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SSN Journal of Management and Technology Research Communications

An Open Access International Journal of Management & Technological Sciences

Website: https://mntrc.in/about-us/

About Us

Society for Science and Nature, (SSN) Bhopal, India is a non-profit academic organization, founded in 2008 by academicians from all walks of life: literature, arts, science, technology and nature. The main objective of the organization is to work for the upliftment of the society and the community in large, imparting free services for quality education and research. The Society has been trying to integrate systems of values, ethics, and principles in the students, the future of country's tomorrow. The society has been carrying out academic and educational programs in the country for providing quality education, expertise and training to students and scholars, using state of the art technologies with experienced academicians, teachers, engineers, doctors and social scientists belonging to various disciplines.

Society for Science and Nature, has been publishing an academic international peer-reviewed journal since 2008: **Bioscience Biotechnology Research Communications**, which is in 17th year of successful publication. SSN has ventured into starting yet another international publication, **SSN Journal of Management and Technology Research Communications.** It is an open-access, international peer reviewed quarterly journal for publication of original research articles, exciting reviews, interesting case histories and perspectives in applied areas of management and technology, including biological and medical sciences.

The journal welcomes empirical and analytical papers, reflecting both methodological rigor and practical relevance as well as literature reviews and meta-analyses showcasing and promoting current academic research in upcoming areas of management, science and technology. The insufficient publishable research in the sub-continent, and the developing nations, on the intertwining between management and successful management of science and technology, particularly in areas like health, basic science, engineering, including computer sciences prompted the proposal of this new journal.

The experienced and highly qualified board of editors of this journal will aim to foster diverse investigations of management of science and technology research, encompassing various types of applied areas. We intend to evaluate the theoretical and practical perspectives, utilising a range of methodologies and data—including quantitative, such as surveys, lab experiments, and archival research, as well as qualitative approaches, including case studies and examining the different settings in Management, Science and Technology.

We are particularly interested in – but not limited to – the following research avenues in applied areas of **Management, Science and Technology:** Biological Sciences, Health Sciences, Physical Sciences, Natural Sciences and Engineering.

Our Vision: In the coming years we hope and wish that **SSN Journal of Management and Technology Research Communications** will try to maintain high standards of ethical and quality publication, as we believe that it is only quality which can fully utilize the science for our welfare!

We do have a vision to become an important force for pluralism—teaching and disseminating the research skills of management, in living with science and technology. **SSN Journal of Management and Technology Research Communications** strongly believes that it will achieve high standards of ethical and quality publication as we visualize that it is only quality, which can truly help shaping technology for our existence!

Complaint Policy of SSN Journal of Management and Technology Research Communications

Genuine complaints in Publication: Complaint or expression of dissatisfaction made in honest intention of improvisation are always welcome, as they provide an opportunity and instant moment of attaining quality. The editorial team of SSN Journal of Management and Technology Research Communications shall strive hard to establish, along with the publisher, a transparent mechanism for appeal against editorial decisions or any related matter of publication. If still there are any genuine complaints related to ethical publishing, we are always open to them for the sake of maintaining quality and ethics of publication.

Please write your complaint with Journal title, Vol No/ Issue No /Year /Page numbers, full title of the MS and necessary author details along with type of complaint. The complaint must be about something that is within the jurisdiction of SSN Journal of Management and Technology Research Communications, its contents or process such as authorship, plagiarism, copy right violation, multiple, duplicate, or concurrent publications/ simultaneous submissions etc. Similarly, undisclosed conflicts of interest, reviewer bias or competitive harmful acts by reviewers or any bias of apparent discontentment, backed by logic and judicial discretion will be immediately looked into without any bias and discrimination.

If the Editor receives a complaint that any contribution to the Journal breaks intellectual property rights or contains material inaccuracies or otherwise unlawful materials, a detailed investigation may be requested into, with the parties involved, substantiating their materialistic claims in writing, following the law of natural justice. We assure that we will make a good faith determination to remove the allegedly wrongful material or take actions as per law. All the investigations and decisions are to be documented to the Journal.

Our aim is to ensure that Management and Technology Research Communications follows best practices in publication and is of the highest quality, free from errors. However, we accept that occasionally mistakes might happen, which are inadvertently made or beyond human control, giving opportunity to all parties to decide the best to rectify.

Editorial Complaints Policy: The Managing Editor and staff of Management and Technology Research Communications will make every effort to put matters right as soon as possible in the most appropriate way, offering right of reply where necessary. As far as possible, we will investigate complaints in a blame-free manner, looking to see how systems can be improved to prevent mistakes occurring.

How to Make a Complaint: Complaints about editorial content should be made as soon as possible after publication, preferably in writing by email to editor@mntrc.in or by on-line submission at www.mntrc.in.

Article Withdrawal Policies Of Management and Technology Research Communications

Submission of an article to Management and Technology Research Communications implies that the work has NOT been published or submitted elsewhere, therefore, the journal is strongly against unethical withdrawal of an article from the publication process after submission. Once the article is submitted, it is the absolute right of the editorial board to decide on article withdrawals. For genuine withdrawal, the corresponding author should submit a request which must be signed by all co-authors explaining the explicit reasons of withdrawing the manuscript.

Accepted articles in final stages of publication if are withdrawn, will entail withdrawal fees. The request will be processed by the editorial board and only serious genuine reasons will be considered if possible. The decision of the editorial board will be final and not negotiable. Unethical withdrawal or no response from the authors to editorial board communication will be subjected to sanction a ban to all authors, and their institute will also be notified.

It is a general principle of scholarly communications, that the editor of a journal is solely and independently responsible for deciding which articles submitted to the journal shall be published. In making this decision the editor is guided by policies of the journal's editorial board and constrained by such legal requirements in force regarding libel, copyright infringement and plagiarism. An outcome of this principle is the importance of the scholarly archive as a permanent, historic record of the transactions of scholarship.

Articles that have been published shall remain extant, exact and unaltered as far as is possible. However, very occasionally circumstances may arise where an article is published that must later be retracted or even removed. Such actions must not be undertaken lightly and can only occur under exceptional circumstances. In all cases, official archives of our journal will retain all article versions, including retracted or otherwise removed articles.

This policy has been designed to address these concerns and to take into account current best practice in the scholarly and library communities. As standards evolve and change, we will revisit this issue and welcome the input of scholarly and library communities. See also the National Library of Medicine's policy on retractions and the recommendations of the International Committee of Medical Journal Editors (ICMJE) concerning corrections and retractions.

Article withdrawal

Only used for Articles in Press which represent early versions of articles and sometimes contain errors, or may have been accidentally submitted twice. Occasionally, but less frequently, the articles may represent infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Articles in Press (articles that have been accepted for publication but which have not been formally published and will not yet have the complete volume/issue/page information) that include errors, or are discovered to be accidental duplicates of other published article(s), or are determined to violate our journal publishing ethics guidelines in the view of the editors (such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like), may be withdrawn. Withdrawn means that the article content (HTML and PDF) is removed and replaced with a HTML page and PDF simply stating that the article has been withdrawn according to the Policies on Article in Press Withdrawal with a link to the current policy document.

Article retraction

Infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Occasionally a retraction will be used to correct errors in submission or publication. The retraction of an article by its authors or the editor under

If the Editor receives a complaint that any contribution to the Journal breaks intellectual property rights or contains material inaccuracies or otherwise unlawful materials, a detailed investigation may be requested into, with the parties involved, substantiating their materialistic claims in writing, following the law of natural justice. We assure that we will make a good faith determination to remove the allegedly wrongful material or take actions as per law. All the investigations and decisions are to be documented to the Journal.

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Accepted articles in final stages of publication if are withdrawn, will entail withdrawal fees. The request will be processed by the editorial board and only serious genuine reasons will be considered if possible. The decision of the editorial board will be final and not negotiable. Unethical withdrawal or no response from the authors to editorial board communication will be subjected to sanction a ban to all authors, and their institute will also be notified.

