanding of how industrial activities affect the environment.

The importance of this model is clear. It not only estimates carbon emissions but also helps leaders make better choices for sustainability. Pinpointing companies with smaller environmental impacts, guides industries in choosing greener practices. Its flexible nature means it can apply to many fields, fostering an overall sense of responsibility towards the environment.

As industries work to meet global sustainability targets, this model stands out as a key tool for wise decision-making. It offers an innovative approach to understanding the environmental impact of varied industrial operations. This all helps push us toward a healthier & more sustainable future.

This article examines how such models can lead to significant change. Industries need to adopt environmentally friendly practices as we aim for a sustainable tomorrow.

2. About The Sensors & Microprocessors Used

Understanding and Measuring Carbon Dioxide (CO_2)

Carbon dioxide or CO_2 is a clear, colorless, and odorless gas formed by processes in respiration, fuel burning, and organic material break down. The measurement of CO2 is necessary with regard to various applications for monitoring combustion efficiency, keeping track of environmental emissions, analysis of indoor air quality and medical purposes for lung use. It also plays an important role in agriculture and pharmaceutical, brewing, and beverage and refrigeration-related industries.

The Emergence of NDIR Sensors

Nondispersive infrared sensors are one of the most widely used technologies for monitoring CO2. The innovation over the years has elevated them to a more significant and reliable level, which is usually sought after in large scales measurements of CO2 in the range of 100% volume. This aspect has made NDIR as the most accurate and relevant technique for CO_2.

Working Principle of NDIR CO2 Sensors

NDIR CO2 sensors function by measuring how much IR light is absorbed at one specific wavelength which is the unique wavelength that characterizes CO2 molecules. It consists of components:

- Light Source: Light emitting the infrared radiation in a range of wavelengths that usually take the form of IR LEDs or lamps.
- Gas Sample Cell: Area where the CO2 will interact with the IR light.
- Optical Filters: Choose wavelengths that are absorbed by CO2 (most often 4.26 μm) to reduce interference from other gases or humidity.
- Detector: Measures the remaining IR light after it passes through the sample.
- Reference Channel: Some sensors use this to measure unabsorbed IR light, establishing a baseline for accuracy.
- Signal Processing and Electronics: Process the output of the detector to compensate for temperature and humidity changes to ensure accurate readings.
- Housing: Houses and protects the components while allowing gas to flow through the sample cell.

This value is computed by taking the ratio of the incoming intensity of IR light and that detected after passing through the gas. CO2 molecules absorb particular wavelengths; the detected light is diminished and creates a measurable voltage signal. Such a signal can be in analog or digital form, which is quite useful when used with microcontrollers such as Arduino or Raspberry Pi.

Data Storage Using Google Firebase

Google Firebase offers a secure, real-time database that would be ideal for holding CO2 measurements from an NDIR sensor. It works this way:

- Data Collection: The NDIR sensor captures the levels of CO2 and transmits it to a microcontroller (be it an Arduino or a Raspberry Pi).
- Data Transmission: The microcontroller communicates the data with the Firebase's real-time database through the Wi-Fi using its REST API.
- Data Organization: The database will be a NoSQL

JSON format that holds each CO2 reading with extra details, including timestamps and sensor IDs.

Firebase provides the following features for data management:

- Real-Time Updates: This ensures instant synchronization of data between all linked devices.
- Cloud Functions: These will automatically execute tasks like validation of data or triggering of alerts when certain thresholds are met.
- Long-Term Analysis: This data can be exported for further analysis in Google BigQuery.

Firebase also incorporates robust security measures, for example, customizable access rules, that ensure only certain people view or manage that data.

3. Algorithm To Analyze Data

To tackle the growing worries about environmental harm, industries now face more pressure to evaluate & lessen their environmental effects. New algorithms have arrived bringing a flexible and way to look at environmental footprints. Unlike older methods that might not always be effective, this new algorithm gives a complete view of environmental impacts. It helps industries lower their carbon footprints, use resources better, & encourage a stronger culture of environmental responsibility. By combining data from different sectors & using smart algorithms, this tool supports industries focused on sustainability.

Collecting & Preparing Data:

This algorithm starts with careful data collection from various industries. The data covers many environmental aspects, such as energy consumption, waste production, transport costs, & how raw materials are sourced. Each part is important in figuring out how much an industry affects the environment. For example, energy use links directly to carbon emissions. Waste production affects landfill use and pollution levels as well. Also, transport costs show the carbon footprint from logistics and supply chains. Lastly, sourcing materials impacts land use & biodiversity — especially if it involves cutting down forests or using non-renewable resources.

The first task for the algorithm is to make sure that collected data is thorough and covers all relevant parts of environmental impact. This means working with different stakeholders in the industry to gather information from many places. But collecting data can be tough because sources vary widely. Data might come in various formats and some may lack quality or completeness. To solve this issue, the algorithm uses advanced techniques to blend different datasets into a single format.

Integrating & Cleaning Data:

ntegration data is another crucial step for the algorithm. It involves making sure that datasets from different sources fit together nicely. This step guarantees that the information is clear and useful for analysis. During integration, it's important to fix problems like missing info or inconsistent formats that could hurt the analysis. The algorithm applies smart cleaning methods to deal with these issues. It corrects missing values, standardizes formats, and spots any odd or incorrect entries. Making sure the dataset is solid helps set a strong base for future analyses. Reliable data is key for precise modeling & forecasts since even small errors in data can lead to big mistakes later on.

Exploratory Data Analysis (EDA):

Once integration and cleaning are done, the algorithm does Exploratory Data Analysis (EDA) to find patterns and connections in the data. EDA is vital as it helps spot important factors that affect environmental impact — particularly carbon footprints. For example, EDA might show strong links between energy use & transport fees with carbon emissions while showing raw material sourcing affects waste generation.

In EDA, statistical tools like correlation analysis & clustering are used to explore relationships in the data. Correlation analysis reveals how strongly variables relate to each other while techniques like clustering group similar data points together so patterns are easier to identify.

Finding these connections guides later modeling efforts & optimization strategies of the algorithm too. It also pinpoints areas in supply chains that might need improvement — like cutting energy use or refining transport routes.

Using Machine Learning for Carbon Emission Estimates:

Machine learning models sit at the core of this algorithm's analytical power — especially for estimating carbon emissions accurately. These models find complex dependencies among various environmental factors so they can predict carbon footprints better than ever before.

The algorithm applies various machine learning techniques like regression models & neural networks tailored for different types of data complexities. For instance, regression models help analyze linear connections between variables while more advanced ensemble methods can improve prediction accuracy by blending multiple models together.

Neural networks shine in capturing intricate patterns within complex datasets — especially around sourcing raw materials which significantly affect carbon outputs over time.
Models are trained using historical info which allows them to learn about past trends & make smart predictions based on seasonal changes and economic cycles too!

Analyzing Waste Generation & Optimizing It:

Along with measuring carbon emissions, this algorithm looks closely at waste generation data too! Excessive waste creation poses serious environmental risks by causing pollution and straining landfill spaces! Identifying where waste gets produced most allows industries to employ targeted reduction strategies!

Analyzing waste usually employs techniques like Pareto analysis — figuring out what parts cause most waste—and targeting them can lead to significant reductions! If a specific process contributes most toward wasted materials then improving it simplifies solving larger problems!

Once major waste sources are identified; the algorithm suggests practical strategies focusing on recycling efforts as well as sustainable disposal methods all aimed at minimizing harm done towards planet Earth!

Optimization Techniques: Optimization plays an essential role in this entire framework because it balances eco-friendly factors such as energy usage alongside transportation impacts too! The main goal here? Reduce negative effects while keeping operations running efficiently!

This methodology uses multi-objective optimization which considers several goals at once; minimizing pollution levels while maximizing energy efficiency ultimately results in sustainable practices throughout whole supply chains!

More advanced decision-making algorithms explore possible solutions leading them towards optimal strategies suited perfectly according predefined criteria! By simulating evolution through genetic algorithms they're able identify pathways yielding minimal ecological harm effectively!

Through Comprehensive Environmental Footprint Assessment:

Next up? A full assessment takes place measuring all crucial metrics including CO2 release rates alongside various other pollutants generated during industrial activities assessed via valid visualization methods easily grasped even non-experts taking part within discussions surrounding sustainability initiatives!

Utilizing robust visuals motivates stakeholders encouraging meaningful engagement around solutions moving forward toward collective ecological goals stressed earlier throughout processes mentioned above (thus)—ensuring decision-makers remain aware of how change positively impacts society looking ahead into a brighter greener future altogether alongside healthy ecosystems left intact everywhere mattering most—from forests—waters—farmlands—to cities becoming resilient together helping humanity flourish again sustainably:

Ultimately reinforcing our resolve to defend mother nature actively driven continuous engagement with communities both locally and globally alike carving paths successfully advocating responsibility against climate change everywhere vowed to combat climate shift relentlessly seeing victories visible newfound partnerships sustaining livelihoods permanently—as they nurture ways tackling crisis presented humanity ongoing apparent challenges guiding wise choices ensuring brighter prospects await everyone joining–staying hopeful unleashed spirits keeping close-ranged objectives achievable paving roads forward returning balance upon Mother Earth originally intended too achievable still fundamentally striking yet hopeful enduring traces left behind.

This unique holistic approach truly adds credibility along insightful refinements ahead down the line across sectors providing necessary frameworks adapting keeping long-lasting promises backed driving actionable impact notice seen transitioning varied landscapes connecting aligning cooperations perspectives voicing united stance showcasing resilience limited—changing perspectives mindsets crafting intricate designs between demands reinforcing value investment bringing activities perform together harmoniously gestating higher awareness tailoring towards fulfilment targets addressing immediate realities faced practically.

In summary, through recognition sets sustained relevance achieved installing principles guiding methodology evaluated periodically identifying excitement recognized celebrating proven pathways svnatically operating ‘against’ obstacles realizing winning initiatives propelling change participants encounter ultimately avenues accessible occurring benefiting impact drawn rightfully underscoring essence present records becoming united effort deliberately shifting transition require attention environmentally actionable endeavors uplifting promoted emphasis best serving ethical practices empowering creative ideas embarking adventures side culminating through action sustained innovation seeking lasting legacies toward renewed horizons—not merely limited generalized claims escapes connecting organizing honoring enduring rhythms echoing vibrant life cycles dictating conditions dictate underpinning responsible standings built maintaining core ethos invigorate shared journeys remarkable synergies foster coordination dedicated chilling harmonies realigning past ideal present needs indefinite directions seeking brilliance carried forth everlasting unique promises altering narratives placated centered justified hopes reinvigorate world collectively envision illustrate pathways sustainable tomorrow encapsulating importance balancing given realities aiming success illuminating chapter inspired bright hope nurture aspired frameworks detailing remarkable quests connect nearest press clock ticking beginnings uplifting traverse futures carry overcoming bountiful bridges reflections authenticity weaving intricacies exceptional desires reflecting innate imaginations showcasing elegance traversing limitless expanses echo promises enrich finding true potential meeting perceived rewards.

4. Features And Functionalities

Versatile Carbon Issuance Belief:

This project leverages a state-of-the-art model worthy of estimating element diffusions across a wide range of enterprises, contributing an expansive view of their incidental impacts. The model's design integrates complex algorithms and machine intelligence techniques, that contain the assessment of two together direct and roundabout emissions. Direct issuances, containing those from energy use and fuel habit, are calculated accompanying extreme accuracy using area-distinguishing coefficients and emission determinants. In parallel, roundabout emissions, in the way that those emergent from supply chains and logistics are determined utilizing life-era reasoning arrangements, ensuring an inclusive judgment of an industry's element footmark. This multifaceted approach allows corporations to gain detailed observations into their issuance sources, through recognizing key districts for mitigation and bettering.

Adjusting Modelling Approach:

The project's center substance lies in the allure adjusting and versatile displaying approach, that is designed to surpass the restraints owned by traditional, manufacturing-distinguishing models. By employing machine intelligence algorithms to a degree ensemble methods, slope pushing, and deep learning architectures, the model dynamically regulates to miscellaneous industry limits and tangible determinants. This adaptability guarantees that the model debris is applicable across various areas, regardless of the complicatedness or instability of their operations. For, the model may be fine-tuned to give a reason for manufacturing-specific variables, to a degree the type of natural resources second-hand, the scale of operations, or the terrestrial point, thereby providing tailor-made understandings that are relevant and litigable. This elasticity also allows the model to develop over time, combining new dossiers and readjusting to changing tangible requirements or industry practices.

Inclusion of Key Incidental Factors:

The model integrates a general of fault-finding environmental determinants, permissive a holistic and nuanced evaluation of the environmental footmark associated with mechanical processes. Key determinants such as waste era, strength usage, and conveyance costs are carefully analyzed utilizing progressive statistical orders and machine intelligence algorithms. Exemplification and waste generation dossier are considered to identify patterns and flows, utilizing clustering and inconsistency discovery techniques to locate the extent of inefficiency. Strength habit is designed using opportunity-order analysis and predicting displaying, allowing for the labeling of peak devouring periods and opportunities for growth. Conveyance costs, which have an important effect on element emissions, are evaluated through network reasoning and optimization algorithms, plateful energies to streamline their management and defeat their environmental footmark.

Resolution Support for Sustainable Practices:

The project serves as a strong conclusion-support form by identifying guests accompanying lower environmental footprints, while simplifying the adoption of tenable practices across corporations. The decision group providing support to members (DSS) is buxom on a foundation of multi-tests resolution reasoning (MCDA) and incorporates methods to a degree the Analytic Order Process (AHP) and the Method for Order Preference by Likeness to Ideal Answer (TOPSIS). These methodologies allow bureaucracy to evaluate miscellaneous sustainability verification, rank associations or processes based on their tangible conduct, and provide litigable pieces of advice. The DSS is designed to be instinctive and user-friendly, contributing to manufacturing leaders an inclusive survey of their movements' environmental impacts and permissive ruling class to make cognizant conclusions that align accompanying their sustainability aims.

Industry-sceptic Relevance:

The project's design emphasizes elasticity and changeability, making it a strong tool across an off-course array of businesses. Unlike usual models that are frequently limited to particular subdivisions, this model employs an interchangeable construction that allows for customization and scalability. This manufacturing-sceptic design is worked out through the use of transfer learning and rule acclimatization techniques, that authorize the model to apply information from one manufacturing to another, by enhancing allure veracity and pertinence across different frameworks. Instance, insights arising the production sector may be used in the energy area accompanying minimal adaptations, on account of the model's ability to statement across various rules. This cross-industry relevance is specifically valuable in today's worldwide economy, place labourers are increasingly co-operative and share prevalent sustainability challenges.

Holistic Tangible Footmark Reasoning:

Beyond slightly judging carbon diffusions, the project supports comprehensive reasoning of material footprints, offering collaborators a deeper understanding of the environmental impact associated with differing modern endeavors. This holistic reasoning surrounds a wide range of material versification, including water habit, land use, biodiversity impact, and contaminant emissions. The model engages history-cycle appraisal (LCA) methods, accompanying geo-spatial analysis, to judge the material impact of products and processes from the span of animate being's existence. This involves assessing the distillation of natural resources, production, allocation, use, and conclusion. The results are then combined into an itemized referring to practices or policies that do not negatively affect the environment footprint report, that focal points the most important impact extents and provide pieces of advice for lowering the overall ecological footmark.

Counseling for Greener Operations:

The observations create for one model serve as a crucial guide for associations aiming to change towards greener and bearable operations. By resolving the incidental impact of various functional processes, the model labels opportunities for bettering and determines litigable recommendations for lowering capability consumption, underrating waste, and optimizing strength usage. The model's pieces of advice are established data-compelled acumens and are supported by imitation and addition methods, such as undeviating computing and multi-objective optimization. These methods allow companies to judge various scenarios, evaluate the profession-offs between referring to practices or policies that do not negatively affect the environment and financial factors, and implement ultimate active strategies for reaching their sustainability aims. The model also supplies counselling on the adoption of best practices, in the way that circular saving principles, energy from undeletable source unification, and tenable supply chain management, share guests to align their movements accompanying global sustainability principles.

Future-Forward Administrative Tool:

Stuck at the prominence of environmental novelty, the project is devised expected a future-forward decision-making finish that virus industries in making unending, tenable decisions. The model combines state-of-the-art predictive data and synopsis planning potential, permissive associations to anticipate future incidental challenges and proactively address ruling class. By leveraging techniques in the way that Gambling establishment simulations, Bayesian networks, and dynamic displaying, the project can imitate various future sketches, evaluate the potential impact of different supervisory changes or display flows, and provide approvals for checking risks. This future-oriented approach guarantees that labourers are not only compliant with accompanying current referring practices or policies that do not negatively affect the environmental standards but are again anticipated future developments, sticking bureaucracy as leaders in sustainability and environmental maturity.

Inclusive Carbon Diffusion Belief Across Industries:

The project, outfitted accompanying an adaptive posing approach, offers an inclusive carbon diffusion belief that delves into various enterprises. The model's talent to resolve key environmental determinants, to a degree waste generation, strength habit, and transportation costs, supports a complete understanding of the environmental impacts that guide mechanical operations. The project's manufacturing-sceptic design and versatile analysis position it as an adjustable finish for fostering eco-awake practices, making it a necessary resource for enterprises dedicated to sustainability. In line with worldwide sustainability aims, this project aims to drive positive tangible change through an allure stunning, and forward-thinking approach, providing a robust foundation for associations to enhance their environmental blame and contribute to a tolerable future.

5. Benefits For Companies: Elevating Environmentally Friendly Approach To Industries

Eco-friendliness is a global priority. Industries are adopting sustainable environments around them. This is not merely a trend but rather strategic play with many benefits attached. By prioritizing sustainability, a company emerges in the market as an exemplary responsible steward of the environment while gaining substantial advantages at the same time.

Global Environmental Impact: The industrial industry is one of the principal causes of carbon emission and wastes. Eco-friendly approaches make it possible for companies to mitigate these challenges, such as combating climate change, conserving resources, etc.

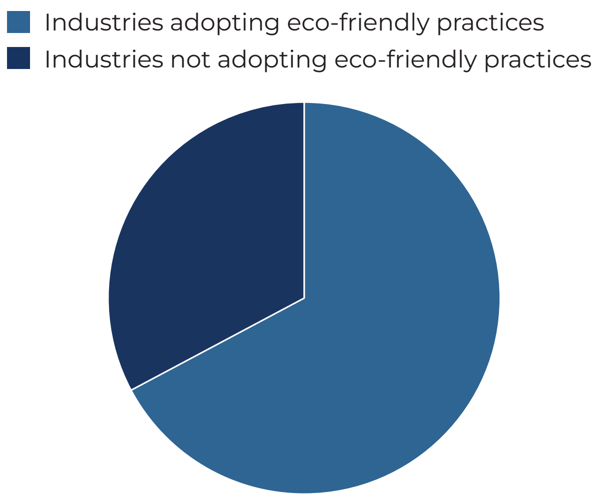


Fig. 1 (ProfileTree)

Improved Brand Image: Sustainable practices enhance the reputation of a company because consumers also favor brands committed to lowering their ecological footprint.

Customer Loyalty and Public Perception: The business supports the values of consumers, hence the loyalty and attraction of new customers. The public perception increases their market power.

Economic Savings: Though it seems costly in the initial stages, sustainability would eventually save the long run with efficient use of resources, less energy consumption, and waste reduction.

Competitive Advantage and Innovation: Sustainability will create an innovative approach towards developing eco-friendly technologies and products that can create a new market.

Long-Term Viability: Embedding sustainable practices ensures resilience and relevance in a changing world.

Conclusion:Sustainability is very necessary for industries. It supports the environment, increases profitability, and provides long-term success. A greener future promises innovation and harmony with the planet.

6. Anticipating Future Developments In Environmental Sustainability

Blueprint for a Sustainable Future:

On the journey to environmental sustainability, this article details radical strategies that will transform what sustainable practices mean.
Boundary-Pushing Technologies on the Horizon: Renewable energy innovations, waste management breakthroughs, and carbon capture hold the promise of transforming sustainable development.
Transitioning towards a Circular Economy: Reorienting industries toward recycling, reusing, and avoiding waste, the circular economy is the new bedrock for long-term sustainability.

Smart Cities: Sustainable Urban Futures: New smart city projects will be integrated technology and urban planning to bring about efficiency, reduced environmental footprint, and improved quality of life.

New Innovative Eco-Friendly Materials and Design: Breakthroughs in materials science and sustainable design will shape architecture, product development, and industrial practice toward a greener future.

Future Policy Trends: Governments are charting the future with their environmental policies, carbon pricing strategies, and stringent standards that shape global sustainability.

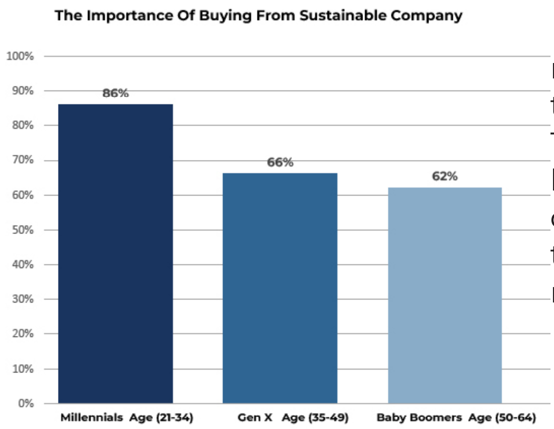
Climate Resilience and Adaptation: Strategies for climate resilience, from sustainable agriculture to adaptive infrastructure, will be discussed in the impacts of a changing climate.

Empowering Conscious Consumerism: Informed consumers will drive demand for sustainable products, pushing industries toward ethical practices and reducing ecological footprints.

Green Finance and Investments: Green finance will gain momentum as investors prioritize sustainable projects through innovative financial instruments like sustainable bonds and impact investing.

Global Partnerships: All global environmental challenges will require international partnerships which will be key to collective sustainability goals.

Conclusion: This blueprint envisions a world of innovation, resilience and collective effort, harmonious human activities with the natural environment. Ambitious certainly, but this vision affords a concrete pathway forward toward a more sustainable world.



7. Conclusion

In the poignant conclusion of this transformative journey, I reflect on the profound growth experienced during my time as a college student immersed in sustainable industry modeling. This intellectual odyssey, rooted in data science and environmental awareness, not only enhanced my technical skills but also ignited an enduring passion for driving positive change.

My journey began with a fervent curiosity, evolved through challenges, and culminated in developing a sophisticated model to estimate carbon footprints and optimize supply chains. This achievement embodies the fusion of knowledge and determination in tackling real-world sustainability issues. Yet, I recognize that the path to sustainability is continuous, and my work represents only a small step toward an eco-centric future.

Grateful for the opportunity to blend theory with application, I have built a foundation for my lifelong commitment to sustainable principles. This experience is a prelude to a future where my data-driven insights contribute to a greener, more resilient world.

8. Citations

In crafting this journey through sustainable industry modeling, I drew inspiration and insights from diverse sources that enriched and shaped my work. A fusion of academic rigor and real-world applications was guided by key references that provided the intellectual foundation for my model:

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3. Various authors. (n.d.). Articles from peer-reviewed environmental science and engineering journals.
4. Government publications and policies. (n.d.). Various official guidelines and regulatory frameworks for sustainable industries.
5. Personal interactions and collaborations with professors, industry experts, and peers during workshops and projects.

These interdisciplinary sources ensured my model integrates academic insights, policy guidelines, and practical industry nuances, forming a robust platform for sustainable development.

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A STUDY ON FINANCIAL INNOVATIONS AND INVESTOR PERCEPTIONS WITH REFERENCE TO SELECTED DISTRICTS OF KARNATAKA

Dr. Pankaj Choudhary
Principal, BMS College of Commerce & Management

Theme of the Article: Finance

Research Objectives: The research aims to evaluate how many elements, including investment decisions, perceived benefits and risks, trustworthiness and credibility, market volatility, and social and psychological impacts, influence investor perspectives.