It is a general principle of scholarly communications, that the editor of a journal is solely and independently responsible for deciding which articles submitted to the journal shall be published. In making this decision the editor is guided by policies of the journal's editorial board and constrained by such legal requirements in force regarding libel, copyright infringement and plagiarism. An outcome of this principle is the importance of the scholarly archive as a permanent, historic record of the transactions of scholarship. Articles that have been published shall remain extant, exact and unaltered as far as is possible. However, very occasionally circumstances may arise where an article is published that must later be retracted or even removed. Such actions must not be undertaken lightly and can only occur under exceptional circumstances. In all cases, official archives of our journal will retain all article versions, including retracted or otherwise removed articles.

This policy has been designed to address these concerns and to take into account current best practice in the scholarly and library communities. As standards evolve and change, we will revisit this issue and welcome the input of scholarly and library communities. See also the National Library of Medicine's policy on retractions and the recommendations of the International Committee of Medical Journal Editors (ICMJE) concerning corrections and retractions.

Article withdrawal

Only used for Articles in Press which represent early versions of articles and sometimes contain errors, or may have been accidentally submitted twice. Occasionally, but less frequently, the articles may represent infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Articles in Press (articles that have been accepted for publication but which have not been formally published and will not yet have the complete volume/issue/page information) that include errors, or are discovered to be accidental duplicates of other published article(s), or are determined to violate our journal publishing ethics guidelines in the view of the editors (such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like), may be withdrawn. Withdrawn means that the article content (HTML and PDF) is removed and replaced with a HTML page and PDF simply stating that the article has been withdrawn according to the Policies on Article in Press Withdrawal with a link to the current policy document.

Article retraction

Infringements of professional ethical codes, such as multiple submission, bogus claims of authorship, plagiarism, fraudulent use of data or the like. Occasionally a retraction will be used to correct errors in submission or publication. The retraction of an article by its authors or the editor under the advice of members of the scholarly community has long been an occasional feature of the learned world. Standards for dealing with retractions have been developed by a number of library and scholarly bodies, and this best practice is adopted for article retraction by us.

A retraction note titled “Retraction: [article title]” signed by the authors and/or the editor is published in the paginated part of a subsequent issue of the journal and listed in the contents list.In the electronic version, a link is made to the original article.The online article is preceded by a screen containing the retraction note. It is to this screen that the link resolves; the reader can then proceed to the article itself. The original article is retained unchanged save for a watermark on the .pdf indicating on each page that it is “retracted.”The HTML version of the document is removed.

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1. Manuscript Processing

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The journal is committed to an editorial process that is not compromised by financial or political influence, thereby actively seeking and encouraging submissions from underrepresented segments of the global scholarly communication ecosystem.Incomplete studies and manuscripts not in strict compliance with the journals policies will be strongly discouraged and rejected. Each type of article has a special format and should comply with the updated SSN Journal of Management and Technology Research Communications Instructions for authors / submission check List, published in its issues. All articles in SSN Journal of Management and Technology Research Communications are published under a Creative Commons License, International Attribution 4.0 BY-CC, meaning thereby a free unlimited use of the articles for academic purposes without any embargo.

We are particular in demonstrating conformance with established industry guidelines and best practices promoted by professional scholarly and academic quality publishing organizations such as: Committee on Publication Ethics (COPE) and Principles of Transparency and Best Practice in Scholarly Publishing. Acceptable manuscripts will be checked for data analysis and verification of references before the author will be notified about the status of the paper with any suggestions for modifications. Finally accepted articles will be forwarded to the printer for typeset and formatting, etc. and the proof will be sent to the authors for proof reading, before publication, to be obtained in a time bound frame.

2. Peer Review Policy

Unbiased, independent, critical assessment is an intrinsic part of all scholarly work, including the scientific process. Peer review is the critical assessment of manuscripts submitted to journals by experts who are not part of the editorial staff, and is, therefore, an important extension of the scientific process. Each article submitted to SSN Journal of Management and Technology Research Communications for publication is reviewed by at least two specialist reviewers of the concerned area. The dual anonymized review process is strictly followed and in certain controversial cases, the opinion of a 3rd reviewer can also be sought.

3. Conflict of Interest

For Authors:

All manuscripts for articles, including the original research data-based articles, reviews, editorials, perspectives, comments and letters that are submitted to SSN Journal of Management and Technology Research Communications must be accompanied by a conflict of interest disclosure statement or a declaration by the authors that they do not have any conflicts of interest to declare. All articles that are published in the journal must be accompanied by this conflict of interest disclosure statement or a statement that the authors have replied that they have no conflicts of interest to declare.

To facilitate this policy, all authors must privately disclose 'All their potential conflicts of interest' to the editor of SSN Journal of Management and Technology Research Communications at the time of submission. Authors should also disclose any conflict of interest that may have influenced either the conduct or the presentation of the research to the editors, including but not limited to close relationships with those who might be helped or hurt by the publication, academic interests and rivalries, and any personal, religious or political convictions relevant to the topic at hand.

Type of Declaration

If you are submitting your article to SSN Journal of Management and Technology Research Communications. make a 'Declaration of Conflicting Interests' please include such a declaration at the end of your manuscript, following any acknowledgments and prior to the references, under the heading 'Conflict of Interest Statement'.

If no declaration is made, the following will be printed under this heading in your article: 'None
Declared' Alternatively, you may wish to state that 'The author (s) declare(s) that there is no conflict of interest'

4. Plagiarism

According to Oxford University Dictionary, plagiarism is defined as using some ones else's ideas, words, data, or other material produced by them without acknowledgement. It is the unauthorized use or close imitation SSN Journal of Management and Technology Research Communications condemns all forms of plagiarism, following a very strict and vigilant policy of removing this malady. Within the academia, it is considered dishonesty or fraud and offenders are subject to academic censure. Plagiarism can be unintentional or intentional, reproducing academic material without appropriate credit to the original authors (Citations / References).

Similarly self -plagiarism is the re-use of significant, identical or near identical portions of one's own work without citing the original work. This is also known as recycling fraud. Worst form of plagiarism is to steal the whole article from some journal and publish it under one's own name in another journal.Plagiarism, fabrication, unethical or redundant publication grossly violates the editorial policies of SSN Journal of Management and Technology Research Communications which follows best practice guidelines given by the International Committee of Medical Journal Editors (ICMJE) and Committee on Publication Ethics (COPE), as mentioned in the Instructions for Authors of SSN Journal of Management and Technology Research Communications. SSN Journal of Management and Technology Research Communications. follows the COPE Guidelines in addressing potential redundant publication.

To avoid the need for corrective action after publication, please disclose any prior publication or distribution of your manuscript to the Editor when submitting your manuscript to the journal. It is important to ensure appropriate attribution to your prior publication of the material is included in the manuscript and that any quoted materials are identified as quotes so that readers of your article may reference the original work. **All authors submitting their MS to SSN Journal of Management and Technology Research Communications must complete and sign the ethical statement form and append the Plagiarism Check Certificate of their MS along with copy-right form (www.mntrc.in) failing which, their MS will not be processed further.** The Editorial Committee of SSN Journal of Management and Technology Research Communications will take appropriate action against any author found to be guilty of intentional plagiarism or exceeding the standard limits of plagiarism / similarity levels of the text matter in their MS.

The name of author(s) committing plagiarism or using similar text without appropriate citations will also be disseminated to concerned authorities. We do not tolerate plagiarism in any of our publications, and we reserve the right to check all submissions through appropriate plagiarism checking tools. Submissions containing suspected plagiarism, in whole or part, will be rejected. If plagiarism is discovered post publication, we will follow our guidance outlined in the Retractions, Corrections and Expressions of Concern section of these guidelines. We expect our readers, reviewers and editors to raise any suspicions of plagiarism, either by contacting the relevant editor or by emailing at editor@mntrc.in.

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Clinical trials and studies conducted in animals (or not) must have been approved by an Institutional Review Committee (IRC). In the absence of such a formal ethics review committee, the Helsinki Declaration of 1975, as revised in 2000 and/or the Guide for the Care and Use of Laboratory Animals, as adopted and promulgated by the United States National Institutes of Health or Indian Council of Medical Research (ICMR) India must be followed. If doubt exists whether the research was conducted in accordance with the Helsinki Declaration, the authors must explain the rationale for their approach, and demonstrate that the institutional review body explicitly approved the doubtful aspects of the study. In case of any study involving clinical trial, taking of informed consent of patients is mandatory.

1. On Ethical Issues:
Animal and Human Studies

Ethical declarations in research form an integral part during the submission process of a manuscript to a journal. SSN Journal of Management and Technology Research Communications , requires that the experimental conditions under which animal and human assays and tests are performed are as per standard protocols used worldwide.

Authors must make it clear in writing that the procedures they used were as humane as possible and have been compiled with the guidelines for animal care of their institutions or with national / international guidelines. Studies on animals must comply with the prevailing standards of animal welfare according to Indian Council of Medical Research Guidelines or Committee for the Purpose of Control & Supervision of Experiments on Animals (CPCSEA) in India, and likewise following similar conditions elsewhere, (Ethical Approval Committees/ Institutional Review Board with Approval Number is necessary).For details of animal studies please see : ARRIVE and Guide for the Care and Use of Laboratory Animals.

Studies involving human subjects / patients / and also if the manuscript includes case reports / case series, authors need to provide the following: Name of the Ethical Committees /Institutional review Board, they have obtained consent from along with approval number /ID. Authors should specifically mention that the study was in accordance with the Helsinki Declaration of 1975 (Human Research: Helsinki Declaration as revised in 2013, SCARE criteria etc).

Human Studies: Ethical Standards and Informed Consent

++For studies involving human subjects and volunteers, please indicate in the manuscript, in a section preceding the References, the following statement or an analogous statement that applies to your situation: "All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975 Human research: Helsinki Declaration as revised in 2013.

Case Reports: Case Reports should be followed as per the guidelines of SCARE criteria

Informed consent should be obtained from all patients for being included in the study." If any identifying information about participants is included in the article, the following sentence should also be included: "Additional informed consent was obtained from all individuals for whom identifying information is included in this article." If you have not included or cannot include this statement in your manuscript, please provide the reason or an alternative statement here and in the manuscript.

1. Disclosure of Interest

Author Contribution: Authors must mention the nature of contribution as per standard format.

Authors must provide details of any financial or personal relationships that might bias the work being submitted. In a section of text preceding the References, please provide relevant information for each author(s) with regard to any conflicts of interest. All submissions must include disclosure of all relationships that could be viewed as presenting a potential conflict of interest.

Acknowledgement of sources:

Proper acknowledgement of the work of others must always be given. Funding acknowledgement must be properly made with grant details, number etc.

Data access and retention: Authors may be asked to provide the raw data in connection with a paper for editorial review, and should be prepared to provide public access to such data.

6. Editorial Committee The Editorial committee comprises of the Editor- in-Chief, Academic Editors, Executive Editor, Managing Editor, Assistant Editor (s) and the editorial secretaries, who meet frequently to expedite the business of the journal. The editorial committee follows the guidelines provided by the International Committee of Medical Journal Editors in Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication which can be downloaded from http://www.icmje.org/

7. Advisory Editorial Board

An international advisory board comprising of members from diverse regions, with significant professional experience in different fields of biological and biomedical sciences helps the Editorial Committee in policy matters when needed. Senior advisory board members from India as well as abroad are members of the journal. Each member is selected due to the expertise and experience in the field of his/her specialization. Affiliations, biographies and addresses of all members of the Editorial Board is displayed on the website of SSN Journal of Management and Technology Research Communications.

Editorial Policies

Generally, functioning of the journal is overseen by an Editorial Advisory board, which consists of eminent and competent researchers in the field, who contribute by inviting contributions and proposing expert opinions on the suitability of submissions. The Editorial board consists of the following important positions:

Editor-in-Chief: The Editor-in-Chief is primarily the one responsible for activities conducted for the journal and maintains the right of final acceptance or rejection of manuscripts. An experienced academician with quality publications is appointed by the Society for Science and Nature, Bhopal India www.ssn.org the official Publishers of SSN Journal of Management and Technology Research Communications to oversee the entire publication process of the journal.

Executive Editor: Executive Editor is who directs processing of the manuscripts which entail soliciting manuscripts from potential contributors, assessing the suitability of the manuscript with respect to its scope, managing the peer review process, devising strategies for the progress of the journal, coordinating with the reviewers and board members, taking decisions on the revised submissions and occasionally assisting the Editor-in-chief in final acceptance or rejection of manuscripts.

Associate Editors: Their role is in handling in reporting to the Chief Editor, and supervision of the editorial team, managing submissions, assigning articles, overseeing publication schedules and other matters related to smooth functioning of the journal.

Academic Editors: Academic Editors are associates who will assist the Chief / Executive Editors in assessing the suitability of the manuscript with respect to its scope, managing the peer review process, devising strategies for the progress of the journal, coordinating with the reviewers and board members.

Editorial Board Members: The international editorial advisory board consists of a panel of researchers having expertise in the relevant field, who are appointed by the authorities of the journal for a specified term of 2 or more years. Editorial board members are required to: carry out peer-reviewing of submitted manuscripts, assess submissions based on the policy and scope of the journal, organize publication of thematic issues, invite new authors and submissions, provide editorials for thematic issues organized under their guest editorship.

Editorial Team: The editorial team is made up of experienced and highly qualified researchers and faculty members of different subjects who help the management of editorial process.

Peer Review

SSN Journal of Management and Technology Research Communications follows the anonymized peer-review procedure for submissions of all manuscripts to its journal. All submitted manuscripts, after initial evaluation for scope, originality, conformity to the journals instructions and check list, language and academic quality writing are then subjected to an extensive anonymized peer review in consultation with members of the journal's editorial board and independent external referees (usually two reviewers). All manuscripts/chapters are assessed in a time bound frame (usually a month with the reviewers), and the decision based on all the peer reviewers' comments, finally taken by the journal's Editor-in-Chief, is then conveyed to the author (s).

(Ethics, Duties and Responsibilities of Authors Reviewers and Editors, Plagiarism and its Control, Malpractices and Ethical statements) Link of copy right form and Plagiarism Check Statement.

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To maintain fair practice we at, Society for Science & Nature (SSN) Bhopal India, the official publishers of SSN Journal of Management and Technology Research Communications strongly believe in strictly following these guidelines for maintaining academic quality and scientific rigor.

These features include information about the methods of selecting articles, especially on the explicit process of external peer review; statements indicating adherence to ethical guidelines; evidence that authors have disclosed financial conflicts of interest; timely correction of errata; explicit responsible retractions as appropriate; and opportunity for comments and dissenting opinion.

We are deeply committed to fair practice of this publication, especially with regard to plagiarism, collaboration, originality, fraud and conflict of interests.

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Only persons who meet these following authorship criteria should be listed as authors in the manuscript as they must be able to take public responsibility for the content: (i) made significant contributions to the conception, design, execution, data acquisition, or analysis/interpretation of the study; and (ii) drafted the manuscript or revised it critically for important intellectual content; and (iii) have seen and approved the final version of the paper and agreed to its submission for publication. All persons who made substantial contributions to the work reported in the manuscript (such as technical help, writing and editing assistance, general support) but who do not meet the criteria for authorship must not be listed as an author, but should be acknowledged in the "Acknowledgements" section after their written permission to be named as been obtained.

The corresponding author should ensure that all appropriate co -authors (according to the above definition) and no inappropriate co-authors are included in the author list and verify that all co-authors have seen and approved the final version of the manuscript and agreed to its submission for publication. Authors of manuscripts of original research should present an accurate account of the work performed as well as an objective discussion of its significance. Underlying data should be represented accurately in the paper. There should be a clear statement of logical objectives and rationale / justification to take up the study. Study design must be robust and all methods used must be cited properly with standard references so that they can be reproduced easily. A paper should contain sufficient detail and references to permit others to replicate the work.