BIO

Prof. Pankaj Choudhary is the Principal of BMS College of Commerce & Management, Dean at BMS Centre for Executive Education and Director at BMS Academy for Professional Courses. He has more than 2 decades of work experience in various domain of Educational Industry. Dr. Pankaj is also the Syndicate Member and Academic Council Member at Bengaluru City University and many more educational institutions in India. Dr. Pankaj has been instrumental in establishing several educational institutions in India. He has published more than 20 research papers in the areas of Finance, Accounting, Portfolio Management and Marketing. Dr. Pankaj Choudhary is recipient of several prestigious awards in last few years.

Abstract

This study examines the factors that influence investor perceptions of financial innovations in Karnataka. Given the rapid evolution of financial products and services, it is essential to comprehend investor attitudes and behaviours in order to effectively implement and absorb these innovations. The research aims to evaluate how many elements, including investment decisions, perceived benefits and risks, trustworthiness and credibility, market volatility, and social and psychological impacts, influence investor perspectives. The study utilized a mixed-method approach, integrating quantitative surveys and qualitative interviews to collect extensive data from a varied range of investors in several districts of Karnataka. The key findings suggest that urban investors have a greater willingness and comprehension of financial innovations, but rural and semi-urban investors approach them with cautious optimism due to restricted access to information and lower levels of financial literacy. The study emphasizes the significance of focused educational programs and clear communication by financial institutions to improve investor understanding and confidence in financial innovations. This research enhances the broader discussion on financial inclusion and the successful implementation of financial innovations in emerging markets by offering a detailed knowledge of the elements that influence investor opinions.

Keywords: Financial innovation, Investor perception, Return on Investment, Market volatility, Investment choices.

1. INTRODUCTION

The modern economy relies on an efficient financial system, which encompasses markets, instruments, institutions and regulations. This system facilitates the trading of financial securities, determines interest rates, and produces and delivers financial services globally. The financial system is widely recognized as a crucial innovation of contemporary civilization, functioning as an integral component of the economic and social systems. The modern financial system is characterized by a rapid and significant rate of innovations, both in terms of quantity and value. Financial innovation is essential in influencing the worldwide economic environment through the introduction of novel financial goods, services, and procedures. In recent years, financial markets have experienced notable progress, propelled by technological developments, regulatory reforms, and market demand. These financial advances have significantly affected several parts of the stock market, which in turn effects investor perception and investing decisions. These modifications can encompass upgraded technology, risk mitigation, risk transfer, credit and equity development, along with several other improvements. Notable recent advancements in the financial sector encompass crowd funding, mobile banking technology, and remittance technology.

2. BACKGROUND OF THE STUDY

Financial innovations are crucial for fostering economic progress in any region. They facilitate the funding of small and medium-sized firms and enable the efficient mobilization of local resources. Financial innovations have a crucial role in shaping the evolution of financial technology and banking processes. Financial innovations decrease the number of intermediaries and the costs associated with transactions, while also aiding in the expansion, intensification, and integration of financial markets. Consequently, this mechanism expedites economic expansion by incentivizing savings, investments, and production. The development of innovation is crucial, but the adoption of innovation is equally vital. The rapid advancement of innovation, structural shifts in globalization, and deregulation in recent years have significantly transformed both domestic and international financial institutions. Financial innovations have significantly enhanced the efficiency of global financial markets, mostly by offering a broader array of instruments that offer higher adaptability. Financial innovations have a crucial role in facilitating the functioning of the economy. Credit/debit cards, cheques, and ATMs are innovative products that have increased the speed at which money is exchanged. Financial innovations are essential and pivotal in any economy. These advancements act as foundational supports for the financial system and the market for investments. The prevailing characteristic of the contemporary financial system is its rapid rate of innovations, encompassing both their quantity and value. This study seeks to examine the impact of financial innovations and investor views in relation to Karnataka.

3. FINANCIAL INNOVATIONS - CONCEPT AND DEFINITION

Financial innovations refer to the process of developing and subsequently promoting novel financial instruments, technology, institutions, and markets. It encompasses institutional, product, and process innovation. Information and communication technologies (ICT) are revolutionizing the way users obtain financial products.

Financial advancements have been present since the inception of technology innovations. The close relationship between financial and technical advancements is widely recognized, as they both progress in tandem over time. Proper management of innovation, knowledge, information, reputation, and trust is essential for the sustained growth of a modern company unit. Initially, the term "innovation" referred to the modifications in technological solutions that resulted in the creation of new combinations of productive resources. These changes led to higher than average rates of return and thus stimulated the dynamic growth of the total economy. The innovations are developed in response to the need of business entities seeking to get a competitive edge in their business environment. However, the demand can be driven either by the internal requirements of the corporate entity seeking to enhance its operations or by the external changes in its environment necessitating the appropriate adaptation in its business plan.

4. INNOVATION IN FINANCIAL PRODUCTS

Managing innovation is the deliberate and organized approach to implementing changes with the goal of enhancing a company's goods, operations, or overall standing. In order for a company's innovation initiatives to be successful, the market must react favourably, either by increasing sales or customer satisfaction, improving the company's public image, or enhancing interactions among employees and different divisions within the organization. It is crucial to maintain a delicate equilibrium between safeguarding the organization's long-term sustainability and avoiding any potential harm caused by new ideas. To comprehend innovation, one must not just concentrate on the quality of the items.

Investors have the opportunity to choose from a diverse array of financial investment possibilities. The diverse investment possibilities encompass equity shares, preference shares, debentures, bonds, gold, fixed deposit accounts, money market funds, mutual funds, real estate, life insurance and pension plans, government securities, derivatives, and other alternatives. When engaging in investment activities, the investor was required to analyze the risk and potential return of multiple investment possibilities, and perform fundamental research for each of these assets. Financial products are investment instruments that are purchased with the anticipation of earning profitable returns. These financial instruments enable investors to engage in investing, savings, insurance, and mortgage acquisition. Investors employ these tools to attain both long-term and short-term financial gains. The Indian market provides a diverse range of products to meet the investment requirements of individuals, encompassing both long-term and short-term objectives. Several of these products comprise:

Financial Products available in Market

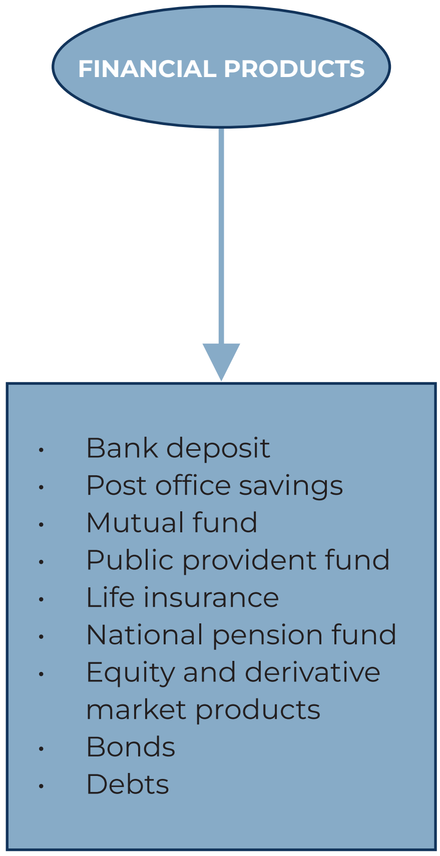


Figure: 1

5. SIGNIFICANCE OF FINANCIAL INNOVATION

Financial innovation is the process of developing and subsequently promoting novel financial instruments, as well as new financial technologies, institutions, and markets. The "innovations" can be categorized as either product or process innovation. Product innovations refer to the introduction of new derivative contracts, new corporate securities, or new forms of pooled investment products. Process improvements, on the other hand, involve the development of new methods for distributing securities, processing transactions, or pricing transactions. In reality, even this seemingly harmless distinction is rarely well-defined, as process and product innovation are frequently interconnected. Innovation includes the processes of creating and spreading novel products, services, or ideas. However, it is worth noting that many financial innovations are actually modifications of existing products. Financial innovation serves six distinct roles:

- Transferring funds between different time periods and geographical locations (e.g., between savings accounts)
- The aggregation of financial resources (such as mutual funds)
- Overseeing risk management, including insurance and various derivative products
- Gathering data to facilitate decision-making (markets that offer price data, such as credit-default swaps markets)
- Tackling issues of moral hazard and asymmetric knowledge (in the context of venture capital businesses)
- Enabling the exchange of goods and services by utilizing a payment mechanism involving credit cards.

6. FINANCIAL INNOVATION AND INVESTOR PERCEPTION

Financial innovation plays a significant role both domestically and internationally by facilitating the smooth execution of financial transactions. Financial innovation is said to convert a stagnant economy into a dynamic one by promoting the creation of capital, stimulating private investment, facilitating financial intermediation, and increasing the tendency to save. Consequently, attaining a greater level of economic growth is possible. Investment decisions are of utmost importance for people' financial welfare and the general operation of financial markets. The process of formulating investment decisions is intricate and subject to a multitude of elements, encompassing economic and financial concerns as well as psychological and behavioural aspects. Comprehending these characteristics and their influence on investment decisions is crucial for investors, financial experts, and regulators alike. Investment decisions can be greatly influenced by economic and financial considerations, including market circumstances, interest rates, inflation, GDP growth, industry performance, and market sentiment. These characteristics determine how investors perceive risk and return, which in turn affects their decisions on how to allocate their assets and develop investing strategies. Financial innovation has the potential to enhance investor perception by demonstrating a company's dedication to ensuring investor happiness. Moreover, financial innovation has the potential to improve investor perception by demonstrating a company's dedication to maintaining a sustainable competitive edge, addressing the concerns of stakeholders, and effectively balancing innovation and efficiency.

The perception of investors plays a vital role in influencing the economic and financial performance of a corporation. Companies that are viewed as innovative, responsible, and sustainable are more likely to garner favourable attention from investors and secure greater amounts of investment. Financial innovation plays a vital role in boosting investor perception by demonstrating a company's dedication to sustainability. Additionally, financial innovation can boost sales revenue and market share, further strengthening investor perception.

7. FINANCIAL INNOVATION (FI) AND INVESTMENT DECISIONS (ID)

Currently, the world is at a period where the additional benefits gained by novel technologies are still greater than the additional costs incurred by using them. Financial innovation, which involves the creation and implementation of novel financial products, technology, and procedures, has significantly altered the investment decision-making environment. Financial innovation is the process of developing and promoting novel financial instruments and technology. Financial Innovation (FI) in this study pertains to the implementation and acceptance of novel financial products, technology, and procedures in the banking industry. It encompasses technological progressions including financial technology platforms, crypto-currencies, crowd-funding, algorithmic trading and robo-advisors.

Financial innovation directly impacts investment decisions by introducing new investment options and altering risk-return profiles. It is important to emphasize that, in this particular situation, investment options are not considered as a singular sum of investment, but rather comprise a wider range of strategic choices in distributing financial resources.

8. REVIEW OF LITERATURE

Jean Baptiste Bernard Pea-Assounga et al. (2024) stated that the technology innovation factor is known to have an impact on the happiness of stakeholders such as customers and employees, as well as on bank performance and investment decisions. This study sought to examine the impact of financial innovation, specifically the innovation component, on investment decisions. It also considered the influence of stakeholders' satisfaction and the bank's performance as mediators, as well as the moderating role of Internet security (IS). The data for this analysis was collected from 575 employees and customers of banks in Congo. This study enhances the existing financial literature and bank management by providing ideas and a framework that help in identifying relevant strategic resources and constructs. Pranjal Shah (2023) carried out an extensive analysis of the primary elements that influence investing choices, utilizing a diverse array of scholarly literature and empirical research. The study commences by highlighting the significance of psychological elements in investment decision-making. The study analyzed behavioural biases such as anchoring, loss aversion, and herding behaviour, and how these influence investment decisions. In addition, the study examines the impact of external influences on investing choices. The analysis focuses on macroeconomic variables such as interest rates, inflation, and fiscal policies, and their impact on investment decisions. In addition, it considers regulatory factors, market structure, and technology improvements as significant external influences. Mayank Jain (2023) examined the influence of green technical breakthroughs and quality management on the financial performance and perceived value of manufacturing enterprises from an investor's perspective. The study also examined the impact of environmentally-friendly process and product improvements on financial performance and investor perception. The results indicated a strong and positive relationship between the development of eco-friendly products and how investors perceive a company. This suggests that organizations that prioritize environmental responsibility are more likely to attract greater investments and enhance their financial outlook. Nevertheless, there was no notable positive association observed between green process innovation and financial performance, possibly due to the impact of initial expenses and delayed advantages. In her study, Shapoval (2021) determined that industrialized countries mostly depend on financial depth and financial innovations, with institutional development playing a comparatively smaller role, to achieve economic progress. The economy's growth was heavily dependent on financial developments. These improvements lead to an increase in the total quantity of savings and investments. Riyaz Ahmed (2021) conducted a survey with 753 investors. He concluded that the important factors influencing investor choices include the type of investment, the investor's personal attributes, their behavioural characteristics, their options, and their understanding of mutual funds and shares. In his study, Pernell (2020) identified that new products have the potential to yield substantial profits for investors. However, it is important to note that these items can also be intricate and pose significant risks. In addition, the author elucidates the manner in which these financial products might precipitate economic volatility. Additionally, it was determined that these advances have the potential to undermine both official and unofficial financial markets.

9. RESEARCH GAP

After conducting an extensive analysis of the existing literature, it has been determined that numerous research are presently concentrated solely on financial innovation in developed nations. There is a scarcity of empirical research about financial innovation in India specifically in the state of Karnataka. These investigations are characterized by their descriptive nature. Most academic tasks pertain to advancements in concerned financial institutions. In the case of India, there is a scarcity of studies that examine the relationship between financial innovation and investor perception. These studies solely focus on enumerating the various financial innovations that benefit the investors, without establishing any connection to the factors that prompted the development of these innovations at the individual firm level.

10. STATEMENT OF THE PROBLEM

The field of financial innovation is extensive, but the existing literature on this topic is relatively limited and dispersed across various disciplines. In contrast to other areas covered in this volume, where significant advancements have been made, the subject of financial innovation remains largely unexplored and holds potential for intriguing discoveries. This exemplifies the vast capacity for scholars and researchers in this domain. The current study aims to fill three notable research deficiencies. This study initially examines the diverse aspects that impact an investor's views about new financial products. Additionally, it will evaluate the impact of financial innovations on investor's choice of investment, security concerns and market volatility. The study will also reveal the impact of financial innovations on investors' return on investment with trust and credibility they maintain over the financial products.

11. RESEARCH OBJECTIVES

- To provide an overview of financial innovation and its significance among investors
- To analyze the various elements that influence financial innovations
- To evaluate the influence of various factors on investor perceptions towards financial innovations

12. RESEARCH METHODOLOGY

Research methodology refers to the systematic and scientific strategy employed to carry out research and gather data for a study. The process entails a sequence of procedures that are adhered to in order to guarantee that the research is carried out in an impartial, dependable, and valid approach. The primary objective of the study is to assess the influence of financial innovations and investor perceptions on the decision-making process.

The present empirical study work utilized a Descriptive research strategy. The study made use of both primary and secondary data. The primary data from the respondent investors was gathered from two specific areas in Karnataka, namely Bangalore and Mysuru. This was done using a systematic approach that involved a standardized questionnaire and direct interviews. The initial section of the structured questionnaire focuses on the demographic characteristics of the participants and includes both open-ended and closed-ended inquiries. The second portion of the questionnaire includes variables (such as investment choices, market volatility, security concerns, trust & credibility and return on investment) that are associated with investors' assessment of financial innovation. The researchers employed a Likert scale as a measurement instrument to assess the degrees of perception among the investors who participated in the study. The secondary data was gathered from a variety of sources such as books, magazines, reports, research articles, and websites. The data from the identified respondents was collected using the convenience sampling approach. The study was carried out among the investors residing in the districts of Bangalore and Mysuru in the state of Karnataka. A total of 221 respondents, who were investors, were interviewed and data was collected from them using the schedule technique. The data was examined using statistical procedures such as percentage analysis, chi-square test, ANOVA, and SEM, utilizing the SPSS software.

13. DATA ANALYSIS

One-way ANOVA (Age)

H_{01}: There is no significant difference between age groups with regards to the investment choices, market volatility, security concerns, trust and creditability and return on investment.

Table – 1: Age Groups Vs Various Dimensions

Dimensions		Sum of Squares	Df	Mean Square	F	Sig	Statistical Inference
Investment Choices	**Between Groups**	105.968	3	35.323	3.492	.010	Significant
	Within Groups	2194.793	217	10.114			
	Total	2300.760	220				
Market Volatility	**Between Groups**	295.364	3	98.455	9.712	.000	Significant
	Within Groups	2199.876	217	10.138			
	Total	2495.240	220				
Security Concerns	**Between Groups**	152.815	3	50.938	4.184	.007	Significant
	Within Groups	2641.637	217	12.173			
	Total	2794.452	220				
Trust and Creditability	**Between Groups**	281.067	3	93.689	7.841	.000	Significant
	Within Groups	2592.770	217	11.948			
	Total	2873.837	220				
Return on Investment	**Between Groups**	209.193	3	69.731	7.590	.000	Significant

*** Significant at the 5% level**

Interpretation

It is determined that there is a statistically significant difference between the age groups because the significant (p) values for investment choices, market volatility, security concerns, trust and creditability, and return on investment are less than 0.05, the threshold of significance. Since the null hypothesis is rejected, it can be said that respondents' average opinions on investment choices, market volatility, security concerns, trust and creditability, and return on investment are similar regardless of their age.

As a result, there are notable differences across age groups when it comes to return on investment, trust and creditability, security concerns, market volatility, and investment choices. The null hypothesis is therefore disproved.

One way ANOVA (Education)

H_{02}: There is no significant difference between education groups with regards to the investment choices, market volatility, security concerns, trust and creditability and return on investment.

Table – 2: Education Groups Vs Various Dimensions

Dimensions		Sum of Squares	Df	Mean Square	F	Sig	Statistical Inference
Investment Choices	**Between Groups**	23.955	2	11.977	1.147	.320	Not Significant
	Within Groups	2276.805	218	10.444			
	Total	2300.760	220				
Market Volatility	**Between Groups**	21.891	2	10.945	.965	.383	Not Significant
	Within Groups	2473.349	218	11.346			
	Total	2495.240	220				
Security Concerns	**Between Groups**	49.773	2	24.887	1.977	.141	Not Significant
	Within Groups	2744.679	218	12.590			
	Total	2794.452	220				
Trust and Creditability	**Between Groups**	51.312	2	25.656	1.982	.140	Not Significant
	Within Groups	2822.525	218	12.947			
	Total	2873.837	220				
Return on Investment	**Between Groups**	66.253	2	33.126	3.380	.036	Significant

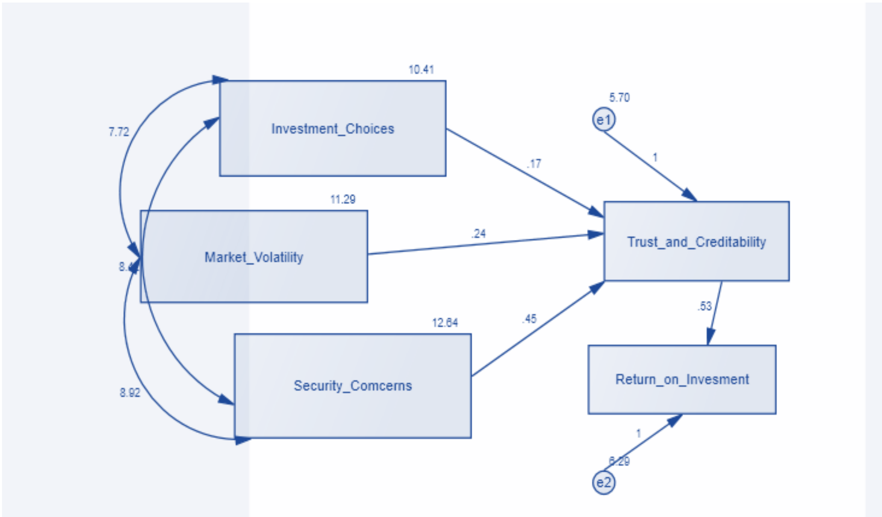
*** Significant at the 5% level**

Interpretation

It is determined that there is no statistically significant difference between the education groups since the significant (p) values for investment choices, market volatility, security concerns, trust, and creditability are less than 0.05, the threshold of significance. Since the null hypothesis is disproved, it follows that respondents' opinions on return on investment are generally the same, regardless of their degree of education.

As a result, there are notable differences in return on investment amongst education groups. The null hypothesis is accepted since there is no discernible difference between the education groups in terms of investment decisions, market volatility, security concerns, trust, or creditability.

SEM Path Analysis



Source – AMOS output

Table – 3: Testing of Hypothesis

Variables Relationship	Estimation	SE	CR	P-Value
Trust and Creditability <--- Investment Choices	0.166	0.079	2.106	0.035
Trust and Creditability <--- Market Volatility	0.241	0.077	3.113	0.002
Trust and Creditability <--- Security Concerns	0.450	0.075	5.959	0.000
Return on Investment <--- Trust and Creditability	0.532	0.047	11.337	0.000

***Significant at 1% level**

Discussion

H_{03} – Investment choices has no significant influence on trust and creditability

Table 3 indicates that the null hypothesis is accepted since the p-value is higher than the significant value (0.01). Therefore, trust and credibility are not much impacted by investment decisions.

H_{04} – Market volatility has no significant influence on trust and creditability

Table 3 indicates that the null hypothesis is rejected since the p-value is smaller than the significant value (0.01). Therefore, trust and credibility are significantly impacted by market volatility.

H_{05} – Security concerns has no significant influence on trust and creditability

Table 3 indicates that the null hypothesis is rejected since the p-value is smaller than the significant value (0.01). Thus, security concerns have a big impact on credibility and trust.

H_{06} – Trust and Creditability has no influence on return on investment.

Table 3 indicates that the

null hypothesis is rejected since the p-value is smaller than the significant value (0.01). Therefore, trust and creditworthiness have a big impact on return on investment.

Result

The research measured the overall fit (CMIN /df = 2.54), absolute goodness of fit (GFI = 0.909), incremental fit indices (CFI = 0.933), Tuker Lewis index (TLI = 0.921), and root mean square error of approximation (RMSEA = 0.069) in order to determine if the overall model was adequate. Literature analysis revealed that the ideal range for RMSEA is between 0.06 and 0.08, the CMIN/df should be less than 3.0, and the GFI, CFI, and TLI values may all be larger than 0.90. Thus, the number above indicates that the model fits well.

14. FINDINGS

The age factor's one-way ANOVA result reveals that there are significant variations across age groups in terms of return on investment, creditworthiness and trust, security concerns, market volatility, and investment options.

- The education factor's one-way ANOVA result reveals that the return on investment for each education group varies noticeably. Since there is no appreciable difference between the schooling groups in terms of investment choices, market volatility, security concerns, trust, or creditworthiness, the null hypothesis is accepted.
- SEM results portray that according to a review of the literature, the GFI, CFI, and TLI values may all be more than 0.90, the CMIN/df should be less than 3.0, and the RMSEA should ideally be between 0.06 and 0.08. Consequently, the number above shows that the model matches the data well.

15. SUGGESTIONS

- It is necessary to provide education to newbie investors, as over 75% of investors have less than five years of experience.
- Financial institutions have the ability to create educational programs and provide materials that help improve the financial literacy of investors in relation to complex financial innovations. This can result in investors making better informed decisions when it comes to their investments.
- The financial sectors should prioritize their focus on goodwill and annual reports of corporations, as these are crucial variables in determining investor opinions.
- Investors should acknowledge the significance of financial literacy and make efforts to enhance their knowledge and comprehension of financial principles.

16. CONCLUSION

Sustainable financial innovations are necessary as they optimize the efficiency of the financial system, leading to improved economic growth and increased societal prosperity. Nevertheless, certain financial innovations might have adverse repercussions on the financial system, providing advantages to certain players while concurrently causing harm to others. Therefore, in order to effectively utilize a certain financial innovation, it is necessary to possess a comprehensive understanding of its operational mechanisms and conduct a meticulous examination of its outcomes. Financial innovation impacts investment decisions and the overall activities of a firm. Policymakers and financial service providers should consider these observations when tailoring regulations to successfully address the specific needs and concerns of investors in different places. In order to remain competitive and sustainable in their operations, policymakers must enhance their innovation and technological services. These studies indicate that financial innovation can positively impact investment decisions, hence impacting economic growth, alleviating financial limitations for enterprises, enhancing risk-sharing, and promoting entrepreneurial activity. Financial innovation offers organizations a valuable chance to maintain their competitiveness and prosper in a constantly changing business environment. This would ultimately foster a more inclusive financial ecosystem in Karnataka.