Discussion must have a critical and comprehensive account of statements supported by up-to-date references. Conclusions must be drawn which must corroborate the data and interpretation highlighting the novelty of the work. References need to be checked for their presence in both text and reference section with all links of refrences from Google Scholar, Pub Med etc.

Fraudulent or knowingly inaccurate statements constitute unethical behavior and are unacceptable. Review and professional publication articles should also be accurate and objective, and editorial 'opinion' works should be clearly identified as such. Submission of a certificate by all MS submitting authors in this regard is mandatory in the form of the Copy Right Form and Plagiarism Check Report of SSN Journal of Management and Technology Research Communications.

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Informed consent should be obtained from all patients for being included in the study." If any identifying information about participants is included in the article, the following sentence should also be included: "Additional informed consent was obtained from all individuals for whom identifying information is included in this article." If you have not included or cannot include this statement in your manuscript, please provide the reason or an alternative statement here and in the manuscript.

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Reminiscences of Prof DK Belsare's Past and Present Research Career: A Student's Tribute to an Outstanding Academician

Ayesha S Ali
Professor of Zoology and Biotechnology, Saifia College, Barkatullah University, Bhopal, 462001, India

ABSTRACT

These heartfelt feelings of gratitude by the author are for her doctoral supervisor, Prof DK Belsare PhD, D.Sc. FNASc, a distinguished international researcher, academician, teacher and overall a human being of phenomenal qualities. Prof Belsare started his academic and research journey in the late 1950s and continued it effortlessly till his death on 31st December, 2025, spanning almost seven decades. Dr Belsare worked on the endocrine system of fish, *Ophiocephalus punctatus*, where he reported a stalkless pituitary, thyroid gland (previously called blood sinus) and indirect blood supply through the hypothalamus for the first time and published these reports in reputed journals like Nature, American Journal of Morphology, American Journal of Experimental Biology, Zellforch Anat and Anatomical Research, Current Science and many others. Similarly, the adrenergic receptors that regulate heartbeats in fish, Gambusia affinis, was also the first report, published in Current Science in 1965. With over 200 research publications, 50 books and attending dozens of international conferences, chairing them worldwide, Prof Belasare was an institution in himself. He leaves behind a legacy of intellect and wisdom, which was matchless. I am fortunate to be his student, who was lucky to meet him just before he left for his heavenly abode, at 92, still talking science.

KEY WORDS: PROF DEVIDAS K BELSARE, RENOWNED INTERNATIONAL RESEARCHER, DISTINGUISHED. PROFESSOR

INTRODUCTION

Prof. Dr DK Belsare, PhD, D.Sc. FNASc, started his research career in August 1958, when he got the Central Government's UGC fellowship under the supervision of Dr H. Swarup, a distinguished professor and academician of the pre-independence era. Dr Belsare worked on the endocrine system of fish, *Ophiocephalus punctatus*, where he reported a stalkless pituitary, thyroid gland (previously called blood sinus) and indirect blood supply through the hypothalamus for the first time and published these reports in reputed journals like Nature in 1965, when access to the world's number one journal was limited, what to talk about publication in it.

His later publications were in top journals like American Journal of Morphology, American Journal of Experimental Biology, Lipids (Springer), Zellforschung und Anatomie, Anatomical Research, Current Science and many others. Similarly, the adrenergic receptors that regulate heartbeats in fish, *Gambusia affinis*, was also the first report, was published in Current Science in 1965.

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Prof. DK Belsare PhD DSc FNASc FZSI

Prof Belsare's studies on wildlife started in 1979 on the biology of Gour, Tiger and several species of birds, reptiles and amphibians, where he published them in several books like Wildlife Management, Icon of Tiger, Tigers in Tigerland, Birds of South Asia, Vanishing Roar of Bengal Tiger, Vanishing Asian Wildlife, etc. For his wildlife research, he was awarded the highest Fellowship by the National Academy of Sciences (FNA Sc.) in 1980.

Prof Belsare served as technical advisor for wildlife Research Projects by the Government of Madhya Pradesh from 2010 to 2012. In 1967, in Delhi, there was an International Symposium on Endocrinology which was attended by many American and European scientists, where he presented a paper on endocrine glands like pituitary, thyroid and corpuscles of Stannius' role in reproductive mechanisms in fish. This was the first discovery in teleost fish species that explained why Gangetic carps like Rohu, Catla and Mrigal require monsoon rain environmental stimulus for egg-laying.

Prof Belsare was offered a National Foundation Science USA, fellowship by Dr. Browing to work on the problem of estimation of hormones, like FSH and LH, in mammals in his laboratory of the Dental College of Texas University, Texas, USA, using a gonad piece of two-day-old mice by inserting in eye of castrated mice and studying the hormonal level. After one year, he was offered a research associateship in Baylor College of Medicine, Houston, USA, to work on hypothalamic factors of releasing and inhibit growth hormones secreted by the mammalian pituitary gland. A group of scientists like Dr. Van Critchlove, Dr Roger Guillemin, and Dr. Andrew Schally were working on this problem for several years.

He was successful in removing anterior brain fibres by designing a "brain knife " (a small blade attached to a hypodermic injection needle) and also preparing hypothalamic islands in rats by removing forebrain by suction for estimating level of growth hormones. I was successful in keeping these rats in a CO2-O2 environment in a chamber by injecting saline-sugar for one week and estimating growth hormone by radioimmunoassay.

In these rats, Andrew Schally and Roger Guillemin found the clue of somatomedin and somatostatin factors secreted by the hypothalamus, for which they got the Nobel Prize in 1974. Prof Belsare was not present at that time because he returned to India in 1972. Later on realised that time, when Dr Andrew Schally was offering him an Assistant Professorship.

In 1979 both Prof DK Belsare and his wife Dr SD Belsare got a United Nations Environmental Fellowship (UNEP) for training in a water management course. The Director of UNEP offered him a UNEP Professorship for lectures on tropical environment and water management for 10 years. He used to go to Germany every year for delivering lectures in universities of Germany, Holland, Poland and Czechoslovakia, etc. In April 1983, due to an increase in summer temperature, the water supplied to residents of Dresden City had a smell of rotten fish even after treatment. The experts from Holland and Russia could not solve this problem. The Chief Engineer, Mr Pugh and Prof Dr Uhlmann told Dr Belsare about this problem during his lecture on rapid sand filtration technology in tropical climate. He went along with them to see the raw water supply from the lake. At the very first site he saw the colonies of protozoa, which were the cause of the rotten fish smell to water.

Prof Belsare told them that this is probably due to Synura protozoan colonies. Dr Uhlmann examined these colonies under a microscope immediately, and he found that these colonies were of Synura. For two weeks, many experts tried to solve this problem, and they spent $35,000 to remove this smell with activated charcoal.

Prof Belsare solved this problem by changing the pH of the raw water by adding lime, and the next day the smell disappeared. The Chief Engineer asked him about his fees for solving this problem, which he declined. He did not accept the fees because he was paid by the UNEP.

On December 3, 1984, more than 40 tons of methyl isocyanate gas leaked from a pesticide plant in Bhopal, India, immediately killing at least 3,800 people and causing significant morbidity and premature death of many thousands of people and animals. Engineer Tomazeuski from Poland sent Dr Belsare gifts of propolis for application to the affected people's burned skin. With the help of doctors of the rehabilitation centres in Bhopal, he was successful in curing skin burns and the report was sent to Tomazeuski. He invited him to deliver a lecture at the International Conference of Apimondia (Bee-Keepers Union) at Krakow, Poland in 1985. This conference was attended by 500 participants. Prof Belsares lecture was immediately translated into Spanish, French, German and Latin. It was appreciated by all of them with huge applaud. The Chairman of the Conference hugged DR Belsare and the business of Apipol Company increased with huge profit. This company appointed Dr Belsare as their expert for advice till 1993.

After Dr Belsare's retirement, the Environmental Planning and Coordination Organization (EPCO) of the Government of Madhya Pradesh appointed him as Director of this Institute for preparing detail report on environmental studies. Within one year, he prepared a thousand-page document, which still serves as guide for the Government Officers for training on environmental problems every year. After this, the Government appointed him as Advisor for projects funded by the German Government to prepare a document on Disaster Management and under this programme he used to visit almost all the states of India for delivering lectures before their officers to serve as a guide for action during disasters they have to face. Nearly 20 documents were prepared by him with Dr. Dubey, Director of the Disaster Management Institute, for the guidance of government officials of various states of India.

Some of Prof. Belsare's lectures during Dr Har Swarup's Centenary Function at Ujjain, India, dated 9th December 2022: Dr Har Swarup was an outstanding personality, a good teacher and research guide and above all a good human. I have the honor of being his first student for doing research in fish endocrinology and obtaining my Ph.D and D.Sc. degrees under his guidance and reporting first discoveries of thyroid gland, indirect blood supply to pituitary and germ cells in fish and publishing in world's famous scientific journals like Nature, Current Science, American Journal of Morphology, American J. Experimental Biology, Oxford University Journal, European Journal of Endocrinology, German Journal of Anatomical Records and others. My discovery of the thyroid gland in air-breathing fish was widely applauded by the Zoologists gathered in the First All India Congress of Zoology, Jabalpur in 1959 during my first presentation, as a Research Scholar.

Dr Swarup has an outstanding academic career, securing the First Merit Position in Ajmer School Board's examination and the First Merit Position in B.Sc. and M.Sc. examinations of Agra University. He was successful in the production of Triploidy in fish by simple methods of cold and hot shock treatments to gravid female and male fish, Gasterosteus aculeatus in 1957 for his D.Sc. degree of Oxford University (U.K.).

Triploidy is usually not produced in animals, but since then in many fish species like Nile tilapia (Hussain et al., 1994), rainbow trout (Hansen, 2003), yellow perch (Max and Sucumaran 2007), Clarias macrophegalus (Parven and Gallardo, 2014), Turbot (Piffer, 2003), Shelfish (Prieferet al., 2009) triploidy was produced using Dr. Swarup's technology for production of sterile fishes for aquaculture and fisheries management.

This technology is now routinely applied to several species of salmon and African catfish (Clarias gariepinus) for high growth rate, high stocking-density capacities, high consumer acceptability and high resistance to poor water quality and oxygen depletion. Triploid fishes (3n) have two sets of chromosomes of maternal origin (2n) and one set of chromosomes of paternal origin (1n). This is direct evidence of Darwin's theory of Origin of Species. This technology explains the Synteny phenomenon of genomes cut and pasted in the course of evolution, which Darwin could not explain at that time!

I learned the style of teaching and research from Dr Swarup, which helped me to deliver lectures before international scientists for several hours and explore new areas of biological research, like molecular epigenetics of animals and humans, regarding environmental stress effects, behavioral stress science and molecular horology of Indian Hindu mythology like Bhrugu Sanhita etc. After my retirement from university service, I published 28 books of scientific fiction and am planning more books to write during the coming years. I feel that Dr H. Swarup is with me and I always imagine that he is guiding me.

When he was the honorary wildlife warden of Madhya Pradesh Tiger Reserves, he would discuss the life of tigers in these protected areas with me. I used to store them and write in my notebooks that helped me to write books like (1) Tigers in Tigerlands, (2) Management and Biology of Indian Wildlife, (3) Inroduction to Biodiversity, (4)Tiger, the Icon of India, (5) Birds of South Asia (6) Vanishing Asian Wildlife, published by Amazon.com (Columbia U.S.A.), RoseDog Publisher (Pittsburgh, U.S.A) and Lambard Pub. Germany.

My latest book on Inheritance of Acquired Characters of Modern Life Style, published by Amazon.com Company in August 2022 explains the consequences of smoking, alcoholic habits and drug addicts and religious mad people's criminal actions and their children becoming terrorists and criminals, forensic psychiatry is my latest thinking, which I inherited from Dr Swarup's original way of thinking. I plan to complete the list of 50 books for the benefit of people before I leave this planet forever. I hope you will remember me whenever you remember Dr Har Swarup!

Thank you all for patiently listening to my lecture.
Prof Belsare’s present research before his sad demise in December 2025, despite not having a laboratory to work in, but he used his experience and expertise to discover new technologies and write books after consulting literature. I was lucky to visit him in Nagpur, India a few days before he left for his heavenly abode; I remember he wanted to attend an international conference, contemplating a research paper, talking even in his ICU with his artificial life support system! What a man, lived a life of his science, till the end.

Prof Belsare has written 30 scientific books so far, most of them published by Amazon Publishers, USA. He has published over 200 research papers, many of them in European and American journals, and now uses these technologies for the livelihood of farmers of small holdings to prevent suicide due to debt and rural water supply of pure drinking water. Such a project of 320 crores of rupees, which was prepared by Dr Belsare is now running in Maharashtra state by the NGO, Maharashtra Gram Darshan Amaravati. Till his last breath, Prof Belsare was studying the technology of epigenetics (Science of inherited acquired characters through genes) for writing books and reporting causes of diseases and terrorism by human online predators who do sexual assaults on teenagers.

Biodata of Prof Dr D.K. Belsare
Position: Director, Maharashtra Gram Darpan, Amaravati (Maharashtra, India). Hon Director, Dr Belsare Institute of Fisheries Research and Training, Morshi, Amravati MS, India.

Educational Qualifications: M.Sc., PhD, D.Sc.Date of Birth: 26 March 1933.

Distinguished Fellowship: FNASc. in 1980, F.Z.S.I in 1985 (for Wildlife & Fisheries research).

Positions held: Lecturer 1961-64, School of Studies in Zoology, Vikram University, Ujjain and Lecturer 1964-68 Nagpur University.

Reader 1968-76 Nagpur University
Professor 1976-93 Bhopal University (Barkatullah University).

Post-doctoral Fellow 1968-70, Texas University, Houston USA, Research Associate 1970-72. Baylor College of Medicine, Houston USA

Experience: Teaching post-graduate classes for 30 years, Research for 50 years and over 50 lectures on Ecosystem Management for Sustainable Development (Water & Wildlife) delivered at Technical University Dresden sponsored by UNEP from 1980 to 1988 for participants from developing countries.

Significant Contributions

- He has made significant contributions to Wildlife & Biodiversity Conservation in the tropical region with reference to the Indian sub-continent. He was awarded a Visiting Fellowship of the United Nations Environmental Programme for delivering lectures on wildlife management and environment from 1980 to 1988 in various universities of Europe. During this programme, he delivered 20 lectures on tropical wildlife and water management before the participants in the Ecosystem Management Programme sponsored by UNEP, held at Technical University Dresden (Germany). His gene pool fragmentation hypothesis is accepted as a cause of isolation of certain mammalian species like the Asiatic lion & tiger, which are on the brink of extinction.
- This theory holds good for races of other species like Barasingha and Wild Buffalo, of which different races are widely isolated. His concept of adequate living space for the tiger to save from extinction proposed in 1992 was widely appreciated, and now conservationists like well known Tiger Expert Mr.Sawarkar (2004) is saying the same thing.
- Dr Belsare published three reviews on the ecology of surface water of the tropics in 1982. This is a useful contribution for water treatment problems in tropical countries including India.
- Dr Belsare is the first scientist of India (1979) to spread the message of environmental awareness & wildlife protection for the benefit of the common man and their importance in human welfare and survival. He organized seminar/symposia/workshop from 1980 to 1985 for general awareness among the people and presented papers on wildlife conservation for ecological services.

- Other contributions on Environmental Subjects
- As Professor & Head 20 years
- Research Associate, Baylor College of Medicine USA. 3 years (1968-71)
- UNEP Fellow, Germany 1979
- UNEP Visiting Professor European Universities 9 years
- Advisor Apipol Company Krakow Poland 5 years
- Director (R &D) Environmental Planning & Coordination Organization Bhopal 1995:
- Advisory Board Member: ENVIS-Node DMI Bhopal 2003-present
- Member of Technical Committee Wildlife Research, Govt of Madhya Pradesh 2006:
- Publications over 200 research papers in Scientific Journals
- Organiser of International Symposia : India 3 Bhopal
- Malayasia 1 Kaulalumpur1983 USA 1 Columbus Ohio, 1992,
- USA 1 Chicago 2019, Uzbekistan (Tashkand) 2020 Oct.