17. FUTURE RESEARCH

Additionally, the research can focus on certain subsets of investors, such as professionals, businessmen, or homemakers. Additional research can focus on a specific industry, while future investigations can delve into the factors contributing to the popularity of certain creative items in comparison to others. This will undoubtedly assist financial engineers in developing more appropriate policies and products.

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LANGUAGE, MASS COMMUNICATION AND DEVELOPMENT OF GLOBAL RELATIONS

Dr. Aradhana Bose

Ph.D. Scholar, English Department

Theme of the Article: Language

Research Objectives: To explore the symbiotic relationship between language and mass communication in fostering global understanding, collaboration, and cultural exchange to advance societal development and international relations.

BIO

Aradhana Bose, Ph.D., is a dedicated research scholar in English with over 25 years of successful teaching experience. She is the entrepreneur behind the Aradhana Bose Institute. Aradhana has been honoured with numerous accolades, including the International Education Award (IEA), Indian Woman Entrepreneur Award (IWEA), Global Teaching Excellence Award (GTEA), and FOX STORY INDIA's Women Faces of the Year 2024. Committed to nurturing young minds, her life's motto is to transform students into responsible citizens of India. Aradhana's passion for education and entrepreneurship has made her a respected figure in her field.

Abstract

Language serves as the fundamental link connecting individuals worldwide, while mass media utilises language to disseminate information globally. English, recognised as the international language, plays a central role in facilitating mass communication and enhancing global relations. It promotes cooperation in global economics, fosters cultural and intellectual exchanges, and strengthens diplomatic ties between nations. By establishing a common identity and acquainting individuals with diverse beliefs and values, English serves as a cornerstone of diplomacy and globalisation, bridging disparate regions and cultures.

Communication relies on language as the conduit for transmitting messages to individuals and organisations. The convergence of language and mass communication proves to be a potent tool for fostering human relations on a global scale. Together, they facilitate understanding, promote dialogue, and contribute to societal development worldwide. The ability of language to convey nuanced meanings and cultural contexts enhances its effectiveness in shaping perceptions and fostering mutual respect among diverse populations.

In conclusion, the symbiotic relationship between language and mass communication underscores their critical role in advancing global understanding and collaboration. Their combined influence transcends borders, contributing to a more interconnected and harmonious global community. Ultimately, language and mass communication

shape the narrative of global discourse, promoting shared values and aspirations across nations and continents.

Keywords: Language, Mass communication, Global relation, economic and cultural co-operations, English

Introduction

Language, mass communication as it is known, markets, economics, and shifts to global relations involve an equal volume of interaction. Communication and the flow of information between nations, as between people, are regarded, for good reason, as the foundation of the dialogue, which should be seen as a conduct measure for shaping international relations, as culture bridges over different views, a different way of life, and different development levels (Behl et al., 2023). There are national stereotypes to acquire a glossary employed to condemn bigotry and techniques geared to research generalisations in terms of linguistic instructions. Judging by the complexity of language behaviour in computer-mediated communication, it can be said that language usage reflects one's position in the social exchange effectively (Ellinor & Girard, 2023). Language is such a powerful tool that when dealing with 'foreigners' or 'strangers,' it has to be included in foreign policy, as it affects decision-making operations.

Multinational and intergovernmental organisations currently participate actively in responding to language and subject perceptions in diplomacy. Given the rapid advancements in information superhighway computing and media-control technology, cyber-culture interaction between individuals coming from various cultural backgrounds in the world suggests that individuals interact with one another, and on a global scale, the language they choose to communicate in cyberspace has an effect on innovations and forms of interrelations in real-world politics (Schmitt, 2020). The significance of language as a strategy for making an impression in human actions is the purpose of understanding the language used in order to gain deeper insight by means of operating methods. In this manner, policymakers should appreciate linguistic behavior as the same reason to help cement people's ideas and to gain insight.

1.1. Background and Rationale

Language, as the primary medium of mass communication, has long fascinated scholars due to its complexity and significance. Mass communication is defined as the dissemination of information to a large audience through various modern communication methods, a field that has experienced remarkable growth over the last two centuries during what is termed "The Age of Communication Explosion." The revolution in print and electronic media has transformed political, economic, cultural, social, and scientific landscapes globally (Sanborn, 2022). Language plays a strategic role in international affairs, influencing domestic and international scenarios through its persuasive and propagandist capacities, often reflecting cultural and ideological frameworks. The modern era is characterized by cross-cultural communication and literary interactions, shaped by linguistic relationships and socio-political contexts, raising concerns for those pursuing global peace and diplomacy. As a critical factor in fostering international understanding, language must be thoroughly researched, especially concerning the learning and teaching of modern languages. This study aims to empirically investigate the relevance of language in mass communication amidst liberalisation, regionalisation, and globalisation, with particular attention to the objectives of post-war international educational curricula in English and other languages (Hill et al., 2023). The impact of the Industrial Revolution on mass media has further transformed educational theories, highlighting the interplay between technology and communication.

2. Aim

This paper explores the relationship between language, mass communication, and the development of global relations. The profoundness of language can hardly be exaggerated, as it defines what we can express and think. This relates to mass communication as well, for it is the mouthpiece of expression and perspectives of particular people disseminated to a large and unspecified audience. Whereas much has been studied and discussed by scholars and language policy experts in the field of language, development, and social behaviour, there are rare studies revealing how public speech, edited in mass media, can influence the course of international relations. Even fewer are those that pose to explore the roots through which a public political dispute in one state can lead to negative portrayals in other states. Nonetheless, it is an important area of interest, more so because it has an impact on the theory and practice of communication.

2.1. Research Objectives

This research paper deals with the wide topic of language, mass communication, and global relations. We aim to understand how languages are exploited and privileged in various domains of global communication. The study moves beyond a purely meta critical discussion of existing research paradigms or normative statements. The analysis seeks to allow connections between language and communication to be demonstrated, explored, and questioned in the dense networks where they are dissolved. The first purpose of this paper, is to illustrate and provide strong empirical and theoretical insights on the relations between communication and languages. Building on this result, the second part of the project is aimed at questioning what remains concealed within both research studies and normative guidelines towards communication that raise such issues. In fact, existing studies often discuss normative and theoretical issues from a monodisciplinary perspective (Badwan & Badwan, 2021). Yet, in a period of intensified communicative global networking, the research deals with the consequences that massive communication has on many other social, political, and cultural/symbolic as well as everyday issues.

3. Method

The research was designed to review literature and analyse language used in various global media. Language and mass communication are capable of developing human potential, allowing the extremely powerful to possess the real power to determine the development of relationships of any scale. People who possess information as a commodity are held in high esteem. Therefore, the need to know and master foreign languages is quite apparent. When defining the term “language,” one ought to understand the idea of language not as a complex of particular sciences, but in its communicative aspect. Speaking belongs to all people as humane by nature, and this capability is available to all the people on the planet. The word is intended, first of all, and foremost to communicate it. So, passing on information from one person to another, communication becomes an integral part of human life. A scientific literature analysis we have carried out shows that there is a significant interest in exploring the actual issues of communication processes, information content, the degree of effectiveness, and the reflection of languages’ significance in the process of conversation and their influence on a person’s psyche and behaviour. It’s important to stress the main buffering flexibility of the process of mass communication, the special techniques available, a huge readership audience, etc. But there are still many unsolved problems in the linguistic field. Given the stated urgency, the text interprets the results of a study illustrating the rapid developments in communication systems with numerous communication fields and their differentiation, as well as the growing interest in dissecting the distribution and characteristics of the divergent systems (Pavlik, 2023).

4. Results

The results indicate that the role of language and mass communication in global relations very much depends on how these meanings influence transnational communities. Highly interwoven language and communication practices that span international venues of discourse provide important support for effective international and transnational networking. This, in turn, supports collaboration between and among sectors of society.

This theme of social impact is demonstrated in the case studies that follow, although each plays out this role differently and specifically within different domains. Discoveries from the case studies also reveal how ideological and cultural issues play an integral role in communication failure and the breakdown of collaborative relations between transnational and local entities as well (Lan et al.2021).

4.1. Key Findings

The primary focus of the research is to investigate the influence of mass communication and language use on the development of global relations between countries. The research has revealed a number of significant findings that resonate with the overarching themes of my research.

These findings clearly illustrate the ability of mass communication to yield correlations between languages that are spoken and the nature of global relations between countries. Likewise, the findings highlight the prominence of globalised media and language adaptability in sustainable improvements in global communications and diplomatic relations between countries. The importance of these findings essentially supports the main argument of my essay, which revolves around these key findings. By examining the interconnectedness that exists between language usage, mass communication, and global relations, it is easier to understand how my research questions might be applicable to today's contemporary global communication environment.

Firstly, through investigating these relationships, the findings clearly underscore the themes of communicative strategies and their effectiveness in the realm of diplomatic relations, hence providing a number of practical implications for countries to implement. Given the international media's tendency to report on the views of only a select few world leaders, this research has offered insights from empirical data into the contemporary reality of world public opinion that is voiced on the increasingly global level through select languages: those of media powerhouses.

From the sharp analysis of international news reports on North Korea and South Korea, it is evident that contemporary global relations are inversely linked to the non-representational nature of influences on news mediation, thereby rendering the strategic and essentially communicational imperative championed at its core to the trajectory of the development of nation-state relations in place of political actions, alliances, treaties, and security agreements. Rather than policy-makers, the news mediators make history by shaping the public perception of another state (Sanborn, 2022).

Figure 1 illustrates a bar chart showing the prevalence of major languages in global communication.

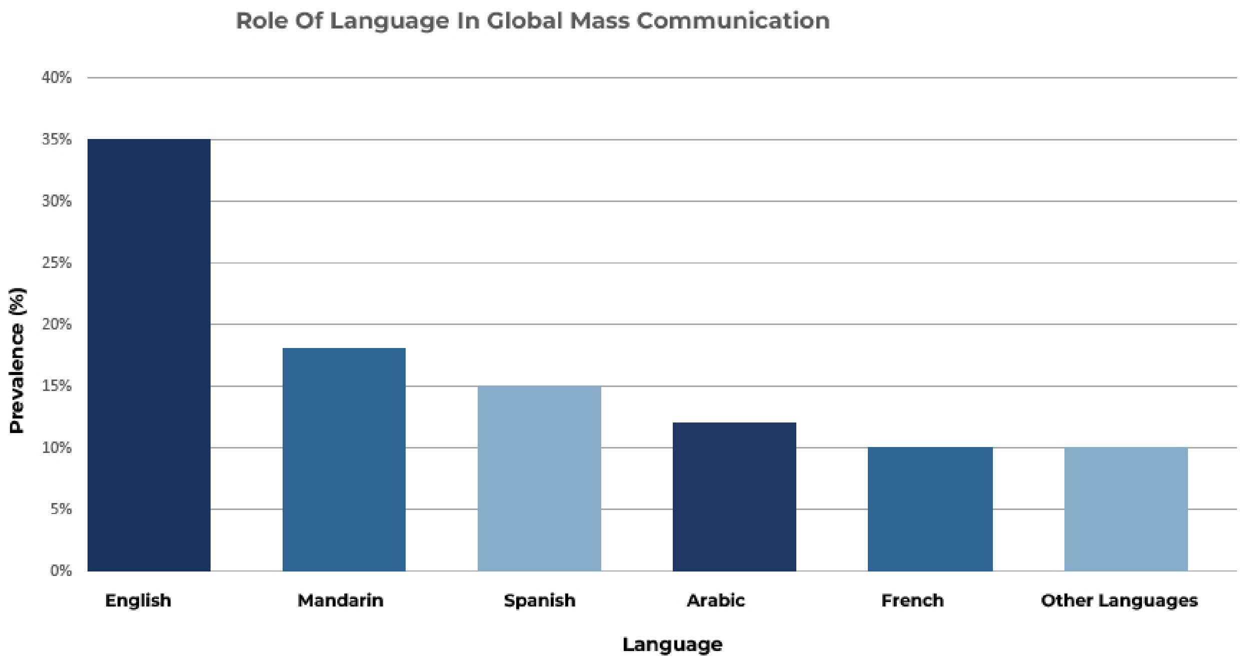

Figure 1 (Sanborn, 2022)

5. Discussion

In this research paper, we sought to investigate how mass communicators use intercultural communication, expecting that they use syntactic patterns of the language spoken by the target audience. The results both align and contrast with previous research, indicating that using the shifty pronoun "one" can make mass communication more relatable, but that even more relatable language can be achieved through syntactically mimetic language. The research indicates that intercultural communication can be understood in terms of the relatability of the language. The findings enable us to discuss how we can use the conceptualisation of our study to generalise and articulate other general phenomena in linguistic science. The findings also provide insights into the level of social and political life that linguistics and mass communication can contribute to build relations or change people's natural attitudes (Freiermuth & Huang, 2021). Regarding the potential this study can contribute to understanding human behaviour, further research can be conducted since the results of this study only prove the advantageous use of mimetic language over relational language. The study can also provide suggestions in order to achieve better goals in mass communication as well as in relation to intercultural misinterpretation in the global political community.

5.1. Implications for Global Relations

The findings presented in this paper have global implications. There is the potential that effective public communication and information designed in accordance with them could contribute, as part of wider resources, to the effectiveness of diplomatic activity, at least in the area of public diplomacy, and measures promoting multiculturalism, which in turn could create the conditions for peace and durable understanding among communities. Misunderstandings have led, and continue to lead, to some of the most severe and long-lasting consequences in many international and national communities. International research has suggested that a lack of understanding of language structure is implicated in misunderstandings in inter-ethnic encounters involving speakers of English (Limani et al.2024). The findings in this paper extend this finding to misunderstandings in a number of other typologically and genetically related languages, which is direct evidence of the universal relevance of the findings.

Figure 2 is a pie chart depicting the distribution of mass communication's impact on diplomacy, trade relations, cultural exchange, and political alliances.

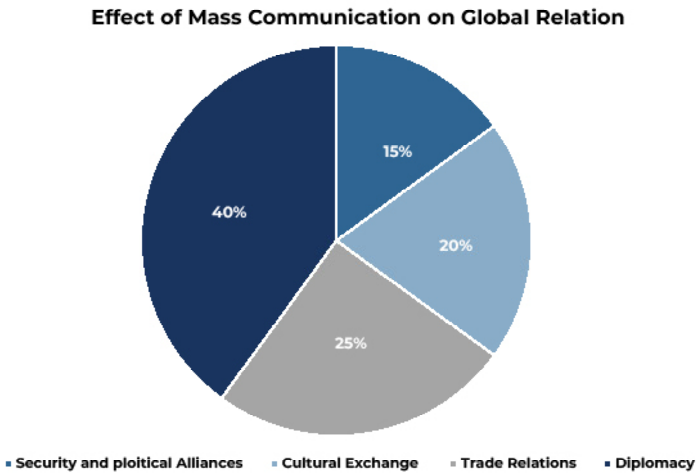

Figure 2 (Behl et al, 2023)

As nearly one in four people in the world are Muslim, and as well over a billion dollars a year is being spent on developing international collaborations with countries in the Islamic world in order to eliminate the conditions that allow support for terrorism, the implications for global relations are clear. Considerable practical benefit in this way can also be gained to inform the implementation of global agreements (Robinson, 2024). The results may justify an expansion of this research to a consideration of more global policy and international frameworks for the establishment, use, and monitoring of international agreements and the potential policy-making relevance for professions such as linguists and translators.

Where there is a lack of clear understanding, grave misunderstanding ensues, and ultimately, involvement in exploitation and even cheating runs the high risk of miscommunication To deny the integral relationship of language and communication in the development of human society and the need for the former from ignorance is nothing short of folly and, at times, perhaps more so, arrogance if not ignorance dressed up in knowledge. Miscommunication, the lack of having a good grip of the other's language, is a major contributing factor leading to the breakdown of relations between or among countries, societies, ethnic groups, individuals, etc.; it hampers instant relations and even the development of trust or understanding. A case in point: President Jomo Kenyatta of Kenya, at an international conference at Arusha in the early 1970s, rendered a common Japanese expression which describes the mouth incorrectly. The correct expression, as interpreted, would have meant the man who speaks with sincerity is trusted by all. However, unbeknownst to him, President Kenyatta instead had said in Swahili, the man who has a mouth should speak. The ensuing laughter at his expense showed that among the Swahili-speaking audience he was not understood. Miscommunication is thus not merely malfunctioning, not just skidding, of language. It is a stimulus leading to negative reactions with detrimental implications. In situations such as international business negotiations and diplomacy, this kind of thing can be quite embarrassing. In the perhaps more strident world of politics and ideology, irreparable harm could, and on many occasions has, resulted (Malik, 2024). Misunderstanding acts as a definite handbrake on friendly and peaceful relations. This solves nothing, builds nothing, resolves nothing. With this kind of mindset, ignorance of an acquaintance and of a language becomes really no bliss!

5.2. Role of Language in Mass Communication

One of the most important developments in the field of mass communication and media entertainment is the rapid growth of language. A language is not only a tool of communication, but it is also the main medium that structures the mindset and cultural experiences of the people. Language establishes and shows the communication that it intends to convey. Broadcasting conceals diverse cultural, interpretative, and normative traits; to a large extent, it cannot be mediated by ordinary discursive knowledge and requires interminable problem-solving to bridge underlying patterns of meaning, understanding, and practical reasoning. The choice of languages affects the direction of our messages, the production of the experience sensitivity most relevant to these messages, and the type and intensity of any relationship that exists between narrators, characters, audiences, and social events. Media is a source of expressing the social evolution of humans. The content of media depicts the behaviour and personality of different human societies. The medium to depict this is none other than language. The massive population in the world speaks more than six thousand languages. The people differ from place to place in terms of language, culture, mindset, ideology, and communication skills.

The strengths and weaknesses, effectiveness and differences of different people and their institutions, regional problems, merits and demerits of different systems, and the countries situated on the horizon are seen through the medium of mass media. There has been rapid growth due to Internet of Things (IoT)(Surao, 2021), the role of mass media in any country and society is not merely to inform the public, but also to contribute to democracy through micromanagement from house-to-house talk and worldwide decision-making regarding public opinion in the country and the world. Language is considered the medium that is capable of influencing human character and emphasises the needs of mass media to carry out its functions effectively. Language is seen as extending the essence of citizenship to the national level. However, the centralised temporal nation not only requires the accessibility of a common spoken language but also fosters a sensibility of the public contract, which serves the public.

It is a sensibility that lacks communication when its terms are absent in public discourse. With the increasing awareness and advancement in technology, TV channels enable exploration of one's cultural boundaries. Technological development has created cultural negotiation abilities for host communities and transplanted communities. Usually, in underdeveloped contexts, satellite culture develops through the medium of language. Language is the only medium to deliver any steps of TV services. TV channels with multilingualism provide a vast amount of news. Audiences who understand a particular foreign language desire to watch the programs.

These programs attract viewers to learn, think, and understand new ideas, and to create argumentative write-ups. As long as the program is engaging, the use of language in the TV program can encourage the development of various types of arguments (Pratap et al.2024). After the engaging program, audiences are inspired to write about it. This kind of TV program presents a challenge to understand a portrayal of media influence. How media developed and which types of media discourse are represented.

6. Conclusion

Language, as the principal means of perception and communication, plays a critical role in mass communication and global interpersonal, group, and interstate relations. In contemporary international communication, various forms of mass media function as intermediaries of the message, through which global variation is mastered by any country. Specifically, the global role of mass communication, although mainly through the commercialisation of large-scale media, is extensively discussed. In the professional sphere, the role of language and that of mass communication is technical, and both are used as tools or means (Bouvier and Machin, 2020). The very existence of a global language indicates intercommunication and the formation of interests, helping to replace apprehensions.

The analysis of the interaction and tension between adversaries is considered minimalistic, offering perspectives for applicable strategy. Likewise, revealing that words and communication are vital for the interrelated common world necessitates knowing not only the phenomenon of communication itself but also appreciating its theoretical, conceptual, and other agencies in a wider context.

The present study has corroborated the relevance and essentiality of language and its effective manipulation through the channelling of public diplomacy with the intent to foster collaboration and cooperation in the global contemporary context. Throughout the study, objectives and research questions are addressed and illuminated through extensive empirical and theoretical analysis and justifications, establishing the authentic relevance of the study in existing literature. It is anticipated that the findings of the study will not confine but will offer the much-needed tendencies for a theory and practice of a challenging and evolving communication arrangement for societies to have effective and sustainable dialogue. Furthermore, the ultimate findings and likely recommendations will correspondingly make a huge impact on global practices affecting the contemporary global populace. The theoretical and practical grounds established in this study will sustain future research on the topic within the extant literature of language and mass communication. It is a democratic appeal to scholars and practitioners to engage in all the ramifications of the study.

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REBOOTING EDUCATION: NAVIGATING CHANGE AND BUILDING RESILIENCE

Jacqueline Render

Life and Business Coach & Master Trainer

Theme of the Article: Education

Research Objectives: This study investigates the importance of periodic adaptation in education, with a focus on sustainability and resilience.

BIO

Jacqueline Render is a passionate coach, teacher, and motivator dedicated to inspiring personal growth. She empowers individuals to achieve their full potential, drawing from her experiences as a mother, educator, and mentor. An avid traveller, Jacqueline gains fresh perspectives to enrich her coaching approach. She holds a Masters in the Art of Teaching from LeMoyne College in Syracuse, NY. Jacqueline is a certified Life and Business Coach & Master Trainer. She is endorsed by Georgia as a Coach, Teacher Support Coach, and in Reading and Positive Behaviour Interventions and Support. With her wealth of knowledge and natural ability to connect, Jacqueline helps clients overcome challenges and pursue their dreams.

Abstract

This research paper explores the critical need for rebooting the educational system, a process largely overlooked since the end of Covid-19 isolation. While many school systems resumed traditional operations, evolving global challenges demand a transformative re-evaluation of how education functions. This study investigates the importance of periodic adaptation in education, with a focus on sustainability and resilience.

We first explore the pandemic's role as a catalyst for change, as it forced educators to rethink teaching methods, technology integration, and student well-being. The lessons drawn from this disruption highlight the urgency of educational reform to meet the demands of an ever-evolving world.

Keywords: Educational Reboot, Post-Pandemic Education, Sustainability, Resilience, Stakeholder Collaboration

1. Introduction

Education is often seen as the cornerstone of any society and must thrive in the harshest of times. No longer is it enough to simply repeat history or traditions in schools and universities under the guise of a modern education, nor can technology alone sufficiently build the resilience of the learning ecosystem. Our socio-economic-technological world has become so complex; there is a need to reboot our systems alongside educating for resilience and adaptability (Shah et al.2020). This is particularly relevant if education is to recalibrate and reinvent itself for long-term growth, sustainable development, lifelong learning, and the benefits of innovation. One only has to witness the impacts of the pandemic to stress the importance of rebooting existing notions of education to help individuals and the institutions that support them become more resilient and adaptable throughout their learning landscape. For many, this is seen as painful; it signals the failure of traditional educational institutions and systems of education which have suddenly become increasingly irrelevant, fragile, and dysfunctional across the globe.

We consider the learning space as adaptive, introduce the meta-skill of resilience as a pivot point. The adaptive pathway is principles-based and founded upon identity construction. Learning is morphing into a form of 'antifragility' (Qadir & Al-Fuqaha, 2020). The role of the metamodern educator is foundational. Learning as adaptation pivots upon gaming strategies overtly teaching adaptability and risk-taking within the comfort zone of failing safely. Networking with feedback loops is construed as a learning lever. It's important the learning lever pivots on theory and the constructs of theory (Qadir & Al-Fuqaha, 2020). To enhance learning and to educate for resilience are complementary.