Attended Conferences/symposia / seminar 162
Supervised Ph.D. 48, D.Sc. 2

- Gold Medals awarded: University Merit Gold Medal 1959
- Zoological Society Gold Medal 1985, 20th Century Gold Medal.1998
- Zoological Conference Gold Medal 2000, Best Senior Scientist's Gold Medal 2006
- Lifetime Research: Hormones, Aquaculture, Water Research, Wildlife Biology & Management
- Biodiversity Conservation
- Consultancy: Development of an assessment system to evaluate the ecological status of rivers in the Hindu-Kush Himalayan (HKH) region, sponsored by the European Commission, IIT, Roorkee: submitted in April 2007
- This report contains 275 pages on macrobenthic invertebrates of the Hindukush Himalayan Region.
- Reproductive physiology of Ophicephalus punctatus with special reference to seasonal cycle and hormonal control: hypothalamo-hypophysial and thyroid gland The role of corpuscles of Stannius and interrenal tissue in the reproductive cycle is also demonstrated. Correlative changes in hepatic and serum cholesterol during annual ovarian cycle in Heteropneustes fossilis.
- Indirect supply of blood to pituitary in fish was reported as early as in 1965 (published in Nature, London) and therefore the pituitary hormonal flow is through this region (equivalent to median eminence in mammal)
- Developmental physiology: Development of germ cells and their migration to the genital ridge to form gonads was reported for the first time in Indian fish. Development of endocrine glands (pituitary, thyroid, interrenal tissue, corpuscle of Stannius) is also demonstrated in fish.

The physiologic aspects of functional status of endocrine glands. Stress physiology in Fish: Oxidative stress due to metal pollution, antioxidant mechanisms. Lipid peroxidation (LPO) as a biomarker of oxidative stress. Superoxide dismutase (SOD) level in tissues and blood to protect stress.

Nutritional physiology: Lipid content in major carps under different feed trials Serum electrolytes and histophysiologic response to the interregnal cells and corpuscles of Stannius of Heteropneustes fosilis in high calcium environment.

Role of urophysis in osmoregulation in fish
Macrobenthic invertebrates as biomarkers of environmental stress. This is used as rapid bioassay of water quality required for fish culture and aquaponics.

The latest work that Prof Belsare was supervising was in collaboration on the DNA analysis and microsatellites in Gangetic carps introduced in South Indian wetlands.
Conflict of interest: Author declares no conflict of interest.

Data Availability: All data sets are available with the author

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Effectiveness of Combined Relaxation and Systemic Desensitization to Reduce Examination Anxiety in Indian School-Going Adolescents

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ABSTRACT

Examination-related anxiety significantly impacts adolescents' academic performance and psychological well-being. This quasi-experimental study evaluated a combined intervention using Schultz's Autogenic Training and systematic desensitization in reducing examination-related anxiety among Indian school-going adolescents aged 14–16 years. A total of 80 students from Grades 8 to 10 at St. John's Public School, diagnosed with test anxiety, were selected through convenience sampling. The intervention spanned 15 days, including 10 sessions (two offline and three online per week) of 30 minutes each, integrating interactive discussions, relaxation training, and systematic desensitization techniques. Anxiety levels were pre- and post-evaluated using the Westside Test Anxiety Scale, Hamilton Anxiety Rating Scale, and the Fear Thermometer. Post-intervention results demonstrated a statistically significant reduction in anxiety: Westside Test Anxiety scores decreased from 4.33 ± 0.48 to 2.97 ± 0.27, Hamilton scores reduced from 24.94 ± 3.26 to 16.69 ± 3.25, and Fear Thermometer scores dropped from 8.55 ± 1.05 to 5.46 ± 1.08 ,with all results achieving high statistical significance ($p < 0.0001$). The reductions were consistent across gender and grade levels, indicating broad applicability. These findings underscore the efficacy of a structured mental health approach in mitigating exam-related anxiety. Incorporating such interventions into school-based programs may enhance students' resilience, academic outcomes, and psychological health.

KEY WORDS: DADOLESCENTS, AUTOGENIC TRAINING, EXAMINATION ANXIETY, SYSTEMATIC DESENSITISATION, SCHOOL-BASED INTERVENTION.

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INTRODUCTION

Examination anxiety is a prevalent psychological concern among adolescents, particularly within academic

settings1. It manifests as a performance-related form of anxiety, characterised by worry, fear of failure, and physiological symptoms such as restlessness, palpitations, and disturbed sleep, all of which can negatively affect academic performance and overall well-being2,3. While moderate levels of anxiety may enhance motivation, excessive anxiety impairs concentration, working memory, and cognitive processing, ultimately hindering academic success4.

In India, the issue is further exacerbated by an intensely outcome-focused education system and strong societal pressure to succeed academically. Students often face high expectations from parents, teachers, and peers, leading to feelings of inadequacy, self-doubt, and, in extreme cases, school avoidance or suicidal ideation5,6. Socioeconomic disparities, rigid exam structures, and limited access to mental health resources compound the problem7.

Various cognitive and behavioral factors contribute to the onset and persistence of exam anxiety, including fear of failure, perfectionism, low academic self efficacy, and poor study habits8,9. Chronic anxiety can also diminish students' confidence, social participation, and emotional resilience, with long-term consequences such as depression or generalized anxiety disorders10.

Non-pharmacological interventions—such as deep breathing, guided imagery, progressive muscle relaxation, and systematic desensitization—have been shown to significantly reduce exam-related anxiety by addressing both physiological arousal and maladaptive thought patterns7,11. These interventions enhance self-regulation, reduce autonomic stress responses, and improve academic engagement. Despite growing evidence, school-based mental health programs in India remain underdeveloped, and stigma often prevents adolescents from accessing available support12.

The present study aims to explore the combined effects of relaxation training and systematic desensitization in managing examination anxiety. By targeting both cognitive and physiological components, this integrated approach has the potential to enhance coping skills, reduce academic stress, and improve overall student performance and psychological well-being.

MATERIAL AND METHODS

A quasi-experimental research design was used to evaluate the effects of relaxation training and systematic desensitization techniques on reducing examination-related anxiety among adolescents. Ethical clearance was obtained from the Institutional Ethics Committee of Santosh College of Occupational Therapy (Ref No. SCOT/NOV-24/ECPEADS-06), and permission to conduct the study was granted by St. John's Public School, Greater Noida (West). All participants were fully informed about the study's purpose and procedures, and written informed consent was obtained prior to participation. To ensure better accessibility and participation, intervention sessions were conducted both offline (at school) and online (virtually).

Using Cochran's formula with a 95% confidence level and 5% margin of error, the minimum sample size was calculated to be approximately 80 participants. A total of 80 adolescents, aged 14 to 16 years and enrolled in grades 8 to 10, were selected via convenience sampling based on availability and willingness to participate. The inclusion criteria were students aged 14–16 years from Grades 8 to 10, of both genders, with self-reported examination anxiety. Exclusion criteria included a history of serious medical illness and the presence of diagnosed learning disabilities. In this design, relaxation and systematic desensitization techniques served as the independent variables, while examination anxiety was the dependent variable. The intervention spanned 15 days, including pre-intervention assessment, 10 intervention sessions, and post-intervention assessment. Participants attended five sessions per week, with two offline and three online sessions. Each session lasted 30 minutes, divided into 6 minutes of interaction, 12 minutes of relaxation training using Schultz's Autogenic Training, and 12 minutes of systematic desensitisation exercises.

The study design and therapeutic approach were informed by previous research demonstrating the effectiveness of occupational therapy interventions in managing performance-related anxiety, such as fear of public speaking in school-aged children13.

Outcome Measures: The following outcome measurements were taken at baseline and again after 15 days of training. The assessment tools included the WTAS, a 10 item self report instrument designed to assess worry and performance-related impairment in test anxiety, and the HAM A, a 14 item clinician-rated scale evaluating both psychological and somatic anxiety symptoms, widely used and supported by strong reliability and validity evidence14 and Fear Thermometer is a straightforward visual analogue scale ranging from 0 to 10, enabling children and adolescents to effectively express their anxiety levels. It has demonstrated strong face validity and correlates well with standardized anxiety assessment tools15.

RESULTS

Table 1.0. Test of Normality (Shapiro–Wilk Test)

Variable	Shapiro-Wilk Statistic	p-value
Westside Test Anxiety Scale Pre	0.933	0.0004***
Westside Test Anxiety Scale Post	0.957	0.0089**
Hamilton Anxiety Rating Scale Pre	0.931	0.0003***
Hamilton Anxiety Rating Scale Post	0.920	0.0001***
Fear Thermometer Score Pre	0.871	<0.0001***

**p < 0.01, ***p < 0.001 (statistically significant).

Table 1.0 presents the results of the Shapiro–Wilk test, which was conducted to assess the normality of data distributions for each variable. The findings revealed that both pre- and post-intervention scores on the Westside Test Anxiety Scale, Hamilton Anxiety Rating Scale, and Fear Thermometer significantly deviated from normality ($p < 0.01$ or $p < 0.001$). As a result, non-parametric statistical tests were deemed appropriate and used for further analysis.

Table 2.0. Age Comparison Between Genders (Mean ± SD)

Gender	Mean Age ± SD	p-value
Male	14.86 ± 0.77	0.745
Female	14.92 ± 0.83	

The mean age of male participants was found to be 14.86 years with a standard deviation of 0.77, while the mean age of female participants was 14.92 years with a standard deviation of 0.83. The difference in mean age between the genders was minimal and statistically analysed using an independent samples t-test.The resulting p-value of 0.745 indicates that the observed difference in age between male and female participants is not statistically significant ($p > 0.05$).

Table No. 3. Grade Distribution of Subjects

Grade	Count	Percentage (%)
8	30	37.50%
9	29	36.25%
10	21	26.25%

Table No. 3 shows Grade Distribution of Subjects provides a summary of the participants' academic grade levels, offering insights into the representation of each grade within the study sample. Among the total of 80 adolescent participants, Grade 8 students constituted the largest proportion, with 30 students accounting for 37.50% of the sample. This was closely followed by Grade 9, which included 29 students or 36.25% of the total, and Grade 10, which comprised 21 students or 26.25%.

Pre–post intervention comparisons were evaluated using the Wilcoxon signed-rank test.Pre–post intervention analysis showed highly significant reductions in anxiety scores across all tools (Table 4.0). The Westside Test Anxiety Scale decreased by a mean of 1.36 points ($p< 0.0001$), the Hamilton Anxiety Rating Scale by 8.25 points ($p < 0.0001$), and the Fear Thermometer by 3.09 points ($p < 0.0001$).

Table 5 presents a grade-wise comparison of anxiety and fear scores before and after the intervention.Grade-wise and gender-wise comparisons were analyzed using the Kruskal–Wallis test and Mann–Whitney U test, respectively. Pre-intervention Westside Test Anxiety Scale scores showed a significant difference across grades ($p = 0.0353$), with Grade 10 students reporting the highest anxiety, likely due to academic pressure and board exam stress. Post-intervention scores, however, showed no significant difference ($p = 0.1105$), indicating uniform effectiveness of the intervention.

For the Hamilton Anxiety Rating Scale, both pre- and post-intervention scores showed no significant differences across grades ($p = 0.1746$ and $p = 0.7950$, respectively), suggesting comparable general anxiety levels and response to treatment. Similarly, Fear Thermometer scores did not significantly differ across grades (Pre: $p = 0.5083$), supporting the intervention's equal impact across academic levels.

Table 4.0: Pre–Post Comparison of Anxiety Tools

Tool	Pre-Intervention (Mean ± SD)	Post-Intervention (Mean ± SD)	Mean Difference	p-value
Westside Test Anxiety Scale	4.33 ± 0.48	2.97 ± 0.27	1.36	<0.0001*
Hamilton Anxiety Rating Scale	24.94 ± 3.26	16.69 ± 3.25	8.25	<0.0001*
Fear Thermometer Score	8.55 ± 1.05	5.46 ± 1.08	3.09	<0.0001*

Table No. 5. Grade-wise Comparison of Anxiety and Fear Scores

Tool	Grade 8 (Mean ± SD)	Grade 9 (Mean ± SD)	Grade 10 (Mean ± SD)	p-value
Westside Test Anxiety Scale (Pre)	4.16 ± 0.48	4.39 ± 0.42	4.49 ± 0.49	0.0353
Westside Test Anxiety Scale (Post)	2.99 ± 0.30	2.89 ± 0.23	3.05 ± 0.25	0.1105
Hamilton Anxiety Rating Scale (Pre)	25.23 ± 3.04	24.07 ± 3.16	25.71 ± 3.57	0.1746
Hamilton Anxiety Rating Scale (Post)	16.37 ± 2.92	16.86 ± 3.59	16.90 ± 3.33	0.7950
Fear Thermometer Score (Pre)	8.70 ± 1.12	8.38 ± 1.12	8.57 ± 0.87	0.5083

Table No. 6: Gender-wise Comparison of Anxiety and Fear Scores			
Tool	**Male (Mean ± SD)**	**Female (Mean ± SD)**	**p-value**
Westside Test Anxiety Scale (Pre)	4.24 ± 0.45	4.43 ± 0.50	0.0829
Westside Test Anxiety Scale (Post)	2.96 ± 0.26	2.98 ± 0.28	0.7847
Hamilton Anxiety Rating Scale (Pre)	25.30 ± 3.26	24.51 ± 3.25	0.2831
Hamilton Anxiety Rating Scale (Post)	17.33 ± 3.29	15.95 ± 3.08	0.0580
Fear Thermometer Score (Pre)	8.49 ± 1.14	8.62 ± 0.95	0.5763

Table No. 6 provides a gender-wise comparison of anxiety and fear scores before and after the intervention. Pre-intervention, females showed slightly higher test anxiety (Westside: 4.43 ± 0.50) than males (4.24 ± 0.45), though not statistically significant ($p = 0.0829$). Post-intervention scores were nearly identical for both genders, indicating equal effectiveness ($p = 0.7847$). For general anxiety (HAM-A), males scored slightly higher pre-intervention, but post-intervention, females showed marginally greater improvement ($p = 0.0580$). Fear levels were comparable across genders both before and after intervention, with no significant differences ($p > 0.05$).

DISCUSSION

The present study evaluated the effectiveness of a combined intervention—relaxation training using Schultz's Autogenic Training and systematic desensitization—in reducing examination-related anxiety among Indian adolescents. The findings demonstrated significant reductions across all outcome measures, confirming the efficacy of this dual therapeutic approach in addressing both cognitive and physiological symptoms. Post-intervention scores decreased notably across all tools: the Westside Test Anxiety Scale dropped from 4.33 ± 0.48 to 2.97 ± 0.27, the Hamilton Anxiety Rating Scale from 24.94 ± 3.26 to 16.69 ± 3.25, and the Fear Thermometer from 8.55 ± 1.05 to 5.46 ± 1.08,with all results achieving high statistical significance ($p < 0.0001$). These results highlight the intervention's effectiveness in reducing both cognitive worry and physiological symptoms.

Grade-wise comparisons revealed that although Grade 10 students initially showed higher anxiety (Westside Pre: 4.49 ± 0.49), post-intervention scores across Grades 8–10 converged (range: 2.89–3.05, $p = 0.1105$), indicating the program was equally effective across academic levels.

The decrease in Westside Test Anxiety scores highlights the intervention's role in alleviating cognitive interference and performance-related worry, while improvements in the Hamilton Anxiety Rating Scale reflect reduced somatic symptoms such as tension and restlessness. The decline in Fear Thermometer scores further indicates better emotional regulation and diminished anticipatory fear. Recent studies report that students in higher grades, especially those preparing for board examinations, tend to exhibit elevated anxiety levels—findings consistent with the present study's grade-wise baseline results16. Importantly, post-intervention scores showed convergence across grades, suggesting the intervention's broad effectiveness.