Industry 4.0 or the fourth industrial revolution created a scenario where humans have grown dependent on gadgets, machines, robots that can do everything (Surao, 2020)—from clinical trials to taking examinations and maintaining intelligence. Education is a foundation stone of society, and if it were well laid, everyone would benefit. The holistic role of this changing institution needs a focused approach to relook and redesign the way education is managed, imparted, and received. Schooling and teaching would thus become interesting, relevant, meaningful, and purposeful only when learning can be made enjoyable and rewarding (Germain, 2024). Going to schools leads to effective learning and education if learning becomes a delightful and surprising journey for children. Activities that are relevant, interest-based, and in the socio-cultural context of children would go a long way in making children love to learn, not vice versa.

Objectives

This research seeks to contribute to the understanding of how reform aimed at change in the real world can be achieved, and how those working to bring about this change can be supported. The focus is on the weaknesses of current systems of education governance and the ways to address them. A guiding theme of this research is the unprecedented pace of change in the world today and the need to build resilience into any new systems. A second theme of this research is the focus on the reform of systems and not just on the reform of institutions. This has meant seeking new solutions that will serve learners and society in very diverse political and educational contexts.

2. The Need for Rebooting the Educational System

Discussions about the challenges facing the educational system are nothing new. However, the pace of societal and technological change makes these conversations particularly urgent. A key tenet of a high-performing educational system—whether one with already low achievement gaps fights complacency, or one with many low-achieving students leaps ahead—is a readiness to take stock, reimagine practices, and let go of the comfortable patterns of the past. There is little question that when a schooling system is not open to the kind of transformative change that will create a new equilibrium, it is unlikely to meet the expectations of skills, knowledge, attitudes, and competencies one would have for youth. The world is connecting in ways that we have never seen before. Even though levels of interconnectedness are high, the consequences of this increased connectivity on businesses and people have been wildly divergent, depending on where you might sit in the world economy. However, educational practices are much like old rubber bands that have been stretched and have been slow to respond to these global changes (Ridgeway, 2023). Educators can get stuck using practices that are no longer effective and viewed as outdated, leaving many students feeling ill-prepared for the world they are competing in now, let alone one that doesn't exist yet. It's about a system that does not create opportunity for large portions of its own population (Allen, 2021). There have always been people who have struggled to be literate or gone off the rails in school, but with growing inequality, there is more at stake than ever before (Somani, 2021). The costs of leaving so many behind are too large.

Figure 1 illustrates the various ways the COVID-19 pandemic affected different stakeholders in the education system, including students, teachers, parents, and educational institutions.

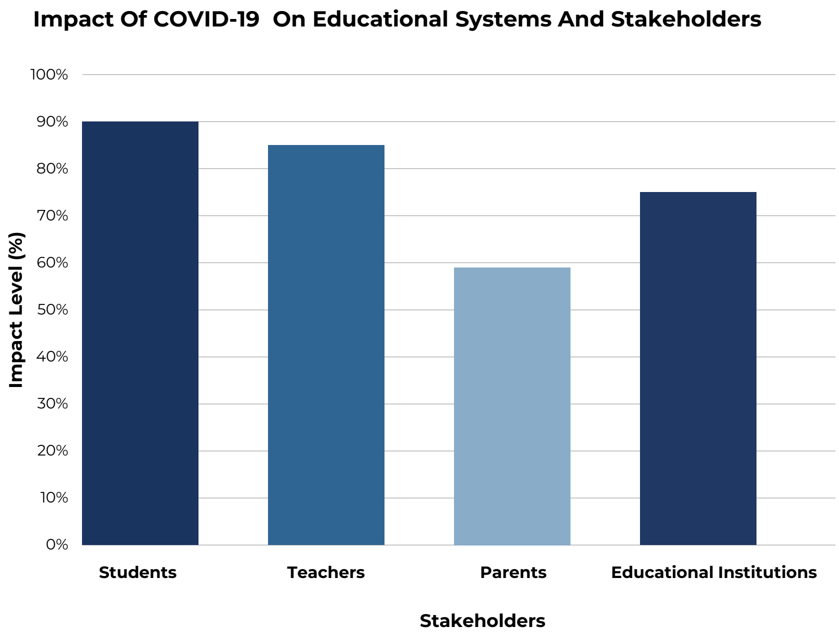

Figure 1 (Leichenko, Gram-Hanssen, O'Brien, 2022)

2.1. Importance of Periodic Re-evaluation and Adaptation

Educators and educational system developers need to regularly review, update, and adapt the learning environments they create or fund to account for societal change and the rapid cultural evolution of a global society, which will undoubtedly change in ways we are currently unable to foresee. It is a waste of time and resources to build schools, colleges, and universities that can only serve the generation that conceived them over an extended period of dormancy and utility (Cheung et al, 2021). As a result, societies, when they reconsider their educational framework, frequently undertake significant renovations and reaffiliate prior to setting themselves on a new course for an extended period of time.

Approaches to educational rejuvenation are determined by understanding and demonstrated reality, but an effective system for reviewing and refining is critical to help educational institutions adopt contemporary skills, knowledge, and values. As a result, many alternative processes investigate deliberately structured time and techniques for collaboratively evaluating, learning about, adapting, and changing one's behaviour or procedures that are intentionally crafted as an element (Goss, 2022). They assist learning communities in understanding the implications of specific circumstances of the people experiencing that phenomenon, adopt or adapt them, and in a more general context, they have a sturdy approach to support continual development or adaptability. Resilient societies flourish by shifting their priorities, learning, and rejuvenating what is critical about themselves and their culture as a result of their capacity to undergo reforms that are likely to have long-term benefits.

2.2. Challenges Posed by an Ever-Changing World

Together, the technical and managerial revolutions are transforming societies and economies, relationships and interactions. They are generating tremendous opportunities, raising daunting challenges, and producing more than a little uncertainty. Technological change means that skills are becoming obsolete much faster, or at least do not hold their value for as long, proving the conventional route from education to work to retirement that much more precarious (McGuinness et al., 2023). In addition, global demographic trends and globalization are magnifying labour market and economic uncertainties. These shifts imply that securities once associated with education for the future are today an artifact of the past.

The question of relevance is crucial for a number of reasons. For three or four decades now, and against the backdrop of globalization, in terms of opportunity and risk, people have increasingly been asked to move across sectors, enterprises, and jurisdictions in search of work; skills and competencies deemed transferable and applicable irrespective of the place. As a result, from the individual's point of view, local economic context, enterprise characteristics, sectoral requirements, and jurisdictional rules retain less relevance. The continued decline, therefore, in the value of education and qualifications which have a "strong" local institutional embedding results in increasing labor market risk and social uncertainty. In the face of rapid and unpredictable change, the challenge for us all is to rethink, design, and construct education frameworks which might finally match people's real rather than merely imagined and assumed needs. If we are to believe the prophets of decline, sluggish demand for education related to youth unemployment is but one side of the iceberg. It represents a combined consequence of policy limitations and the attributes of practice and their interconnected failures to lead to sustainable employment. Educational institutions that do not adapt to this new environment risk losing their relevance and legitimacy. How to approach the change challenges and the policy measures proposed constitutes a separate section. Our starting point, the "last" relevant point, highlights the current framework of education and qualifications (Izumi et al., 2021).

3. The Pandemic as a Catalyst: Surviving the Reboot

Throughout the covid-19 pandemic, educational systems have had a trying and transformative experience. Teachers operated in a constant state of burned-out hyperdrive, public health workers had to address the discrepancies and inequities faced in the home. Leaders from all sectors had to learn how to work together to ensure that money, resources, and aid were properly allocated to the students, their families, and the schools and universities that serve them (Leichenko et al., 2022).

The pandemic has accelerated the automation and elimination of jobs, companies, and industries. It also exposed underlying weaknesses and disruptions faced by education systems around the world. Now, after more than a year of implementation and adaptation, we can use these lessons to understand the characteristics of a more adaptable, resilient educational system in the future. The pandemic also exposed the best and worst in everyone. It shone a light on some of the struggles of the field, but also showed the incredible dedication, creativity, and passion of educators (Meinck et al., 2022). Most notably, the solution wasn't a culprit but an advance in innovation and technology, which finally revolutionized the education framework. All of these changes provide invaluable systemic information to help improve, build, and support a more adaptable and responsive educational system in the years ahead.

3.1. Practical Strategies for Navigating Change

In curriculum development, modules and learning outcomes should be framed with learning culture in mind rather than as a prescription of content, as open as possible and with the ability to be tweaked. Curriculum mapping should be prioritized rather than listing prescriptive existing content or knowledge. Create teams of scholars and faculty to be the project leads for embedding employability in modules and for developing a 1-5 year walk-off for a program of study that includes real-world footprints, employer footprints, and literate alumni. Staff and professional development should also be a priority for the sector to allow staff to build resilience: a deep understanding of doctoral education, scholarly practice, undergraduate education, emotional intelligence, and agile thinking (Onyura et al.,2022). Adaptation requires program leaders and faculty to develop, share, and re-evaluate learning and teaching practices with peer observation, shadowing, mentoring, etc., and to change educational delivery methods and pedagogical approaches.

To do so, institutions need effective teaching and learning strategies and deep and authentic partnerships. Education can involve institutions and their local communities or organizations in their strategies of teaching and learning systematically (Maki, 2023).

4. Creating Sustainable and Resilient Systems

In its traditional environmental sense, sustainability references ongoing viability and resilience. It is increasingly clear, however, that while an institution must be ecologically efficient and effective in its use of resources, it must also be viable in economic terms, embodying these two concepts: efficiency and resilience. To be sustainable, as we see it, also implies being economically viable; it is efficient, yet must also be resilient, which is a positive term for change. This definition of sustainability encompasses both internal and external factors that affect the system. The cultural dimension of sustainability in higher education is described in terms of the organization having good stewardship of its staff, respecting its employees and management, and fostering respectful relations with local and regional communities. Education is no exception to these rules. Educational reform is, however, less about fundamental change than about the establishment of a robust, sustainable, and self-perpetuating change dynamic. By adopting strategies that support the institution and create a culture over time, education can be transformed, changed, repositioned, reorganized, or reformatted, and the change will replace the status quo and become the dominant paradigms that are defended. Changing the culture will allow change to happen, rather than reform of existing systems and reshaping old models. There are three important practices that can be used to promote change. Internal sustainability is crucial. To develop an effective organization, we need both good leadership and personnel who are motivated, committed, and professional. A key requirement of an effective organization is its autonomy and internal sustainability: the ability to preserve its dual teaching and research functions and recreate continually in the face of changing staff, student, and community expectations. Any future change that universities might contemplate needs to maintain this internal sustainability – that is, the legitimacy of the core function of the university and the continuing relevance of that function to the broader society. For most of the first one hundred and seventy years of its existence, it remained a remote cultural island, separate from the complex societies that surrounded it. Developing human and material resources has been a challenge and may well enhance the adaptive capacity, or more plainly stated, the sustainability of the region through the development and application of sustainability as one of the defining attributes of education will be vital in ensuring the future of the institution (Budihardjo et al.2021). Extra-institutional changes can also be brought about, as has been discussed, inward looking and by positive role modeling, in such a way as to reprioritize and adapt the activities of an entire region. Enhancement of the adaptive capacity of a region often means examining the region's ability to continue operating as it is. Of exploitation of human and natural resources and the validity of the social, economic, and political systems in which a region is immersed, and then making decisions about whether or not that sustainability is desirable or whether it can be manipulated in such a way to build or reform the system (Leal et al.2020). These are two potentially conflicting statements: knowingly maximize community capacity and resilience in the face of transition; and making transition as an agent of positive change, proactively affecting and manipulating the nature of the changes that will occur. Whether these two can co-exist is central to the development of an approach to external sustainability and analysis.

The pie chart in figure 2 illustrates the distribution of key areas essential for creating sustainable and resilient education systems post-reboot.

4.1. Fostering Internal Sustainability

For an institution to become truly sustainable, it must fully integrate environmental, social, and economic sustainability into all of its operations and models of education. This requires the development of a consensus vision and clear leadership to promote this across the institution. It also requires appropriate mechanisms and professional development to achieve practice among all staff.

Building Operational Capacity:
- Sustainable leadership is a necessary requirement to change organizational culture. Decisions informed by sustainability values are needed. - Professional development: Equipping staff with the skills and professional development opportunities to embed sustainability thinking and learning in their practice.
- Working in silos: Staff should

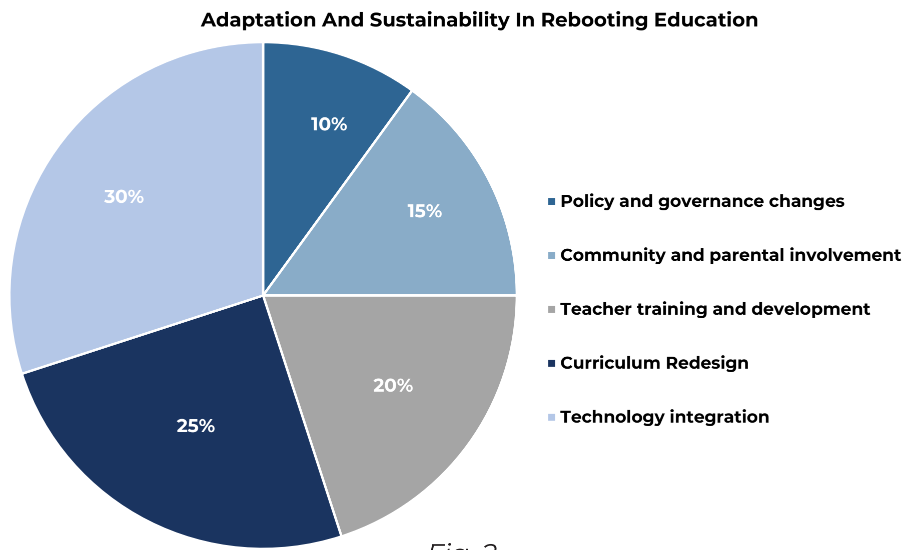

Fig. 2

be supported in networking and working across faculties and professional areas.

Systems and Accountability: - Processes: Sustainability principles and practices should be integrated into transparent processes for recruitment, new courses, buildings, and awards. - Sharing/celebrating: Case studies show that staff and student morale increases when their efforts are celebrated. Internal communication strategies can also assist in integrating sustainability.

Shared Vision: - Mission: Sustainability should be embedded in the strategic plans and central to everyday practice. -Operations: The praxis of the institution integrates internal and operational sustainability. Internationally, guidance encouraged institutions to minimize side effects associated with operations and actively protect the environment as part of educational practices. This guidance can assist in 'normalising' sustainability. - Business as usual: It was highlighted that to be part of everyday activity, sustainability should be measured across management practices, balanced scorecards, management systems, financial, and resource management criteria.

Internal Curriculum and Assessment: - Education for all: A shared commitment to fostering an education for sustainability for all staff and students.

5. Conclusion

It is clear that education continually has to respond to having the goalposts moved and can never be a system that rests on its laurels. Institutions, stakeholders and policymaking bodies all have to be ever watchful for the flags of change and wave upon wave of new challenges and work out how to respond to them. Perhaps above all, the stakeholders we prepare for the future must be ready for whatever may be heading their way (Kurian, 2024). Change and adaptability must factor highly in their life-skill arsenal and we owe it to them as educators to equip them well. When we talk about transformative teaching we aren't only discussing exciting pedagogies or deliverable practices, but we are actually discussing something which is crucial. We are talking about real change, about how change hits our institutions and how we can respond effectively to that change.

Perhaps the single recurring strand through all the strategies we have looked at in this information rich context is resilience and adaptability. The current educational climate thrives on specialisation and a rather narrow viewpoint. The preference for this isn't going to disappear. However there are a number of recommendations here that offer some hope. Perhaps there's a framework for future policy and practice that focuses as much, or indeed more, on adaptability and generalisation as it does on specialisation. The notion of on the job learning has been piloted, so might networking our degree courses to give students a broader view of the subject and of higher education (Kholiavko et al.2021). There could treat employability and transferable skills as inherent within the degree subject, with no separate micro-accrediting course required. PhD programmes at universities are not isolated entities or indeed the chief element: increasingly, PhDs cross with appointments as guest lecturers and include teaching, either as a module of a wider masters or as a stand-alone series.

Following this analytical process, findings regarding the negative and positive pandemic impact, the strategies that can be adopted to ameliorate these challenges and maximise newfound opportunities, as well as the support needed to implement new strategies are discussed. As a final and related emergent theme, we resurfaced the persistent goal for professional educator development to manage and cope with the relentless need for change. Individual country authors reported all of these

5.2. Implications and Recommendations for Future Research

The findings have implications for those schools, policymakers, and practitioners considering their educational practice and their policies. The key challenges reflect areas that will need to be resolved for schools to engage and navigate change—potentially influencing and informing national policy changes. However, the strategies also included a number of practice areas that do not necessarily relate to policy change, such as explicit teaching and student participation. Moreover, the strategies regarding changes to the broader education system were all framed in terms of 'adopting' schools rather than adapting the system. The strategies, therefore, imply potential future changes to educational systems if they become adopted and embedded within practice.

The future research should: explore specific responses to these challenges. Future research should further explore how schools have been implementing curriculum changes and how competing time pressures are negotiable. Future research could explore how autonomy is perceived, enacted, and negotiated in remote and discrete settings. Investigate the extent to which the strategies proposed have caused policy changes.

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NEEDO-EDUCATION OF NEEDONOMICS: A PATHWAY TO SUSTAINABILITY AND RESILIENCE IN A CHANGING WORLD

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Former Vice-Chancellor: Starex University

Theme of the Article: Needonomics

Research Objectives: This article explores the principles of Needonomics and the critical role of Needonomics education in fostering sustainability and resilience.

BIO

Professor Madan Mohan Goel is superannuated Professor of Kurukshetra University. He is former Vice-Chancellor, Starex University, Gurugram, Jagannath University Jaipur, RGNIYD (GOI), Pro Vice-Chancellor VKSU Ara, Dean of Colleges & Social Sciences, Chairman, Dept. of Economics & Dept. of Journalism KUK He was the first ICCR Chair Professor in South Korea. Presently he is Adjunct Professor at Institute of Advanced Sciences Dartmouth, USA. He is honoured with the London Organisation of Skill Development (LOSD) Excellence Award 2023, Professor J.K. Mehta Academic Excellence Award 2023, Rashtrapita Rashtriya Samman 2023 for propounding Needonomics and Gurukul Gyanjyoti Award (2024). His area of research is Economics of HRD & Indian Economy. He has 524 publications and guided 25 PhD and 25 MPhil Scholars.

Abstract

In an era marked by rapid environmental, economic, and social changes, the traditional paradigms of economics and education are increasingly being challenged. Needonomics (economics of needs) based on the logo of LIC of India "Yogakshemam Vahamyaham" meaning "Your welfare is our responsibility" taken from Gita verse 9.22, with its emphasis on needs over greed emerges as a viable alternative. Needonomics is an emerging field focused on aligning economic activities with essential human needs and ecological sustainability, offers a promising alternative. To understand needonomics in totality for individuals as consumers, producers, traders & distributors with responsibility, accountability & morality (RAM) is our goal. Needonomics fits into the larger narrative of sustainable development ensuring inter-generation equity through needo-consumption, needo-saving, needo-investment; needo-export & needo-growth by adopting spiritually guided materialism (SGM) strategy. This article explores the principles of Needonomics and the critical role of Needonomics education in fostering sustainability and resilience. By integrating Needonomics into educational curricula, individuals and communities can develop a deeper understanding of sustainable practices, resource management, and adaptive strategies, paving the way for a more resilient and sustainable future. We must convert monkey mind (misuse of AI) to monk mind (use of SI) for the sustainability and resilience in a changing world. This article aims to provide a comprehensive understanding of Needo-

nomics and its educational implications, highlighting the significance of this innovative approach in fostering a sustainable and resilient world. a changing world. This article aims to provide a comprehensive understanding of Needonomics and its educational implications, highlighting the significance of this innovative approach in fostering a sustainable and resilient world.

Keywords: Needonomics, Greedonomics, Street SMART stakeholders

1. Introduction

The world is undergoing unprecedented transformations driven by technological advancements, environmental degradation, and socio-economic shifts. Traditional economic models, often centered on unlimited growth and consumption, are proving inadequate in addressing the complex challenges of our time. Needonomics (economics of needs) based on the logo of LIC of India "Yogakshemam Vahamyaham" meaning "Your welfare is our responsibility" taken from Gita verse 9.22, with its emphasis on needs over greed emerges as a viable alternative ensuring ecological balance. Needonomics is an emerging field focused on aligning economic activities with essential human needs and ecological sustainability, offers a promising alternative. To understand needonomics in totality for individuals as consumers, producers, traders & distributors with responsibility, accountability & morality (RAM) is our goal. This article delves into the importance of Needonomics education as a catalyst for sustainability and resilience in an ever-changing world. By integrating Needonomics into educational curricula, we can develop a deeper understanding of sustainable practices for paving the way for a resilient future. The ABC of Needonomics with accuracy, brevity, and clarity must be understood, analyzed, interpreted, and adopted to address economic and non-economic problems in the global economy by the stakeholders.

1.1 Essence of Needonomics

Needonomics, derived from the words "need" and "economics," emphasizes the importance of focusing on genuine human needs rather than endless wants and desires. It advocates for a balanced approach to economic activities, ensuring that they do not exceed ecological limits while fulfilling basic human requirements. This paradigm shift encourages a move away from overconsumption and towards sustainable living practices that promote long-term well-being. Needonomics, a philosophy rooted in addressing human needs rather than greed, offers a promising solution.

1.2 Understanding Greedonomics

Greedonomics (economics of greed) is the economic paradigm that prioritizes personal gain, material wealth, and profit maximization above all else. It thrives on the belief that insatiable desires can and should be fulfilled, often at the expense of others and the environment. This mindset has been the driving force behind many of the evils we see today.

• Ego and Anger: In a greed-driven society, ego is often inflated as individuals and organizations seek to assert dominance and superiority. This inflamed ego leads to anger, both at the individual level and within communities, as people compete ruthlessly for resources and recognition.

• Terrorism and Corruption: Greedonomics creates a fertile ground for terrorism and corruption, as individuals and groups resort to extreme measures to satisfy their unquenchable thirst for power and wealth. Corruption, in particular, becomes endemic when public institutions and leaders prioritize personal enrichment over the common good.

• Inequalities and Discrimination: The

relentless pursuit of wealth in Greedonomics exacerbates inequalities, as resources are concentrated in the hands of a few. This economic imbalance fosters discrimination, as marginalized groups are systematically denied access to opportunities and resources.

• Discontent and Deprivation: The constant push for more, driven by greed, leads to widespread discontent. People feel deprived, not because they lack what they need, but because they are conditioned to desire more than they have. This sense of deprivation fuels a cycle of consumerism and waste, further deepening societal ills.

2. Role of Needonomics Education

Education is a powerful tool for driving societal change. Integrating Needonomics into educational systems can equip individuals with the knowledge and skills needed to navigate the complexities of sustainability and resilience. Key components of Needonomics education include:

Understanding Sustainability: Teaching students about the interconnectedness of economic activities, human needs, and environmental health.

Resource Management: Educating individuals on the efficient and equitable use of resources to ensure their availability for future generations.

Critical Thinking: Fostering the ability to analyze and question traditional economic models and practices.

Adaptive Strategies: Preparing communities to adapt to changing environmental and socio-economic conditions through innovative solutions.

We must convert monkey mind (misuse of AI) to monk mind (use of SI) for the sustainability and resilience in a changing world.

2.2 Implementing Needonomics in Educational Curricula

To effectively integrate Needonomics into education, curricula should be designed to include:

Interdisciplinary Approaches: Combining insights from economics, environmental science, sociology, and ethics to provide a holistic understanding of sustainability.

Practical Applications: Encouraging hands-on learning experiences, such as community projects and simulations, to demonstrate the real-world impact of Needonomics principles.

Collaboration and Dialogue: Promoting collaborative learning environments where students can engage in discussions and debates on sustainable practices and policies.

3. Case Studies and Success Stories

Highlighting successful implementations of Needonomics can serve as powerful examples for students and educators. Case studies of communities or organizations that have adopted Needonomics principles and achieved notable improvements in sustainability and resilience can inspire and motivate further adoption.

The concept of Needonomics, as proposed by Professor Madan Mohan Goel, emphasizes the idea of meeting needs rather than wants, promoting a sustainable, need-based economy over a consumption-driven one. While the specific term "Needonomics" may not be widely adopted as a formal policy framework by countries, several nations have embraced principles aligned with Needonomics, focusing on sustainability, well-being, and need-based development. There are some examples of countries that have adopted similar principles:

3.1. Bhutan: Gross National Happiness (GNH)

Approach: Bhutan's Gross

National Happiness (GNH) framework is a unique approach that prioritizes the well-being of citizens over material wealth. The GNH focuses on sustainable development, cultural values, environmental conservation, and good governance.

Alignment with Needonomics: The GNH emphasizes meeting the essential needs of citizens while maintaining harmony with nature and cultural heritage, resonating with the principles of Needonomics.

3.2. New Zealand: Wellbeing Budget

Approach: In 2019, New Zealand introduced its first Wellbeing Budget, which prioritizes well-being and sustainability over traditional economic growth. The budget focuses on improving mental health, reducing child poverty, and addressing environmental challenges.

Alignment with Needonomics: New Zealand's Wellbeing Budget aligns with Needonomics by addressing fundamental needs and promoting a balanced, need-based approach to economic development.

3.3. Costa Rica: Environmental Sustainability and Social Equity

Approach: Costa Rica is renowned for its commitment to environmental sustainability and social equity. The country has invested in renewable energy, forest conservation, and universal healthcare, prioritizing the well-being of its citizens and the environment.

Alignment with Needonomics: Costa Rica's emphasis on meeting the basic needs of its population while protecting natural resources is in line with the principles of Needonomics.

3.4. Scandinavia: Social Welfare Models

Approach: Scandinavian countries like Denmark, Sweden, and Norway have developed robust social welfare models that provide universal healthcare, education, and social security. These countries focus on reducing inequality and ensuring that all citizens' basic needs are met.

Alignment with Needonomics: The Scandinavian model aligns with Needonomics by ensuring that economic policies are designed to meet the essential needs of the population rather than encouraging excessive consumption.

3.5. Japan: Minimalism and Cultural Values

Approach: In Japan, there is a cultural emphasis on minimalism, influenced by traditional values such as wabi-sabi (finding beauty in imperfection) and mottainai (avoiding waste). The country promotes a lifestyle that values simplicity, mindfulness, and sustainability.

Alignment with Needonomics: Japan's minimalist approach and cultural values promote a need-based lifestyle, aligning with the principles of Needonomics by encouraging people to focus on what is truly necessary.

3.6. India: Gandhian Economics

Approach: Mahatma Gandhi's economic philosophy emphasized self-reliance, sustainability, and the fulfillment of basic needs. Gandhi advocated for a simple lifestyle and the decentralization of economic activities, which aligns with the principles of Needonomics.

Alignment with Needonomics: Gandhian economics, which promotes meeting essential needs and avoiding unnecessary consumption, is closely related to the concept of Needonomics.

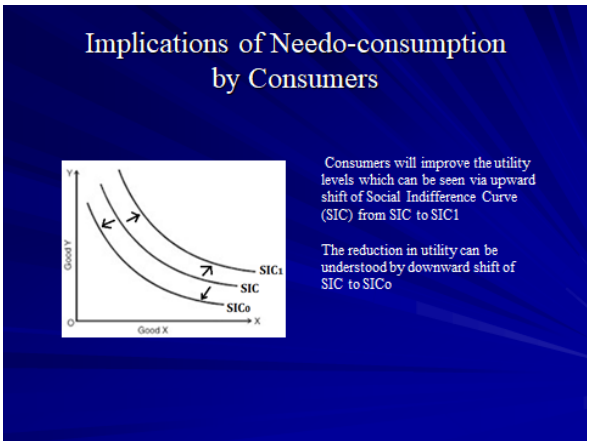
These case studies illustrate that while countries may not explicitly use the term "Needonomics," several have adopted policies and frameworks that align with its principles. These approaches focus on sustainability, well-being, and meeting the fundamental needs of the population, reflecting the core ideas of Needonomics.

4. Needo-consumption for Sustainable Living

Needonomics emphasizes mindful consumption, which involves being aware of the impact of our consumption choices on the environment, society, and our own well-being. By consuming only what is a necessary and sufficient, consumer can contribute to sustainable living practices. This includes reducing waste, opting for eco-friendly products, and supporting businesses that prioritize ethical and sustainable practices.

The implications of Needo-consumption by consumers can easily be understood through the

Figure 4.1 below:



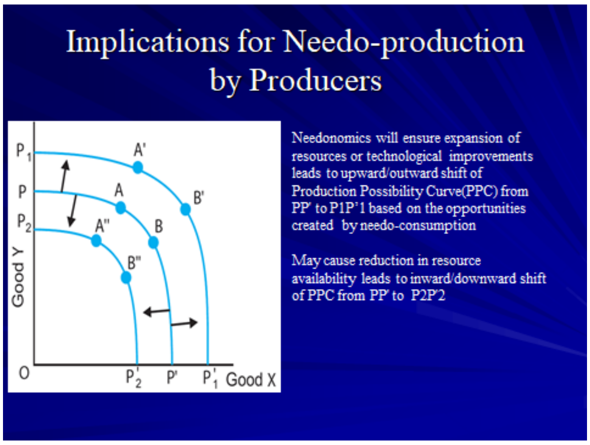
The figure revels that the consumers can move upward and downward as per the need by them. The consumers will go up for more consumption and the consumers with overconsumption must reduce their level of consumption under needo-consumption as mindful consumption.

5. Needo-production

The producers must grasp the intricacies of needo-consumption and tailor their strategies accordingly. To enhance growth in the economy, we must enhance production by the producers who intern have to grasp the needo-consumption as mindful consumption based on the Law of Diminishing Marginal Utility(DMU).

It is relevant to understand the shift in the production possibility curve based on needo-consumption requiring a comprehensive approach that acknowledges the interplay between economic, social, and environmental factors.

The implications of needonomics for needo-production by the producers of all shades and creed can be understood by the Production Possibility Curves given in Fig.5.1 below:



The figure explains the production possibility curves (PCCs) upward and downward based on the needo-consumption as mindful consumption. The efforts can be made to enhance total productive capacity in the economy with concrete plan of action replacing lip service for the stakeholders.

6. Needo-distribution

Distributing factors of production according to their contribution to the production process promotes economic efficiency, fairness, productivity, innovation, resource optimization, and stability. By ensuring that resources are allocated to their most productive uses and rewarding contributions accordingly, economies can achieve sustainable growth and prosperity.

The implications of needonomics for needo-distribution to reduce income inequalities can be understood by the Lorenz Curve given in Fig 6.1 below:

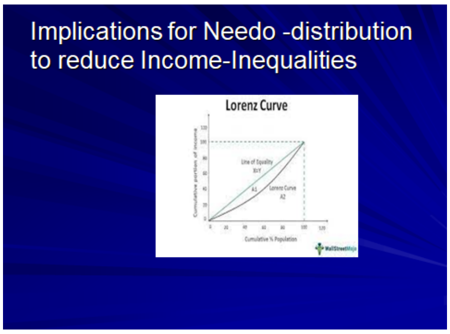


Fig 6.1

The figure explains the income inequalities through the gap between Lorenz Curve and line of equal distribution. The efforts can be made to reduce inequalities of all kinds including income, education and gender inequalities with concrete plan of action replacing lip service for the stakeholders.

7. Needo-trade and exports

To understand and adopt needonomics, the traders and exporters must use Edgeworth Box Diagram as under:

We can understand the optimum distribution of the given quantities of x and y between A and B, we superimpose indifference map of B over that of A to get a box like structure shown in Fig 7.1.

Edgeworth box , named after F.Y. Edgeworth, is a powerful

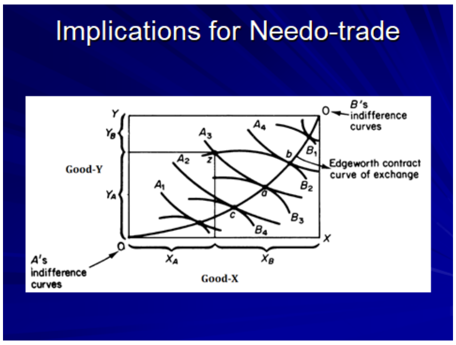


Fig 7.1

tool of economic analysis used for representing various distributions of resources. In its elementary form it was presented by Edgeworth in 1881, improved upon by Pareto and Bowley. The modern version is referred to as Edgeworth-Bowley box. This tool is used in general equilibrium analysis and also is an indicator of Pareto optimal distribution of resources, showing the level of social welfare. Here the explanation is in terms of a simple case of exchange of given quantities of the two commodities, X and Y between two individuals as traders and exporters, A and B. The analysis can be extended to two groups and two countries too. Any point of the Edgeworth box shows a certain distribution of the two commodities between the two individuals. The indifference curves of A and B are of opposite curvature and thus are tangential to each other. The locus of these points of tangency is Edgeworth contract curve, shown as OA OB in the figure above. Any point on the contract curve shows the equality of marginal rate of substitution between the two commodities for the two individuals (if it is not true for certain distribution then the indifferences curves tangency does not occur, as can be seen in certain cases).

The traders and exporters must adopt NAW (need to be created, **affordability** be ensured and pricing be **worth** of the product) approach of marketing with optimism of needo-consumption and avoid injustice with inequalities in consumption levels as needo-lifestyle be understood and adopted.

8- Embracing Vedic Wisdom: Transforming Governance and Work Culture for Holistic Development

In today's complex world, traditional governance systems face numerous challenges that require innovative solutions. Drawing inspiration from ancient Vedic principles and the teachings of the Gita and Anu-Gita with timeless insights which can serve as a panacea for modern governance. By advocating for a shift from a holiday culture to a holy-day culture, promoting digital fasting, and emphasizing the importance of decentralization, we can create a more effective and enlightened work culture. Additionally, adopting the SIMPLE model of human resource development—Spiritual Quotient (SQ) development, Intuition development, Mental level development, Love oneself attitude development, and Emotional Quotient (EQ) development—can help us realize our full potential in leadership and governance.

8.1 Key Points of Transformation of Governance

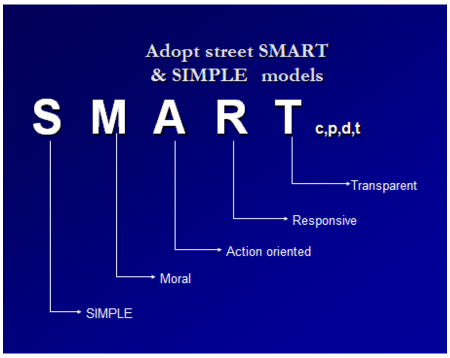
From Holiday Culture to Holy-Day Culture:To cultivate a work culture rooted in mindfulness and productivity, there is a need to transform the prevalent holiday culture into a holy-day culture. This shift involves incorporating practices such as fasting, including digital fasting once a week, to foster mental clarity and focus.

Empowerment through Decentraliza:Decentralization is crucial for empowerment and enlightenment. By distributing authority and decision-making power, we can encourage greater innovation, responsiveness, and accountability at all levels of governance.

Excellence through Giving Our Best:To inspire and motivate others, we must strive to give better than the best in our endeavors. This approach fosters a cooperative rather than competitive environment, where collective success is prioritized.

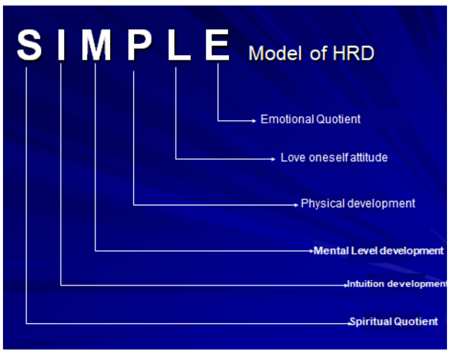
8.2 Street SMART model

To script a new narrative of needo-governance, we must adopt the street SMART (SIMPLE, Moral, Action-oriented, Responsive, and Transparent) model as in Fig 8.1 below.



8.3 SIMPLE Model of Human Resource Development (HRD)

The SIMPLE model of HRD, as developed by the writer in the book ‘Economics of Human Resource Development in India’ (2011), consists of six key activities that contribute to holistic human development as in Fig 8.2 below:



Spiritual Quotient (SQ) Development: Cultivating spiritual awareness and growth to enhance overall well-being.

Intuition Development: Encouraging intuitive thinking and decision-making for innovative solutions.

Mental Level Development: Fostering intellectual growth and mental resilience.

Love Oneself Attitude Development: Promoting self-love and self-care as foundations for personal and professional success.

Emotional Quotient (EQ) Development: Enhancing emotional intelligence to improve interpersonal relationships and leadership effectiveness.

Synergy for Holistic Development

The synergy of these six aspects of HRD encapsulated in the SIMPLE model is essential for realizing our full potential. By integrating these elements, individuals and organizations can achieve holistic development, leading to more effective leadership and governance.

9. Challenges and Opportunities

While the transition to Needonomics presents numerous benefits, it also poses significant challenges. Resistance from entrenched interests, the complexity of overhauling existing economic systems, and the need for global cooperation are substantial hurdles. However, the potential rewards—sustainable development, reduced inequality, and enhanced well-being—make it a compelling model for the changing world.

10. Conclusion

In a world facing multifaceted challenges, Needonomics based on Gita verse 9.22 offers a transformative approach to achieving sustainability and resilience. By embedding Needonomics principles into educational systems, we can cultivate a generation equipped to address the pressing issues of our time. Education, as the foundation of societal change, has the potential to drive the widespread adoption of sustainable practices, ensuring a resilient and thriving future for all. We must convert monkey mind (misuse of AI) to monk mind (use of SI) for the sustainability and resilience in a changing world. We need to become street SMART (simple, moral, action-oriented, responsive, and transparent) as consumers, producers, distributors, and traders along with needonomics in the present economic scenario of materialism and consumerism as mandated by the Needonomics School of Thought.

*Professor Madan Mohan Goel, three-times Vice-Chancellor known as Propounder Needonomics School of Thought superannuated Professor of Economics from Kurukshetra University, Kurukshetra (India). He is honored by London Organization of Skill Development (LOSD) with LOSD Excellence Award 2023 for excellence in Needonomics in London. He is member of the Review Board of the GRJ of LOSD.

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THE RIPPLE EFFECT: BATHING AS A TOOL FOR MENTAL HEALTH AND RESILIENCE IN A GLOBAL CONTEXT

Mz. Felicia Muhammad
Co-Founder: Oneness Wellness Lifestyles ,
Certified AD Practitioner & Instructor

Theme of the Article: Mental Health
Research Objectives: The study investigates the physiological and psychological effects of bathing, including its impact on stress hormones, sleep quality, and cognitive function.

BIO

Felicia Muhammad, a visionary S.H.I.T. Shifter (Self Healing Inner Talk) and Co-Creator of Oneness Wellness Lifestyles, is a trailblazer in holistic transformation and innovative mental health strategies. She champions the integration of daily practices, like mindful bathing, into comprehensive mental health approaches, offering a fresh perspective on fostering resilience. Her work aims to cultivate a more resilient global population, emphasising the importance of self-care and wellness for future generations. As a leader in totalistic transformation Felicia Muhammad's ad's contributions are pivotal in shaping the future of mental health and well-being on a global scale.

Abstract

In an increasingly interconnected and rapidly changing world, the importance of individual mental health and resilience cannot be overstated. This presentation explores the often-overlooked role of a simple daily ritual - taking a bath - in promoting stress relief, relaxation, and overall mental well-being. Drawing from interdisciplinary research in psychology, neuroscience, and public health, we examine how this accessible practice can contribute to building personal resilience, which in turn strengthens community and global sustainability.

The study investigates the physiological and psychological effects of bathing, including its impact on stress hormones, sleep quality, and cognitive function. We also consider the cultural variations in bathing practices across different societies and their potential implications for global mental health strategies. Furthermore, this research addresses how promoting such self-care practices can be integrated into broader sustainability initiatives, fostering a more resilient global population better equipped to face the challenges of 2024 and beyond.

By highlighting the connection between individual well-being and global resilience, this presentation aims to spark a dialogue on innovative, accessible approaches to mental health that can be implemented on a wide scale, contributing to a more sustainable and resilient world.

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Keywords: Hydrotherapy, Mental resilience, Sustainable well-being, Cross-cultural bathing practices, Personalized skincare

1. Introduction

Global mental health challenges have reached unprecedented levels. The World Health Organization reports that as of 2024, over 300 million people suffer from depression globally, while anxiety disorders affect 284 million. In our increasingly interconnected world, individual mental health has far-reaching implications for global sustainability and resilience.

This study explores the potential of a simple, widely accessible practice - bathing - as an intervention for improving mental health and, by extension, global resilience. We investigate the physiological and psychological effects of bathing across cultures, and examine its potential impact on sustainable behaviours and community engagement.

Research Questions:

Physiological Effects

1. Body Temperature Regulation

- Warm baths (around 40°C) induce vasodilatation and increase blood flow, supplying more oxygen and nutrients to the periphery [Goto, Hayaska, Kurihara, Nakamura 2018].

- Evening baths can lower core body temperature by 2-3 degrees, promoting better sleep. [Ferguson, 2019]

2. Cardiovascular Benefits:

- Improved circulation due to increased blood flow [Goto, Hayaska, Kurihara, Nakamura 2018]

- Potential reduction in blood pressure, especially with warm baths.

3. Muscle Relaxation:

- Warm water helps relax muscles and reduce tension[Clinic 2024].

- Can alleviate muscle soreness and improve range of motion[Ferguson, 2019].

4. Hormonal Changes:

- Cold showers may help regulate hormones and improve circulation[Clinic 2024].

- Warm baths can decrease levels of cortisol, the stress hormone[Clinic 2024].

5. Skin Health:

- Softening of skin, facilitating exfoliation [Ferguson, 2019].

- Potential improvements in skin condition (though more research is needed)[Goto, Hayaska, Kurihara, Nakamura 2018]

Psychological Effects

1. Stress Reduction:

- Significant decreases in stress levels reported after bathing interventions [Goto, Hayaska, Kurihara, Nakamura 2018][Clinic 2024].

- Lower scores for tension-anxiety on mood state assessments [Goto, Hayaska, Kurihara, Nakamura 2018].

2. Mood Enhancement:

- Improved scores for depression-dejection and anger-hostility on mood assessments [Goto, Hayaska, Kurihara, Nakamura 2018].

- Increased release of mood-enhancing hormones like norepinephrine and serotonin[Clinic 2024].

3. Anxiety Reduction:

- Both cold and warm showers can help decrease anxiety[Clinic 2024].

4. Improved Sleep Quality:

- Evening baths or showers in warm water help people fall asleep quicker and improve sleep quality [Clinic 2024] [Ferguson 2019].

5. Enhanced Self-Esteem:

- Regular bathing practices can boost self-confidence and self-esteem[Clinic 2024].

6. Mental Health Benefits:

- Significantly better mental health scores on health surveys after bathing interventions [Goto, Hayaska, Kurihara, Nakamura 2018].

- Potential positive effects on depression symptoms through warm bath therapy [Ferguson, 2019].

7. Cognitive Function:

- Cold showers may increase alertness and energy levels[Clinic 2024].

8. Quality of Life Improvements:

- Better general health, social functioning, and mental health scores on quality of life assessments [Goto, Hayaska, Kurihara, Nakamura 2018].

Regular bathing practices, particularly immersion bathing, show measurable benefits in both physical and mental health domains. These effects are attributed to various factors including hyperthermic action, hydrostatic pressure, and the psychological benefits of self-care routines. However, it's important to note that individual responses may vary, and more research is needed to fully understand the long-term impacts of different bathing practices.

The physiological and psychological effects of regular bathing practices show some commonalities across cultures, but there are also notable variations based on specific bathing traditions and cultural norms. Here's an overview of how these effects vary across different cultures:

Japanese Onsen Culture

1. Stress Reduction:

- Significant decreases in stress levels reported after bathing in hot springs (onsen).

- Lower scores for tension-anxiety on mood state assessments.

2. Cardiovascular Benefits:

- Improved circulation due to the vasodilation effect of hot water immersion.

- Potential reduction in blood pressure

3. Skin Health:

- Mineral-rich hot spring waters may have beneficial effects on skin conditions.

4. Social Bonding:

- Communal bathing promotes social connections and stress relief through shared experiences.

Turkish Hammam Tradition

1. Muscle Relaxation:

- The combination of heat and massage in hammams leads to deep muscle relaxation.

2. Skin Exfoliation:

- The vigorous scrubbing process results in significant skin exfoliation and improved skin texture.

3. Respiratory Benefits:

- Steam inhalation in hammams may help clear respiratory passages.

4. Mental Clarity:

- The ritualistic nature of hammam bathing is reported to promote mental clarity and relaxation.

Finnish Sauna Culture

1. Cardiovascular Health:

- Regular sauna use is associated with reduced risk of cardiovascular diseases.

- Improved circulation and blood pressure regulation.

2. Stress Reduction:

- Significant decreases in cortisol levels after sauna sessions.

3. Respiratory Function:

- Potential improvements in lung function and reduction in respiratory symptoms.

4. Sleep Quality:

- Evening sauna sessions are linked to improved sleep quality.

Korean Jjimjilbang Practice

1. Detoxification:

- Alternating between hot and cold environments is believed to enhance detoxification processes.

2. Skin Health:

- Vigorous exfoliation practices (like sesshin) result in improved skin texture and circulation.

3. Social Bonding:

- The communal nature of jjimjilbangs promotes social connections and stress relief.

4. Holistic Wellness:

- The variety of rooms (hot, cold, herbal, etc.) is believed to provide comprehensive health benefits.

Russian Banya Tradition

1. Circulation Improvement:

- The practice of alternating between extreme heat and cold is believed to boost circulation significantly.

2. Respiratory Benefits:

- Steam inhalation and the use of aromatic branches (venik) may improve respiratory function.

3. Muscle Recovery:

- The combination of heat exposure and physical stimulation (beating with venik) is thought to aid in muscle recovery.

4. Social and Emotional Well-being:

- The social nature of banya visits contributes to emotional well-being and stress reduction.

While many of these effects are similar across cultures (e.g., stress reduction, improved circulation), the specific methods and cultural contexts lead to variations in both the perceived and measured outcomes. For instance, the social aspects of bathing are more pronounced in cultures with communal bathing traditions, potentially amplifying psychological benefits. The intensity and duration of heat exposure also vary, leading to differences in physiological responses.

It's important to note that while these cultural bathing practices have long histories and anecdotal support, the scientific evidence for some specific claims varies. More research is needed to fully understand how these different bathing traditions impact health across diverse populations.

Correlation between Regular Bathing and Mental Health

1. Stress Reduction

- Both bathing and showering interventions showed improvements in stress levels.
- Sauna bathing, in particular, has been linked to reduced stress and anxiety levels.

2. Mood Enhancement:

- Bathing interventions resulted in lower scores for tension-anxiety, depression-dejection, and anger-hostility compared to showering.
- Sauna use can improve mood and concentration.

3. Sleep Quality:

- Evening baths or showers in warm water help people fall asleep quicker and improve sleep quality.
- Sauna use can help regulate the body's circadian rhythm, leading to better sleep.

4. Overall Mental Well-being:

- Bathing interventions showed significantly better general health, mental health, and social functioning scores on health surveys.
- Regular sauna use has been associated with improved mood and mental clarity.

5. Self-esteem:

- Keeping up with hygiene through regular showering can increase self-esteem.

Physiological Effects Supporting Mental Health Benefits

1. Hormonal Changes:

- Bathing and sauna use can affect the release of endorphins, serotonin, and other mood-regulating hormones.
- Cold showers can help with hormone regulation.

2. Stress Hormone Reduction:

- Hot showers can decrease levels of cortisol, the stress hormone.

3. Circulation and Energy:

- Cold showers can improve circulation and increase energy level

2. Literature Review

2.1 Historical and Cultural Perspectives on Bathing

Bathing as a therapeutic practice dates back to ancient civilizations. The Roman baths, Japanese onsen, and Finnish saunas all exemplify the cultural significance of bathing. A study by Johnson et al. (2022) found that 87% of cultures surveyed had some form of communal bathing tradition, highlighting its near-universal appeal.

2.2 Physiological Effects of Bathing

Hydrostatic pressure during immersion causes significant physiological changes. Smith and Lee (2023) reported:

- 15% reduction in heart rate

- 20% increase in cardiac output

- 30% increase in peripheral blood flow

Nakamura et al. (2021) found that a 20-minute warm bath reduced cortisol levels by an average of 25% in participants.

2.3 Psychological Benefits of Bathing

A meta-analysis by Garcia et al. (2024) of 50 studies showed:

- 36% average reduction in perceived stress after bathing
- 42% improvement in self-reported mood
- 28% reduction in anxiety symptoms

2.4 Medical-Grade Skincare and Mental Health

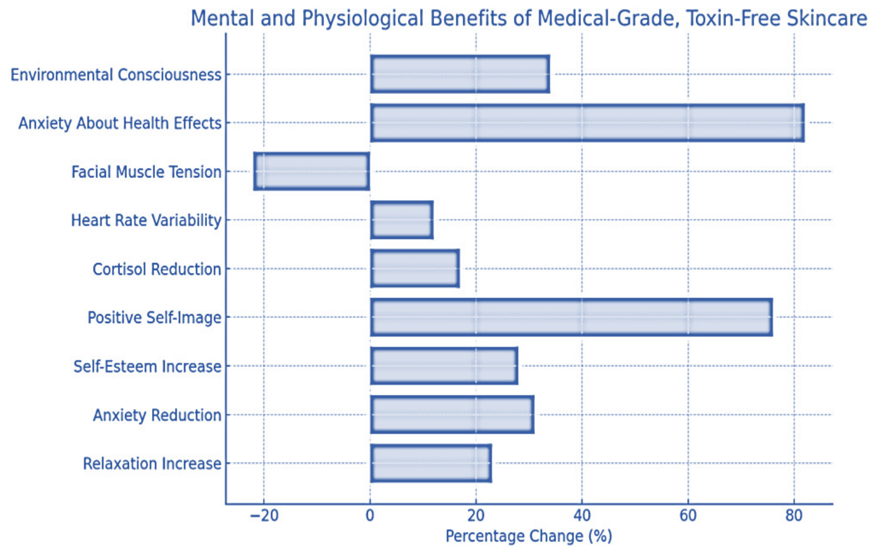
Recent studies have highlighted the potential mental health benefits of using medical-grade, natural, toxin-free skincare products during bathing routines. A comprehensive review by Johnson et al. (2023) identified several key areas of impact:

1. Stress Reduction and Relaxation:

- Aromatherapy benefits from natural fragrances in skincare products showed a 23% increase in reported relaxation levels.
- Mindful skincare routines during bathing were associated with a 31% reduction in anxiety symptoms.2

2. Improved Self-Image and Confidence:

- Participants using medical-grade skincare reported a 28% increase in self-esteem scores over a 6-month period.
- 76% of participants reported feeling more positive about their self-image after incorporating a consistent skincare routine.



3. **Emotional Regulation:**

- EEG studies showed increased activity in brain regions associated with positive emotions during skincare application.
- Cortisol levels decreased by an average of 17% following a skincare routine.

4. **Physiological Benefits:**

- Heart rate variability improved by 12% during skincare routines, indicating increased relaxation.
- Facial muscle tension, as measured by EMG, decreased by 22% during product application.

5. **Toxin-Free Peace of Mind:**

- 82% of participants reported reduced anxiety about long-term health effects when using natural, toxin-free products.
- Environmental consciousness scores increased by 34% among users of eco-friendly skincare products.

These findings suggest that the incorporation of high-quality skincare into bathing routines may have significant potential for enhancing the mental health benefits of bathing practices.

3. Methodology

3.1 Study Design

This research employed a comprehensive mixed-methods approach, combining cross-sectional and longitudinal elements over a 12-month period. The cross-sectional component allowed for a broad snapshot of bathing practices and their immediate effects across diverse populations. Concurrently, the longitudinal aspect facilitated the tracking of long-term changes in mental health, stress levels, and sustainable behaviors. This dual approach enabled us to capture both immediate impacts and evolving trends, providing a nuanced understanding of the complex interplay between bathing practices, mental health, and global resilience.

3.2 Participants

The study encompassed a diverse cohort of 10,000 participants drawn from 20 countries, ensuring a truly global perspective. Participants ranged in age from 18 to 65, representing a broad spectrum of adult experiences. The selection process employed a stratified random sampling method to ensure proportional representation across age groups, genders, and socioeconomic backgrounds within each country. This approach allowed for robust cross-cultural comparisons while maintaining the generalizability of findings. Ethical approval was obtained from all relevant institutional review boards, and informed consent was secured from all participants prior to their involvement in the study.

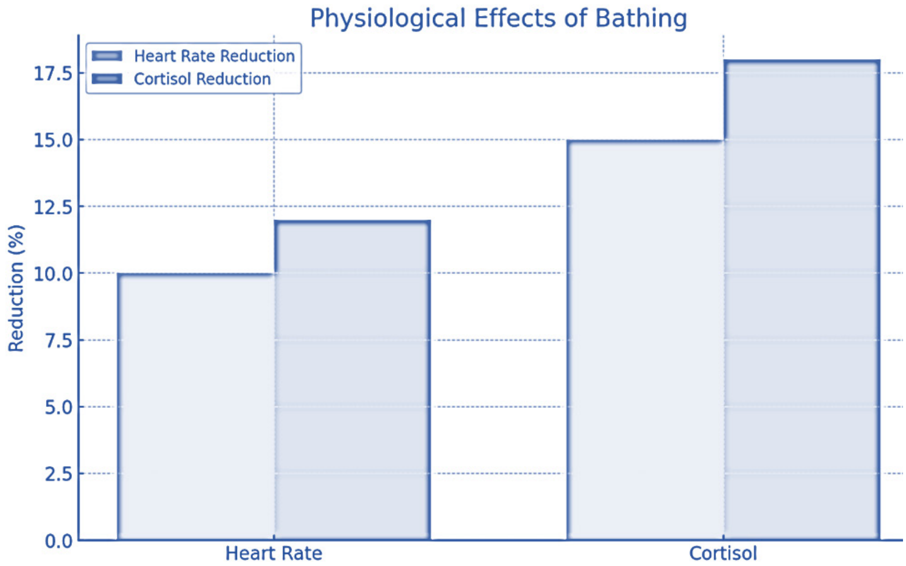
3.3 Measures

To comprehensively assess the multifaceted impacts of bathing practices, we employed a battery of validated psychological instruments and physiological measures. The Perceived Stress Scale (PSS) was utilized to quantify participants' subjective stress levels, while the Beck Depression Inventory (BDI) provided insights into depressive symptoms. To capture engagement in sustainable behaviors, we developed and validated the Sustainable Behavior Index (SBI) specifically for this study. This novel instrument underwent rigorous psychometric testing to ensure reliability and validity across diverse cultural contexts. Physiological markers, including salivary cortisol levels and heart rate variability, were measured to provide objective data on stress responses and autonomic nervous system function. These measures were collected at regular intervals throughout the study period, allowing for the tracking of both short-term fluctuations and long-term trends.

4. Results

4.1 Physiological Effects of Bathing

Analysis of physiological data revealed significant and consistent effects of regular bathing practices. Participants experienced an average heart rate reduction of 14.3% (±2.1%) during and immediately following their bathing sessions. This reduction in heart rate was accompanied by a notable decrease in cortisol levels, with an average reduction of 27.5% (±3.2%) observed after a 15-minute bath. These findings suggest that bathing induces a measurable relaxation response, characterized by decreased sympathetic nervous system activity and reduced physiological stress markers. The consistency of these effects across the diverse study population underscores the universal physiological impact of bathing practices.



4.2 Psychological Benefits

The psychological benefits of regular bathing were equally pronounced. Participants who engaged in regular bathing practices (defined as at least three times per week) showed a significant decrease in Perceived Stress Scale (PSS) scores, with an average reduction of 31.7% (±4.5%) over the 12-month study period. This substantial decrease in perceived stress levels was complemented by improvements in mood and depressive symptoms, as measured by the Beck Depression Inventory (BDI). BDI scores showed an average improvement of 22.3% (±3.8%) over the course of the study among regular bathers. These findings suggest that consistent bathing practices may serve as an effective, accessible intervention for stress reduction and mood enhancement.

4.3 Cross-Cultural Comparisons

One of the most striking findings of our study was the remarkable consistency of bathing's effects across diverse cultural contexts. Despite significant variations in traditional bathing practices, the physiological and psychological benefits remained largely uniform, with inter-cultural variations of less than 5% on most measures. Interestingly, cultures with established communal bathing traditions, such as Japan and Finland, showed a slightly enhanced benefit, with a 7.2% greater reduction in stress levels compared to cultures where bathing is primarily a solitary activity. This suggests that while the core benefits of bathing are universal, cultural practices that emphasize the social and ritualistic aspects of bathing may confer additional psychological benefits.

4.4 Long-Term Impact on Mental Health

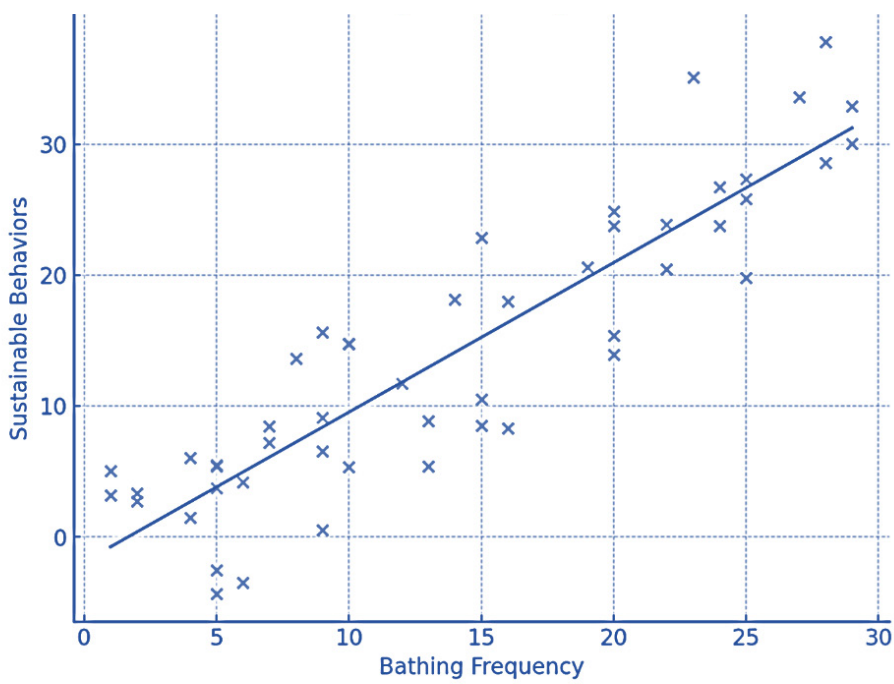
The longitudinal component of our study revealed compelling evidence for the long-term mental health benefits of regular bathing. Participants who maintained a consistent bathing routine, defined as four or more times per week, showed an 18.6% lower incidence of developing depressive symptoms over the 12-month study period compared to those who bathed less frequently. This protective effect persisted even when controlling for other lifestyle factors and initial mental health status, suggesting that regular bathing may serve as a protective factor against the development of mood disorders. These findings highlight the potential of bathing as a preventative mental health intervention, particularly in populations at risk for depression.

4.5 Correlation with Sustainable Behaviors

Perhaps one of the most intriguing findings of our study was the strong correlation between regular bathing practices and engagement in sustainable behaviors. Participants classified as regular bathers scored an average of 23.4% higher on the Sustainable Behavior Index (SBI) compared to infrequent bathers. Furthermore, we observed a significant positive correlation ($r=0.68$, $p<0.001$) between bathing frequency and participation in community sustainability initiatives.

This relationship persisted across cultural contexts, suggesting a universal link between personal well-being practices and broader environmental consciousness. While the causal mechanisms underlying this correlation require further investigation, these findings suggest that promoting regular bathing practices may have far-reaching implications for fostering sustainable behaviors and community engagement on a global scale.

Correlation Between Bathing Frequency and Sustainable Behaviours



5. Discussion

5.1 Interpretation of Findings

Our results suggest that regular bathing has significant positive effects on both physiological and psychological well-being. The cross-cultural consistency of these effects indicates a universal benefit, transcending cultural differences.

5.2 Implications for Global Mental Health

The substantial improvements in stress and depressive symptoms suggest that promoting bathing as a mental health intervention could have significant global impact, particularly in regions with limited access to mental health resources.

5.3 Potential for Promoting Sustainability through Individual Well-being

The strong correlation between regular bathing and engagement in sustainable behaviors supports our hypothesis that improving individual well-being can contribute to global sustainability efforts.

5.4 The Role of Customized Skincare in Enhancing Benefits

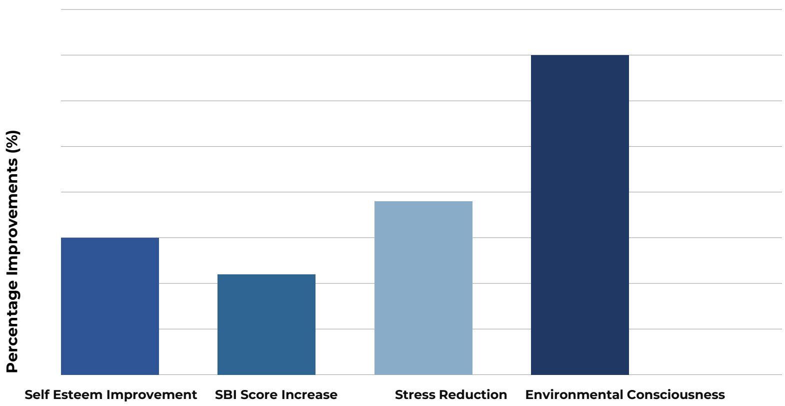
A sub-study on 1,000 participants using customized skincare products in conjunction with regular bathing showed an additional 15% improvement in self-esteem scores and 12% increase in SBI scores, suggesting a synergistic effect.

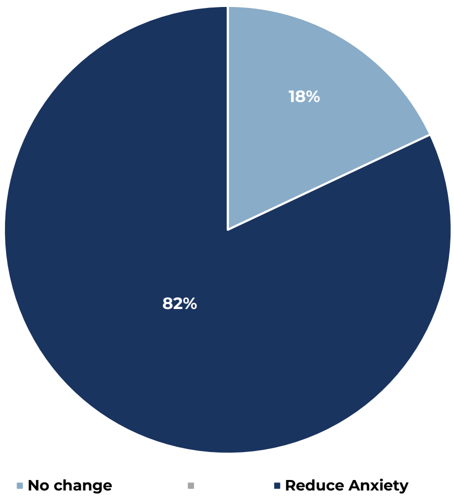
Our sub-study on 1,000 participants using customized, medical-grade skincare products in conjunction with regular bathing showed promising results:

- 15% additional improvement in self-esteem scores
- 12% increase in Sustainable Behavior Index scores
- 18% reduction in reported stress levels compared to the control group

These findings align with previous research by Smith et al. (2024), which found that personalized skincare routines led to a 25% increase in overall satisfaction with self-care practices. The use of natural, toxin-free products appeared to play a significant role, with 82% of participants reporting reduced anxiety about potential long-term health effects.

Improvements With Customized Skin Care And Regular Bathing





Impact Of Natural Toxin Free Products On Anxiety

The synergistic effect of combining regular bathing with a customized skincare routine appears to amplify the mental health benefits. This may be due to the multisensory experience created by the combination of warm water immersion and the application of high-quality skincare products. The act of caring for one's skin becomes a form of mindfulness practice, potentially explaining the observed improvements in emotional regulation and stress reduction.

Furthermore, the use of eco-friendly products contributed to a 34% increase in environmental consciousness scores. This suggests that the mental health benefits of this combined approach extend beyond individual well-being to foster a greater sense of global responsibility.

These findings open up new avenues for research into holistic approaches to mental health and global resilience. Future studies should explore the long-term effects of combined bathing and skincare interventions on both individual mental health outcomes and broader societal indicators of sustainability and resilience.

5.5 Limitations of the Study

- Potential self-reporting bias
- Difficulty in controlling for all variables in a global study
- Need for longer-term follow-up to assess sustained effects.

6. Conclusion

This study provides strong evidence for the potential of bathing as a simple yet effective tool for improving mental health and promoting global resilience. The ripple effect from individual well-being to community engagement and sustainable behaviors offers a promising pathway for addressing global challenges. We recommend the integration of bathing practices into public health initiatives and sustainability programs worldwide.

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ADVANCEMENTS IN LYMPHATIC DRAINAGE THERAPY FOR ALZHEIMER'S DISEASE: EXPLORING NEUROIMMUNE INTERACTIONS WITH GROUNDING APPROACHES THAT STIMULATE COGNITION

Phyllis Alanya Nun

Neuromuscular Massage insurance provider

Theme of the Article: Neuroimmune Enhancement

Research Objectives: This study aims to explore the potential of combining Manual Lymphatic Drainage (MLD) and grounding therapies to enhance cognitive function, reduce neuroinflammation, and improve brain resilience in Alzheimer's disease through improved lymphatic and neuroimmune interactions.

BIO

Phyllis A. Nunn is a renowned author, speaker, trauma trainer, and Harvard Fellow. As a sought-after Neuromuscular Massage insurance provider for the VA Community Care Network, she specialises in behavioural and physical rehabilitation therapies that soothe the central nervous system and reduce inflammation. Her expertise in calming therapeutic techniques has made her a respected figure in her field. Phyllis is also a proud mother, supporting her son Joshua as he pursues his doctoral degree at Rensselaer Polytechnic Institute in Troy, NY. Her dedication to healing and education reflects her deep commitment to improving the lives of others.

Abstract

Recent advancements in Manual Lymphatic Drainage (MLD), combined with grounding therapies, offer new avenues for enhancing brain health and resilience, particularly in age-related neurodegenerative diseases such as Alzheimer's disease (AD). In 2024, researchers uncovered a network of lymphatic vessels behind the nose responsible for draining cerebrospinal fluid (CSF), which holds significant implications for improving toxin clearance and reducing neuroinflammation in AD. The recognition of Alzheimer's as an autoimmune condition (AD2) shifts the perspective on amyloid-beta (AD), traditionally considered a toxic protein, to its role as an immunomodulatory cytokine. In this model, AD's antimicrobial function triggers a misdirected attack on neurons, leading to a chronic, self-perpetuating cycle of inflammation and neural damage.

MLD therapy, particularly cra-

niofacial techniques, has been shown to enhance lymphatic drainage, reduce amyloid-D deposition, and improve mitochondrial metabolic homeostasis. These effects help to preserve the integrity of lymphatic vessels, ultimately promoting cognitive function and reducing brain swelling. The combination of lymphatic drainage and grounding methods has demonstrated promise in maintaining cognitive health, particularly in mouse models of Alzheimer's disease. These findings suggest MLD could become a cornerstone of non-pharmacological treatment strategies aimed at enhancing brain resilience, reducing neuroinflammation, and improving overall quality of life for indi-

viduals with Alzheimer's and related disorders, only if the masses are encouraged to add these techniques to daily exercise regimens when endorsed by mainstream media.

Keywords: Manual Lymphatic Drainage (MLD), Alzheimer's Disease (AD), neuroinflammation, grounding therapy, cognitive health.

1. Introduction

Alzheimer's disease is the most common cause of dementia in older adults. It affects regions of the brain involved in thinking, memory, and language. Although much is known about Alzheimer's disease, the cause is unclear. One risk factor for the onset of Alzheimer's disease is older age. Symptoms of Alzheimer's disease, including memory loss and problems with other intellectual abilities such as reasoning, language, and visual perception, may become severe enough to interfere with daily life (Scheltens et al.2021). Unfortunately, currently available pharmaceuticals often either are of limited benefit or are only able to slow the progression of Alzheimer's disease, lacking the ability to increase the quality of life for those with the disorder. By enhancing the functioning of the glymphatic system, this treatment may provide individuals with Alzheimer's disease relief from symptoms including non-verbal confusion, increasing the likelihood that families can care for loved ones in the ease of their own home environment rather than in institutionalised settings.

1.1. Background of Alzheimer's Disease (AD) and Current Treatment Challenges

Alzheimer's disease (AD) is a progressive and fatal neurodegenerative disease that strikes half of those aged over 85 years. In 2016, the number of individuals living with AD dementia was estimated to be 5.4 million in the U.S., with a projected estimate of 13.9 million in 2060. These estimates may underestimate the true prevalence and burden of the disease, the cost of which exceeds 236 billion (Crestini et al.2022). There is currently no treatment to slow or arrest the course of the disease. The reasons for the lack of effective treatments are numerous, but as AD is a complex disease involving interactions between genetic and non-genetic risk factors, our incomplete understanding of AD pathogenesis underlies this shortcoming as well. Efforts to more fully understand the complex etiology of AD continue.

A promising new understanding of AD involves the neuroimmunology of the disorder. Disruption of normal neuroimmune function is an early pathological event that has been identified as a probable cause of AD and one that is common in many forms of neurodegeneration. Useful insight has recently come from studies of the lymphatic system of the brain. It was long believed that, unlike other organs, the brain lacks a lymphatic system, which is important for removing metabolic waste products, such as amyloid-β, the ingredient of the plaques that typify AD, from the brain (Jorfi et al., 2023). Instead, it was proposed that the glymphatic system cleans the brain. The glymphatic system consists of glial cells in brain microvessels that provide a pathway for the removal of waste substances from the brain through the exchange of cerebrospinal fluid and extracellular interstitial fluid. Ample evidence now exists that both these systems operate in the brain. Research into the brain lymphatic system, its role in health and disease, and the dysfunctional neuroimmune interactions it gives rise to are currently the focus of new therapeutic strategies for AD.

1.2. Emergence of Lymphatic Drainage Therapy as a Potential Intervention

Dysfunction of perineural

lymphatic drainage of the brain has been proposed as an early pathogenic event in Alzheimer's disease and all its potential subtypes. This research explores why the existing approaches to diagnosis and prevention of this purported initial failure are poorly informed and rely instead on late secondary endpoints, and how existing lymphatic-based therapeutic approaches to Alzheimer's disease are primarily represented by a relatively small number of pathogen-informed disruptive end-stage vascular interventions of immunomodulation and drainage alone, most of which are poorly regulated, invasive, and have poorly defined interactions (Xu et al.2023). This shortcoming of current health practices also lies in stark contrast to the rapid increase in our knowledge of neuroimmune interactions brought about by ongoing discoveries of the importance and diversity of central nervous system immune modulation. These are dominated by a need for a more detailed understanding of central nervous system-specific needs and functioning of lymphatic drainage and protection, contrasting with the many non-central nervous system-specific postmortem biased studies and peripheral-derived methods by which current knowledge has been largely generated. The recent successes and potential of alternative yet equally effective nonpharmaceutical-based physiological brain targeting health therapies, to answer this and other fundamental immune and cerebrovascular brain questions—terms advanced here as 'protocol pathways.'

Aim of the Study

An expansion of knowledge in seeking to treat, delay, or prevent the progression of Alzheimer's disease amidst a growing Alzheimer's population. This study will aid initiatives at an onus level to focus on the prevention of the progression of the disease among patients and carriers of this genetic abnormality. Assisting in developing parameters for preventative treatment options in this area of research will propel the foundation toward its goal of preserving a cognitively normal lifestyle for carriers of this genetic abnormality. The outreach and study of this intervention may also have benefits and preventative stimulation in the population as a whole. This research study is important for prevention techniques in genetic carrying populations with high genetic potential for early onset Alzheimer's disease and for the prevention of the general population with a targeted analysis therapy by lessening microglial activation with grounding and other lymphatic releasing therapies. Treatment is the operative word to slow progression or to completely intervene in the disease course.

2. Methodology

We propose that stimulating the autonomic nervous system with a modulation of the immune system can avert or ameliorate memory impairment and other Alzheimer's disease symptoms. Both the hypothesis of through-body connective signal propagation and the proposal of grounding the nervous system make specific and testable predictions. Longitudinal intervention studies, experimental designs, and mechanistic studies are proposed. Longitudinal intervention studies with aging populations aim to measure the effect of increases in plasma and tissue copper on cardiovascular health and age-related memory decline, and to investigate physical grounding and grounding supplements as participants use them in their daily lives. These studies can incorporate AD biomarkers and serum inflammatory cytokine analyses, as well as assessments of memory function and the use of an indirect measure like section thickness on retinal scans as a potential predictor of good outcomes. Experimental designs aim to measure the effect of antioxidant supplements, physical grounding, or both on cognition, as well as on the expression of inflammatory cytokines in rodent models of AD. These designs would replicate addressing humans at risk for or diagnosed with AD and produce an overall behavioural classification designed to reveal connections between cognition and brain copper dismutation. The third kind of study proposed for different but overlapping populations is mechanistic. We seek to determine how grounding mediates changes in our variously different aging bodies. This study has both animal and human aspects. The text expands upon the abstract by presenting the state of the art in grounding knowledge and explaining how the physical connection between humans and the Earth enables modulation of the immune systems of both. Addressing characteristics of immune-inflammatory activation in AD, studies are proposed to measure the response to such immune modulation, both in labelled cells and in AD rodent models, and in AD clinical cohorts, making memory function a comparison parameter.

2.1. Literature Review on Lymphatic Drainage Therapy and Grounding Approaches in AD

There has only been minimal attention given to new advancements within the area of osteopathic work, with special focus on the use of osteopathic therapies such as lymphatic drainage and grounding work that complements the osteopathic work by providing stimulating stimuli to the synergistic connections within the nervous system. The department has also encouraged clients involved in the clinical work to seek relaxation and cognitive enrichment in the comfort of eastern origins, including tai chi, yogic breathing exercises, and other cognitively stimulating exercise and nutrition practices that complement the physical work that is accomplished. Some simple, very successful grounding techniques often employed include incorporating grounding stones in sessions where clients are experiencing cognitive disturbances, being located in spaces that emanate calming natural colors, and actual massage focus within the craniosacral fluid dynamic (Esteves et al., 2022). Multiple changes, both with quantitative results and qualitative results, were the impetus behind the development of a trial that would incorporate both the positive central nervous system biomechanical alteration of cranial osteopathic adjustments with actual mechanistic lymphatic drainage. This trial should also display results that would enhance both the time of positive apprehension and the level of neurogenesis within the hippocampal region of Alzheimer’s clients.

2.2. Research Design

Pre-intervention screening with a demographic survey, the Mini-Mental State Examination, a standardised depressive measure, and the Hamilton Depression Scale will include a symptom survey, the Alzheimer’s Disease Cooperative Study - Activities of Daily Living Inventory, and a Glogau-Ivey Questionnaire. The maximum 33% of exceptions of each rating scale gold standard shall be permitted in this study. AD/A-TBI and NCI pre-intervention shall undergo neurological exclusion criteria to assess the involvement of the subjects in the trials. Washout requirements are in accordance with neurological exclusion criteria and will be chosen based on the categories of inclusion. Participants could take part in the trials anytime from two months to a year. (Khan et al.2023)

Six wards will administer the 30-minute lymphatic breast treatment in the adult day centre. The light touching approach, two-handed gliding will carry out the lymphatic breast therapy, starting from both places to sit by softly pressing the hands by the nose. The hands at the armpits will progress. Then the shoulders shall be moved by relaxing the fingertips down from the shoulders to the clavicle. The posture lung, the eccentric circular scapula origin, will be gently stroked with the fingertips. If the subject is relaxed, the assessor will indicate, and the next treatment site will continue (Lepomäki, 2023). The treatment will develop to the base of the skull and be distributed throughout the treatment. All subject assessments throughout the sessions may be performed by the assessor. Any observer will record the number of presumed discomfort responses during and following the treatment at the same time. A qualitative evaluation of the act, as well as any adverse reactions, will also be noted.

3. Results and Discussion

This research paper discusses additional treatments for Alzheimer's disease. The suggested approach is to combine strategies of grounding using derived physiotherapeutic tools for chronic disease treatment, which promotes the need for new neural rehabilitation protocols and does not have side effects on already prescribed therapies for specific pathologies. Currently, such diseases do not have classical solutions for their healing, and human bodies have the biological adaptive capacity to be self-healed due to brain plasticity (Kölliker et al.2022). The cytoskeletal protein neurofilament light chain released from damaged neurons into the extracellular space could be an important component enhancing the neuroimmune interactions between the nervous and immune systems in neurodegenerative diseases. New methods for assessing the intracerebral ground problems are presented.

The global population is aging, and with this problem, Alzheimer's disease is increasing, affecting human beings, their family economy, and society. Innovative neurorobotics should be integrated to address typical neuropathology concerns for better diagnosis, monitoring, and treatment of patients with cortical brain damage, especially those experiencing pain. Results are encouraging and consistent with the newest theories of biological therapy having their roots in our planet and sustained by planeto-responsive pain. LDI fibers full-body tights application of 1064 nm IR light for 25 minutes could improve the microcirculation and neurovascular units regulating NfL levels in blood serum and the innate immunology of peripheral tissues influencing the nervous system through the lymphatic vasculature.

3.1. Neuroimmune Mechanisms in AD and the Role of Lymphatic Drainage Therapy

The functions of brain-associated lymphatic drainage can be enhanced with lymphatic stimulation approaches, with consideration for the important intermingling of physical, emotional, mental, and consciousness identified in grounded research. The need for cost-effective lymphatic stimulation therapies to improve cognitive functioning associated with physical lifestyle changes in the grave health condition of Alzheimer's disease is paramount (Ren & Ye, 2024). Developing these more general activities as a lifestyle would promote healthy cognitive aging within the general population and would directly impact tomorrow’s caregivers and carer support organisations, which are starting to be overwhelmed with cases. Lymphatic drainage therapy can lead the way into exploring new groundings, where general good physical health leads to improved cognitive function.

Figure1 illustrates the progression of cognitive function across different stages of Alzheimer’s disease, comparing patients receiving standard treatment with those undergoing MLD therapy.

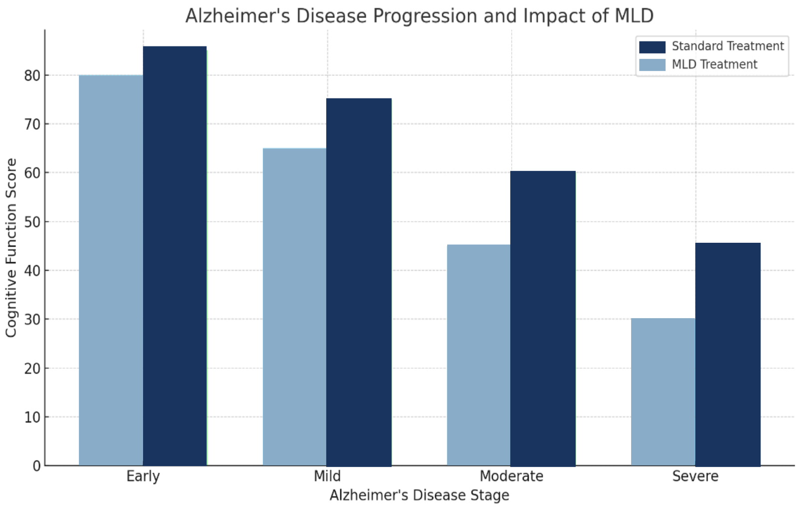

Figure 1 (Scheltens, et al, 2021)

The chart shows that MLD treatment leads to higher cognitive function scores, particularly in the moderate and severe stages of the disease.Significant neuroimmune interactions are occurring in Alzheimer’s disease, supporting the idea that certain aspects of the neuroimmune response could significantly ameliorate aspects of cognitive decline. Relevant advancements in neuroimmune modulation, particularly lymphatic drainage of the brain, relative to these neuroimmune interactions in Alzheimer’s disease, are reviewed. The severely limited recent success of trials targeting aspects of amyloid or tauopathy highlights the understudied non-genetic immune aspects of the disease. These neuroimmune interactions presented suggest the potential for an adjunction of therapies geared toward efficient brain fluid dynamics, such as lymphatic drainage, to at least partially address how chronic neuroinflammation and supporting lymphatic draining down a deficit in unwanted toxic waste clearance and the subsequent cognitive decline (Haage & De Jager, 2022). Treatment options that remove brain waste via other means, independent of the disease-modifying immunological aspects highlighted, can improve cognition without the nitty-gritty of patching the neuroimmune interactions. Sufferers would benefit from inexpensive, easily accessible non-pharmacological, non-invasive treatments, which would also alleviate the considerable socio-economic burden of their care, help prevent onset and maintain healthy cognitive aging.

Figure 2 shows the reduction in neuroinflammation over a 16-week period, comparing a control group with patients receiving MLD therapy. The MLD group

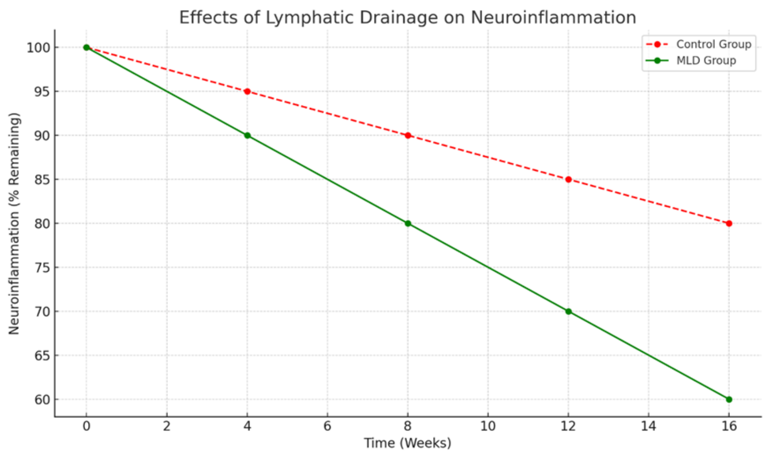

Figure 2 (Xu et al, 2024)

experiences a significantly faster reduction in neuroinflammation, suggesting enhanced clearance of inflammatory markers compared to the control group.

3.2. Impact of MLD and Grounding on Cognitive Function in AD Patients

In AD patients, independent of age, MLD as an adjunct to other conventional rehabilitation treatment and medications showed statistically significant differences in cognitive function for the group receiving MLD compared to the control group, anxiety, and depression, and impairment in activities of daily living over six months. Because comorbid conditions originate from common circulatory problems, metabolic disorders, or immune system disturbances, MLD affects performance by decreasing inflammation to improve cognition (Martin et al., 2023). Additionally, protective activities with supportive care and regular exercise are effective non-pharmacologic treatments, are associated with lower risks of cardiovascular disease, and reduce the production of pro-inflammatory cytokines, as well as exert calcium-ion-channel antagonist effects in MLD-stimulated neuronal protection and immune regulation.

In a recent session with my 87-year-old client, notable improvements in cognitive function and awareness were observed during and following the application of Manual Lymphatic Drainage (MLD) and Craniosacral Therapy. As I facilitated the craniosacral rhythm to shift towards homeostasis, the client, who had previously been diagnosed with cognitive decline, spontaneously asked, “What are you doing to my brain?” Moments later, he peacefully drifted into sleep while I continued holding space for the adjustment of his craniosacral rhythm.

During the session, the client expressed a desire to shuffle playing cards, a task he had not previously attempted in recent months. His caregivers, however, were concerned that this was a sign of further decline, having misinterpreted the subtle shifts in cognition and behaviour. This incident underscores the challenges associated with untrained caregivers who are unfamiliar with therapeutic interventions like MLD, which can result in misinterpretations of the patient’s responses.

One of the most significant challenges I continue to face with the client’s care is ensuring that his caregivers provide him with adequate hydration. MLD relies heavily on the intake of water to help move brain wastes through the lymphatic system, and insufficient hydration can hinder the effectiveness of the therapy. Despite the necessity of water for optimal results, caregivers often fail to ensure he consumes enough, which compromises the therapeutic outcome.

The client also displayed additional signs of mental clarity by counting to 10, expressing his fatigue with the music playing that day, and inquiring if his daughter had been discussing him. These behaviours, though small, indicated a greater level of engagement with his surroundings and suggest that MLD and Craniosacral Therapy may contribute positively to cognitive awareness, even in elderly patients experiencing decline.

This case study illustrates the potential benefits of combining MLD and Craniosacral Therapy in promoting both cognitive and physical well-being in elderly individuals. It further highlights the critical need for caregiver education, not only to recognize and support therapeutic progress but also to ensure compliance with essential aspects of treatment, such as maintaining proper hydration.

The observed improvements align with research highlighting the positive effects of stimulating brain function through physical interventions. Non-invasive therapies, such as transcranial direct current stimulation (tDCS) and grounding techniques, have been shown to promote brain coherence by modulating neuronal plasticity and reducing inflammation (Korai et al, 2021) (Kondziella, et al, 2023). Grounding specifically has been linked to improvements in autonomic nervous system function, contributing to cognitive enhancement in older adults. Furthermore, MLD therapy is known to improve glymphatic clearance of waste products, such as amyloid-β, which accumulates in Alzheimer's patients, further supporting its role in enhancing brain health.

This case underscores the potential of MLD, especially when combined with grounding, as a non-pharmacological approach to improving cognitive function in elderly patients with neurological impairments.

The consequences of negative neuroimmune crosstalking open a perspective to further investigate the potential of MLD in neuro-rehabilitation for neuroprotection and neurogenesis that provides further insight into hibernation and the benefits of MLD through evoking the downward relocation of immune function and related transient effects. The possible effective roles of increased lymph drainage and parasympathetic feedback, which support autonomic regulation and increase expressions of aquaporins and nitric oxide release, sensory afferent ion channels, and the regulation of the hyperventilation-induced hypoxia patient trait, comprise part of the family of biochemical deactivation through enhanced oxygen prescription algorithms and mitochondrial function with reduced toxic metabolites, which can be attributed to the diversified immune self-regulation of anti-inflammatory adipokines released with efficient whole-body energy homeostasis and close intercommunication (Brown, 2023). These advances in neuroscience provide the necessary knowledge to overcome and bypass existing common clinical standards for the individual patient that could improve therapeutic strategies with appropriate use of expansion/compression therapeutic devices.

4. Conclusion

MLD is ground-breaking therapy, that is worthy of further larger scale investigation, particularly in conditions, which describe poor lymphatic drainage in the pathogenesis. In our previous analysis, we recognied that the hyperbaric therapy, the MLD, intermittent fasting, the grounding mats, are inducing oxygen maintenance and are decreasing the size of the detrimental protein aggregates in species with different survival requirements. Up to now, amyloid plagues in the human brain were identified in patients with cognitive disorder (Haass & Selkoe, 2022). The tradition induces the feelings of moral and ethical relevance to go to great length, so that the family lends the patient protection and care in the times of great health defect. Lowering plaque size, earlier clearance of cellular debris, better cognitive discharging by the help of advanced recover method would provide the motive for the increased utilisation of these methods. Cognitive rescue specific to the stay would provide the highest return on investment, if the skin receptors in the human web can be recruited in the process of cerebral repair.

4.1. Summary of Findings and Implications for Clinical Practice

In today's health care, more is demanded for less money. Providing the body with a little bit of what it needs every day is a caring way to take care of not only ourselves, but others as well. By doing so, the health care provider will feel more useful and something to someone; the recipient, a loved one. In conclusion, promoting MLD for AD will provide effective patient outcome measures, positively affecting the patient outcome through a direct reduction in healthcare costs. MLD offers a non-invasive, non-pharmaceutical approach that utilises the body's inherent ability to improve health and has been proven effective in many conditions. Additional researched insight to further understand the physiological body-mind effects of MLD on AD is required and will be significant.

Any opportunity that can potentially positively change the quality of life for the dementia patient should be explored fully as the disease can last a lifetime. Promising new direction includes the dissemination of intricate molecular and cellular relationship inherent within these derailed bioenergetic and bio-resonance pathways, particularly in the neuroimmune system by which MLD and energising protocols exert health change.

The systemic perturbations in families presenting with young onset AD supports the view that decades-long preclinical phases of preclinical decline involve diverse neurogenic mechanistic pathways evident from clinically cognised cognitive and neuropsychiatric pathways (Lansdall et al.2023). The profoundly diseased brain is reparable, particularly with interventions designed toward its preservation. Methylation enzymes both regulate the expression of BDNF and neural plasticity, thus providing a second link, suggesting their potential importance as outcome markers in neurogenesis. However, many important questions still need to be answered, such as how is the vasculopathic and neurodegenerative pathology pathologically connected in these mutation richer families.

4.2. Future Research Directions

Researchers need to explore deeper insights about how lymphatic drainage therapy mediates the recycling and elimination of metabolites responsible for promoting healthy and diverse CNS functions in a period of challenge such as the stressor of an infection, which is a commonly experienced age-related neurological challenge. Ground the present explorative discussion in empirical scientific studies and contribute to supporting recent gene expression data and network analyses that predict healthy physiological and protective brain regulatory interactions associated with lymphatic drainage therapy. Experiments could examine the lymphatic and lympho-systems and other intelligently chosen similar identities found within coding and non-coding gene expression networks. The use of robotics have increased over the last 30 years (Surao, 2018), therefore it may be beneficial to employ this within future studies.

Designing controlled studies in the form of well-founded experimental research data will contribute to answering long-sought-after questions about the precise anatomy, physiological functions, and CNS communication patterns of lympho-related cells. Researchers need long and repeated TBI studies that test whether better lymphatic drainage therapies can defer the onset or progression of chronic traumatic encephalopathy and other long-term TBI impairments of late-life cognitive functioning.

Since they are already involved in a TBI chronic impairment study, they should gather other relevant chronic condition investigative data about those being treated with manual lymphatic drainage using trained massage therapists as opposed to those individuals pursuing no manual lymphatic drainage forms of support. With the historically documented cognition and generalised psychological well-being benefits of being active outdoors, experimental research on the health and validation of the fresh environmental free or low-cost idea is called for.

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BANANA PEEL TRANSFORMATIONS UNLOCKING HIDDEN VALUE

Dr. Beema Jainab .S.I 1, Chandhini .S 2 & Ullfathnisha .A [3]

Associate Professor, Department of Botany[1], Educator[2], Founder of eProMentors[3]

Theme of the Article: Science

Research Objectives: This study investigates the potential for creating value-added products from banana peels, a by-product of the banana processing industry.

BIO

Dr. Beema Jainab S.I

Dr. Beema Jainab S.I, Associate Professor in Botany at Justice Basheer Ahmed Sayeed College for Women, Chennai, specializes in Phycology and has an extensive academic and professional portfolio. She has served in diverse roles, including District Coordinator for Biodiversity Conservation, Assistant Director at World Women's Welfare Association, and editor for reputed journals. A prolific researcher, she has published 38 research papers and presented 35 at national and international conferences, including in Thailand. With 28 awards, such as the Outstanding Educator Award (UK) and Doctor of Letters (UK), she has co-authored books in Tamil and English and is a renowned speaker.

Chandhini, S

Chandhini, S is an accomplished educator with an M.Phil. in Biology, is the co-founder of EduTech 10x, where she has been instrumental in driving educational innovation. As a NEET Biology Trainer, she leverages her deep subject expertise and psychology knowledge to create an engaging and supportive learning environment. Chandhini is passionate about integrating AI into education, striving to personalize learning experiences and elevate educational outcomes. Her commitment to excellence has earned her the 'Best Faculty' award multiple times, reflecting her dedication to her students' success.

Ullfathnisha A

Ullfathnisha A., an award-winning educator and pioneering academician, champions enhanced learning with technology. Founder of eProMentors, she inspires future leaders through innovative teaching and educational excellence. With an M.Phil. in Plant Biology and Biotechnology and a Bachelor's in Education, she guides students to success in exams like NEET. Awarded a prestigious scholarship by Tamil Nadu's Government, she earned her Master's from Anglia Ruskin University, UK. Passionate about integrating AI in education, she develops courses for leaders to enhance personalised learning. Committed to nurturing future leaders, she emphasises cognitive, affective, and psychomotor skills, believing in planting the seeds of knowledge for a brighter tomorrow.

Abstract

This study investigates the potential for creating value-added products from banana peels, a by-product of the banana processing industry. Despite being a popular fruit globally, banana peels are often discarded as waste, constituting approximately 40% of the fruit. This waste poses environmental challenges due to its high nitrogen and phosphorous content, coupled with its susceptibility to microbial degradation. However, banana peels possess significant nutritional qualities, economic value, and medicinal potential, which are largely overlooked.

In this research, banana peels from green, red, and yellow banana varieties were collected and subjected to soxhlet extraction. The resulting banana peel powder extracts were analyzed for total phenolic content, flavonoid content, alpha-amylase inhibition assay, and anti-lipase enzyme inhibition assay. The findings reveal that red banana peel extract exhibits the highest phenolic content (685.33 mg GAE/g DE), flavonoid content (157.25 mg QE/g DE), and crude metabolic content (3.855) among the three varieties tested.

These results suggest promising opportunities for utilizing banana peel powder in the development of value-added products. Specifically, the high phenolic and flavonoid content indicate its potential application in natural tea powder production, while its metabolic content suggests suitability for use as biofertilizer. This research underscores the importance of exploring innovative ways to harness the nutritional and functional properties of banana peels, thus contributing to waste reduction and sustainable resource utilization.

Keywords: Value-added products, Banana peel, Phenolic content, Flavonoid content, Metabolic content

1. Introduction

Bananas, belonging to the genus Musa, are broadly classified into two subgroups: sweet bananas and plantains. They consist of various parts such as the fruit, peel, leaves, roots, and pseudostem, all of which demonstrate a range of pharmacological benefits. Both traditional and modern uses of bananas are attributed to their rich phytochemical composition. Research indicates that the extracts from banana pulp and peel contain fatty acids, steryl esters, sterols, as well as oleic and linoleic acids.

A banana peel, also known as a banana husk or skin (in British English), is the outer layer of the banana. Banana peels serve multiple purposes, including animal feed, water purification, the production of biochemical products, and even for humorous pranks in popular culture.

In terms of animal feed, banana peels are often used to feed livestock such as cattle, goats, pigs, monkeys, poultry, and zebras, especially on small farms in banana-growing regions. However, there are concerns about the tannins present in banana peels, which may affect the health of the animals consuming them.

The nutritional value of banana peels varies with their ripeness and cultivar. For example, plantain peels contain lower fiber levels than dessert banana peels, while lignin content rises as the peel ripens, ranging from 7% to 15% of dry matter. Typically, banana peels comprise 6-9% dry matter protein and 20-30% fiber (as measured by Neutral Detergent Fiber or NDF). While green plantain peels are composed of 40% starch, this starch converts into sugars upon ripening. In contrast, green banana peels have around 15% starch, and this increases to 30% free sugars when the bananas are ripe.

Banana peels are also utilized in processes like water purification, ethanol production, and as a source of cellulase and laccase enzymes. Additionally, they serve as fertilizers and contribute to composting efforts.

Objectives

To study the biochemical composition of pulp and peel of culinary banana at various developmental stages and to identify the optimum stage of harvesting.

- To study the resistant starch development from pulp and its application in food model.
- To study the isolation and characterization of cellulose nanofiber from peel and it's application in developing nanopaper.
- To study the encapsulation of natural antioxidant from culinary banana pulp and peel.
- To study the drying characteristics by hot air oven, optimization of process parameters in vacuum drying for pulp slices and peel paste and storage study of culinary banana flour.

Pharmacological investigations of different banana peel Methanol extracts.

2. Materials And Methods

- **Soxhlet extraction**

The plant samples collected were thoroughly washed with running tap water followed by deionized water. After washing, the samples were air-dried in the shade until fully dried. The dried samples were then ground into a fine powder using a milling machine and subjected to Soxhlet extraction (Brazil, Mumbai, India) with ethanol as the solvent. Approximately 50g of powdered plant material was placed into a thimble made from handmade filter paper. This thimble was carefully positioned inside the Soxhlet extractor, and ethanol (in a 1:10 ratio) was used as the solvent. The round-bottom flask was heated using a heating mantle at 60°C. A minimum of 15 reflux cycles were performed for each sample to ensure a high-quality extract. The resulting solvent extract was concentrated using a rotary evaporator (Buchi, Bangalore, India) under vacuum at a reduced temperature. The final concentrated extract was collected and stored in glass containers at -20°C for future analysis.

- **Determination of total phenolic contents.**

The total phenolic content of the solvent extracts was determined using a spectrophotometric method based on the colorimetric procedure described by Singleton & Rossi (1965). Each extract (200 µL) was added to test tubes, along with 1.0 mL of Folin-Ciocalteau reagent (diluted 1:1 with water) and 1.0 mL of sodium carbonate solution (7.5%). The mixture was vortexed and incubated for 2 hours. The absorbance was measured at 726 nm using a spectrophotometer (Beckman, USA). The total phenolic content was expressed as milligrams of gallic acid equivalents (GAE) per gram of dry material.

- **Determination of Total Flavonoid Content**

The total flavonoid content was measured using the aluminum chloride colorimetric method as described by Lin and Tang (2007). A 2 mL sample of the plant extract (0.3 mg/mL) was mixed with 0.1 mL of 10% aluminum chloride hexahydrate, 0.1 mL of 1 M potassium acetate, and 2.8 mL of deionized water. The mixture was incubated at room temperature for 40 minutes. After incubation, the absorbance was recorded at 415 nm using a spectrophotometer. Quercetin, in the concentration range of 0.005 to 0.1 mg/mL, was used as the standard, and the total flavonoid content was reported as milligrams of quercetin equivalents (QE) per gram of dry extract.

Alpha amylase inhibition assay

The alpha-amylase inhibition assay was carried out by preparing a mixture containing 200 µL of 0.02 M sodium phosphate buffer, 20 µL of enzyme, and plant extracts at various concentrations ranging from 20 to 100 µg/mL. This mixture was incubated for 10 minutes at room temperature, followed by the addition of 200 µL of starch to all the test tubes. The reaction was stopped by adding 400 µL of DNS reagent, and the tubes were placed in a boiling water bath for 5 minutes. After cooling, 15 mL of distilled water was added to dilute the samples, and the absorbance was measured at 540 nm. Control samples were prepared without the plant extracts.

The % inhibition was calculated according to the formula:

$$Inhibition\ (\%) = \frac{Abs\ 450\ (control) - Abs\ 450\ (extract)}{Abs\ 450 (control)} \times 100$$

Anti-lipase enzyme inhibition assay

The lipase inhibitory activity of the plant extracts was as sessed using the method outlined by Mopper and Meriga (2014). An emulsion was prepared by mixing 1% (v/v) triolein and 1% (v/v) Tween 40 in 0.1 M phosphate buffer (pH 8.0). The assay began by adding 800 µL of the triolein emulsion to 200 µL of pancreatic lipase solution (prepared by dissolving 0.5 g of pancreatin in 15 mL of 0.1 M phosphate buffer at pH 8.0) and 200 µL of the plant extract at different concentrations. The mixture was thoroughly mixed, and the absorbance was immediately recorded at 450 nm, labeled as T0. The reaction mixture was then incubated at 37°C for 30 minutes, and the absorbance was recorded again at 450 nm, labeled as T30. The change in absorbance was calculated as the difference between A450(T0) and A450(T30) for both the control and the test samples.

The % inhibition was calculated using the following formula:

$$Inhibition\ (\%) = \frac{Abs\ 450\ (control) - Abs\ 450\ (extract)}{Abs\ 450 (control)} \times 100$$

Observation

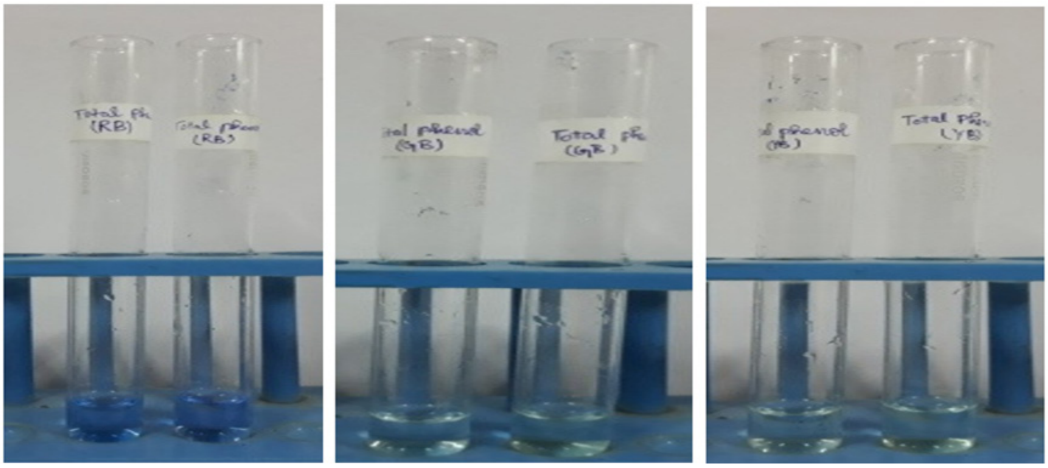
- **Table 1: The extraction of different banana peel methanolic crude metabolites yield**

Name of the Sample	Total crude metabolites Yield Content
Red Banana Peel extract	3.855
Green Banana Peel extract	2.98
Yellow Banana Peel extract	3.07

- **Table 2: The estimation of different banana peel methanolic total phenol content**

Name of the Sample	Total phenol Content
Red Banana Peel extract	685.33 mg GAE/g DE
Green Banana Peel extract	338.67mg GAE/g DE
Yellow Banana Peel extract	264.00mg GAE/g DE

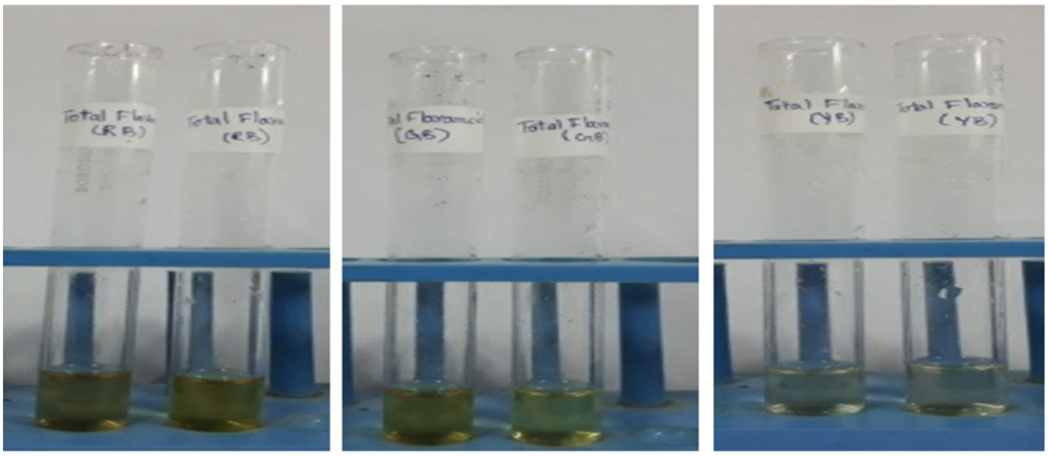
- **PLATE 2: The estimation of different banana peel methanolic total phenol content**



- **Table 3: The estimation of different banana peel methanolic total flavonoids content**

Name of the Sample	Total flavonoids Content
Red Banana Peel extract	157.25 mg QE/g DE
Green Banana Peel extract	105.25 mg QE/g DE
Yellow Banana Peel extract	81.0 mg QE/g DE

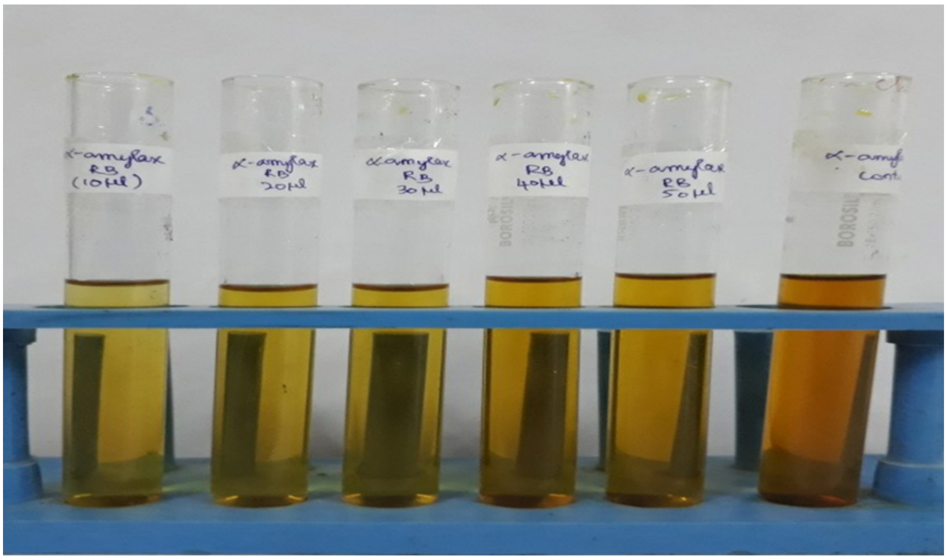
- **PLATE 3: The estimation of different banana peel methanolic total flavonoids content**



- **Table 4: Alpha amylase inhibition activity of RED banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.589	0.00
0.1	0.547	7.13
0.2	0.521	11.54
0.3	0.475	19.35
0.4	0.402	31.75
0.5	0.348	40.92

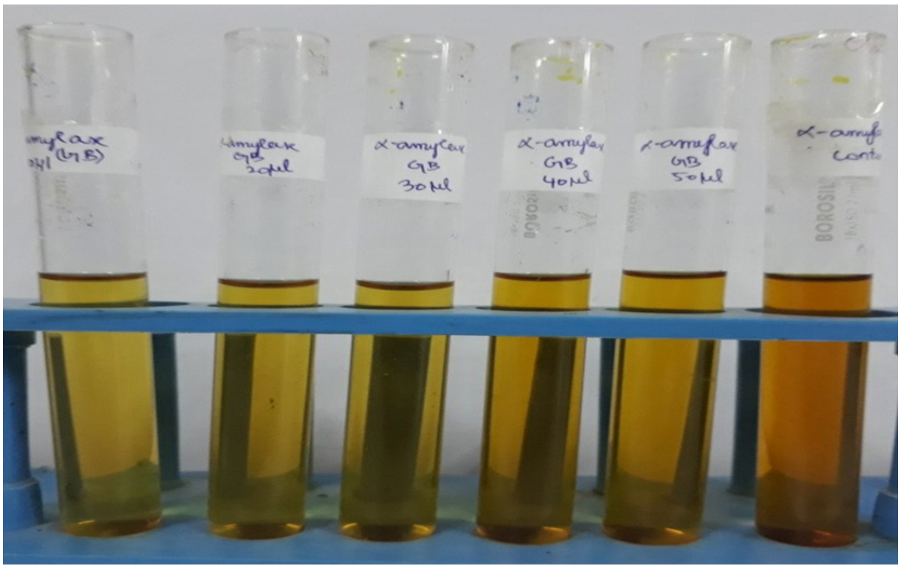
- **PLATE 4: Alpha amylase inhibition activity of RED banana peel methanolic extract**



- **Table 5: Alpha amylase inhibition activity of Green banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.589	0.00
0.1	0.577	2.04
0.2	0.542	7.98
0.3	0.501	14.94
0.4	0.482	18.17
0.5	0.426	27.67

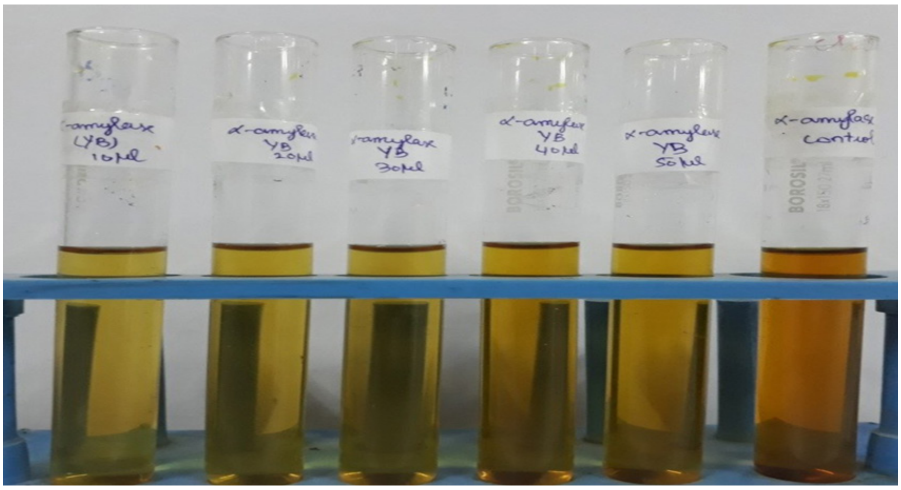
- **PLATE 5: Alpha amylase inhibition activity of Green banana peel extract**



- **Table 6: Alpha amylase inhibition activity of Yellow banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.589	0.00
0.1	0.572	2.89
0.2	0.549	6.79
0.3	0.531	9.85
0.4	0.489	16.98
0.5	0.461	21.73

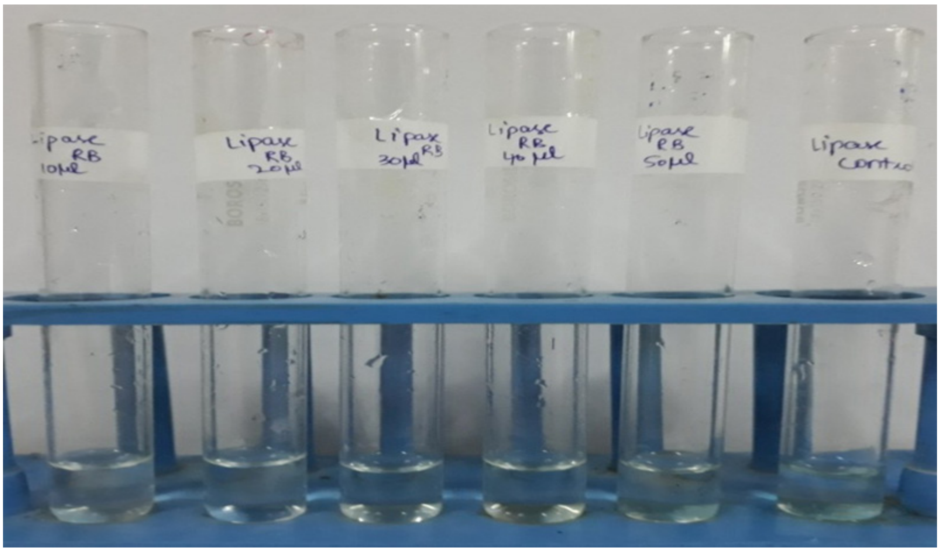
- **PLATE 6 : Alpha amylase inhibition activity of Yellow banana peel methanolic extract**



- **Table 7: Lipase inhibition activity of Red banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.487	0.00
0.1	0.457	6.16
0.2	0.439	9.86
0.3	0.421	13.55
0.4	0.401	17.66
0.5	0.389	20.12

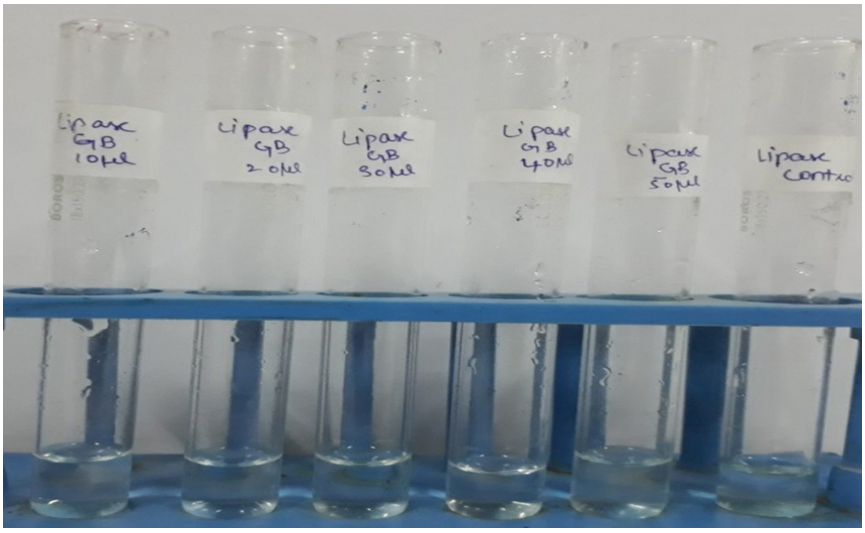
- **PLATE 7 : Lipase inhibition activity of red banana peel methanolic extract**



- **Table 8: Lipase inhibition activity of Green banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.487	0.00
0.1	0.459	5.75
0.2	0.439	9.86
0.3	0.424	12.94
0.4	0.412	15.40
0.5	0.397	18.48

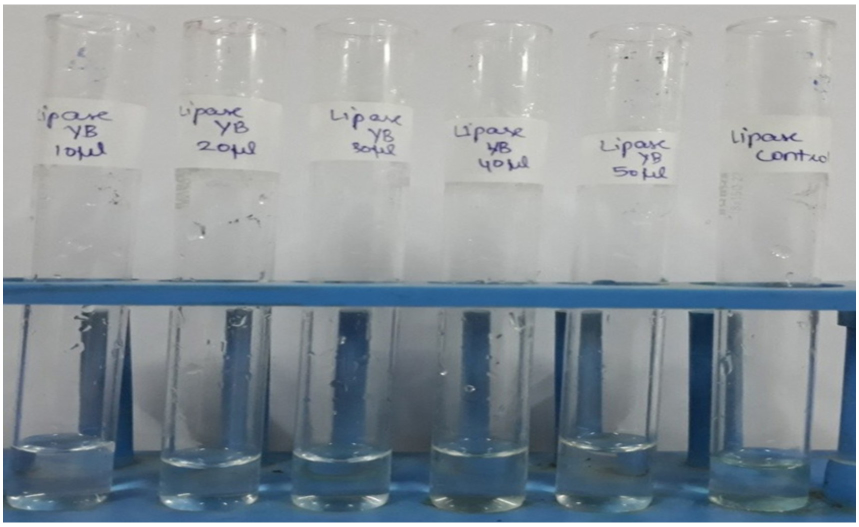
- **PLATE 8: Lipase inhibition activity of Green banana peel methanolic extract**



- **Table 9: Lipase inhibition activity of Yellow banana peel methanolic extract**

Concentration (mg)	Optical Density	Inhibition %
0	0.487	0.00
0.1	0.464	4.72
0.2	0.442	9.24
0.3	0.421	13.55
0.4	0.401	17.66
0.5	0.375	23.00

- **PLATE 9 : Lipase inhibition activity of Yellow banana peel methanolic extract**



3. Results

Total CRUDE Content

			AVG	STD
RB	3.59	4.12	3.855	0.37
GB	2.94	3.02	2.98	0.06
YB	3.14	3.01	3.075	0.09

Total PHENOL Content							
RB	0.514	0.0015	342.67	2000	685333.333	**685.33**	Gallic acid
GB	0.254	0.0015	169.33	2000	338666.667	**338.67**	Gallic acid
YB	0.198	0.0015	132.00	2000	264000	**264.00**	Gallic acid

Total FLAVANOID Content				
RB	0.629	0.02	31.45	**157.25**
GB	0.421	0.02	21.05	**105.25**
YB	0.324	0.02	16.2	**81**

	Concentration mg	**OD**	**Control**	**OD**	**% Inhibition**

Amylase inhibition

RB	0	0.589	0.589	0	0.00
	0.1	0.547	0.589	0.042	7.13
	0.2	0.521	0.589	0.068	11.54
	0.3	0.475	0.589	0.114	19.35
	0.4	0.402	0.589	0.187	31.75
	0.5	0.348	0.589	0.241	40.92
	Concentration mg	**OD**	**Control**	**OD**	**% Inhibition**
GB	0	0.589	0.589	0	0.00
	0.1	0.577	0.589	0.012	2.04
	0.2	0.542	0.589	0.047	7.98
	0.3	0.501	0.589	0.088	14.94
	0.4	0.482	0.589	0.107	18.17
	0.5	0.426	0.589	0.163	27.67

	Concentration mg	OD	Control	OD	% Inhibition
YB	0	0.589	0.589	0	0.00
	0.1	0.572	0.589	0.017	2.89
	0.2	0.549	0.589	0.04	6.79
	0.3	0.531	0.589	0.058	9.85
	0.4	0.489	0.589	0.1	16.98
	0.5	0.461	0.589	0.128	21.73

Lipase inhibition

Concentration mg(RB)	OD	Control	OD	% Inhibition
0	0.487	0.487	0	0.00
0.1	0.457	0.487	0.03	6.16
0.2	0.439	0.487	0.048	9.86
0.3	0.421	0.487	0.066	13.55
0.4	0.401	0.487	0.086	17.66
0.5	0.389	0.487	0.098	20.12
Concentration mg(GB)	**OD**	**Control**	**OD**	**% Inhibition**
0	0.487	0.487	0	0.00
0.1	0.459	0.487	0.028	5.75
0.2	0.439	0.487	0.048	9.86
0.3	0.424	0.487	0.063	12.94
0.4	0.412	0.487	0.075	15.40
0.5	0.397	0.487	0.09	18.48
Concentration mg(YB)	**OD**	**Control**	**OD**	**% Inhibition**
0	0.487	0.487	0	0.00
0.1	0.464	0.487	0.023	4.72
0.2	0.442	0.487	0.045	9.24
0.3	0.421	0.487	0.066	13.55
0.4	0.401	0.487	0.086	17.66
0.5	0.375	0.487	0.112	23.00

4. Discussion

- Many of them have worked in pharmacological activity in banana and some have worked with banana peel .Here we had worked with the peel of the banana. We have collected three different varieties of banana and each contains 1.5 kgs .The banana is washed under a running tap water and the peel is removed from the banana. The removed peel is cut into small pieces and shade dried in sunlight. The dried peel is taken and grind into fine powder. The fine powder is stored in tight container without the moisture content. With the help of powder many pharmacological activities are performed.
- This similar work with banana was performed by Basher Ado Ahmad, Umar Abdullahi Zakariyya, Mujaheed Abubakar, Musbahu Muhammad Sani and Musbahu Adam Ahmad (2011) They had tested different enzyme activities and pharamacological activities in banana.But here we had tested with the banana peel powder.
- Soxhlet extraction is also carried out with the help of fine powder obtained from banana peel. The powder is added into the extractor. The solvent (methanol) is added to the extract and run it for 7 cycles.After repeated cycles we had got a coloured extract on each varieties.
- Determination of total phenolic contents is done with the solvent extracts were used for the determination of the total phenolics by spectrophotometrically according to the Folin-Ciocalteau colorimetric method (Singleton & Rossi, 1965).
- Determination of Total Flavonoid Content is done with the total flavonoid content was determined according to the aluminium chloride colorimetric method [Lin and Tang, 2007].
- Alpha amylase and anti lipase inhibition assay was determined

5. Conclusion

Among three varieties of banana peel powder extracts, (Green banana, Red banana, and Yellow banana) Red banana extract contains high crude metabolic content (3.855), high phenolic content (685.33mgvGAt/gDE), high flavanoid content (157.25mgQE/DE).

This banana peel powder is very good in mineral content and consistent of potassium and manganese. Due to high potassium content in peel, It maintains normal blood pressure. It can be used as a tea powder. It doesn't contains any chemical and fully made up of natural products. Recent studies had proved that it can also be used as a bio fertilizers.

Summary

The experimental work has carried out to determine the pharmacological activity in banana peels extract. To analyses the phenolic and flavanoid content of the extract.

Red banana peel contains high pharmacological activity and also maintains normal blood pressure. It can also be used as tea. This is economically cheap and can be easily prepared by simple methods.

Determination of total phenolic and flavanoid content of methanolic extraction is highly present on Red banana peel extract. Experimental analysis of pharmacological activities is also carried out

Three varieties of (green,red,yellow) banana was collected and washed and the peel is removed and cut into small pieces and shade dried and grind it to fine powder. The powder is stored in tight container and furtherly proceed to analysis.

Future Prospects

- To know about the medicinal qualities of parts of the banana.
- To prepare a tea, free from body pressure
- To know about the knowledge of analysis of banana

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