Additionally, gender differences in anxiety intervention outcomes appear minimal, with both boys and girls benefiting, though females may show slightly greater responsiveness due to higher internalising tendencies17, consistent with current findings. The multidimensional nature of academic anxiety, encompassing physiological and emotional symptoms, has been emphasised in recent literature18. This is supported by moderate pre-intervention correlations between general anxiety and fear scores in this study. The reduction of these correlations post-intervention suggests the therapeutic model effectively addressed multiple anxiety domains independently.

Despite these promising results, the study has several limitations. It was confined to a single school with a small convenience sample, lacked a control group, and did not include long-term follow-up, which limits conclusions about the sustainability of the intervention's effects. Additionally, the reliance on self-reported data and the inability to isolate the specific contributions of relaxation training versus systematic desensitization further constrain the findings. To address these issues, future research should incorporate control groups, extend the duration of the intervention, and include long-term follow-up assessments. Moreover, recruiting larger and more diverse samples from multiple schools would enhance the generalizability of the results and provide a deeper understanding of the intervention's efficacy.

CONCLUSION

The study found that a combined intervention of relaxation training and systematic desensitization significantly reduced examination-related anxiety among adolescents. Scores on the Westside Test Anxiety Scale, Hamilton Anxiety Rating Scale, and Fear Thermometer showed marked improvement post-intervention (all $p < 0.0001$). Grade-wise analysis revealed initially higher anxiety in Grade 10 students, but post-intervention scores were comparable across all grades, indicating consistent effectiveness. Gender-wise differences were minimal, though females showed slightly greater improvement in general anxiety. Overall, the

intervention proved effective in addressing both cognitive and physiological symptoms of anxiety, supporting its use in school-based mental health programs for adolescents.

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Effectiveness of Occupational Therapy Intervention on Sensory Motor Function, Activities of Daily Living and Spasticity of The Lower Limb in Stroke Survivors: A Randomised Control Trial

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ABSTRACT

Stroke is one of the leading causes of disability worldwide, often leaving survivors with motor impairments, spasticity, and limitations in daily functioning. Occupational therapy that incorporates sensory stimulation may enhance neuroplasticity and support better functional recovery. A Randomized control trail study was conducted to analyse the effectiveness of occupational therapy intervention on sensory motor function, activities of daily living and spasticity of the lower limb in stroke survivors. A total 36 participant recruited aged -50 years or older and randomly assigned in one of 2 groups: control group with conventional occupational therapy and experimental group sensory stimulation with conventional occupational therapy. Exercise intervention was conducted for six weeks, four days a week, in 45-minute sessions for all the participants. The outcomes of the intervention were assessed using FMA-LE, Barthel Index, and MAS-LL outcome measure. Improvements were seen in sensory-motor function measured by the Fugl-Meyer Assessment for Lower Extremity ($p < 0.001$), functional independence assessed with the Barthel Index ($p < 0.001$), and reduction of spasticity measured by the Modified Ashworth Scale ($p < 0.001$). These findings suggest that adding sensory stimulation with conventional occupational therapy leads to more meaningful and clinically relevant recovery compared to conventional Occupational Therapy alone in improving motor function, enhancing independence in daily activities, and reducing spasticity in the lower limbs of stroke survivors.

KEY WORDS: EFFECTIVENESS OF OCCUPATIONAL THERAPY INTERVENTION IN STROKE SURVIVORS.

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INTRODUCTION

Stroke, a leading cause of disability and mortality globally, is traditionally defined as a neurological deficit ascribed to an acute focal injury of the central nervous system (CNS) by a vascular cause, such as cerebral infarction, intracerebral haemorrhage (ICH), or subarachnoid haemorrhage (SAH)1.

The Behavioural Risk Factor Surveillance System (BRFSS) reported that the median prevalence of stroke among adults in the United States was 3.4% in 2022. South Dakota and Puerto Rico had the lowest prevalences, at 2.1% and 1.8%, respectively, while Arkansas had the highest prevalences, at 4.8%2.

The study was conducted across twelve villages in Baruipur, West Bengal, along with the urban centres of Mumbai, Trivandrum, Ludhiana, Kolkata, and Punjab. The total reference population comprised 12,479,509 individuals, among whom 11,654 new stroke cases were identified, with a mean of 1,294 (SD ± 1,710). Strokes ranged from 26 to 757 per 100,000 people annually, 108 to 172/100,000, and 18% to 42% in terms of crude frequency, crude incidence, and one-month case fatality rates, respectively3.

Injury to the central nervous system results in abnormal muscle tone and stiffness. Excessive muscle tightness can significantly impact both quality of life and economic. This handicap is common and often co-occurs with motor difficulties following a stroke4. It does, however, recur irregularly over the course of the chronic phase. The prevalence of increased tone in motor deficits ranging from moderate to severe in chronic stroke survivors is still unknown.

Muscle tone can have a detrimental effect on motor control and motor learning after a stroke. Aberrant posture and co-activation of agonist and antagonist muscles are often associated with impaired muscular tone5. The negative impact of increased tone on motor function is more pronounced in single- and multi-joint actions, especially inside spasticity zones. Voluntary motor function may be adversely affected by spasticity. Spasticity is defined as the range of angles in which it is noticed. Importantly, the practice of more coordinated motions and the acquisition of motor abilities are impeded by movement in these regions6. Impairments in motor function that hinder the execution of daily living activities (ADLs) frequently lead to a reduction in overall quality of life7. The lower limb might regain motor function more quickly than the upper limb following a stroke. The primary causes include the degree, frequency, or dosage of lower limb use relative to upper limb use, the existence of spasticity, and its significant impact on the upper limb, however many other factors may also be at play. To improve upper limb motor function, rehabilitation treatments for stroke sufferers should focus on reducing spasticity, particularly in the early post-stroke period, and increasing practice intensity, particularly in real-world scenarios.

Therefore, stroke patients must improve upper limb motor function in order to be able to do ADLs such as eating, cleaning, dressing, grooming, and answering the phone. Similarly, regaining motor function of the lower limbs is essential for walking, which in turn supports daily activities such as shopping, social interaction, and mobility. Furthermore, being able to engage in social activities and carry out ADLs on one's own is essential to achieving a high quality of life8.

It's more important than ever to manage spasticity since it can hinder limb movement and general mobility and increase the risk of additional issues including joint contractures and discomfort, which exacerbate motor weakness and functional limits9.

Numerous sensory modalities are susceptible to strokes. It has been reported that between 65 and 94 percent of stroke victims are no longer able to identify touch sensation10. Proprioception (the ability to sense the location and direction of body parts) damage has also been reported (17% to 52%), as has loss of pinprick feeling (35% to 71%), vibration (44%), and light touch (32% to 89%)10. Kinaesthesia, stereognosis (the sense of identifying or recognising objects by touch), pain, two-point discrimination, and graphesthesia (the sense of recognising writing on the skin by touch) are also affected. Tactile extinction is the term used to describe the inability of an individual with unilateral damage to perceive touch. Light touch, mechanical sensation, sustained pressure, two-point discrimination, kinaesthesia, position sense, shape perception, stereognosis, graphesthesia, pain, and integrated sensory modality evaluation were the mechanisms of sensory impairment examined in the investigations.

Active sensory training, which is founded on learning principles and graded re-education of sensory awareness, and passive sensory stimulation, which uses electrical or thermal stimulation to stimulate afferent inputs, were the two main types of sensory-based interventions that were found. It was shown that strategies for passive sensory stimulation received more attention than active sensory training11.

The present study aims to analyse the effectiveness of occupational therapy intervention on sensory motor function, activities of daily living and spasticity of the lower limb in stroke survivors.

MATERIAL AND METHODS

A randomized control trial study to analyses the effectiveness of occupational therapy intervention on sensory motor

function, activities of daily living and spasticity of the lower limb in stroke survivors. This study was reviewed and approved by the Institutional Ethical Committee of Santosh College of Occupational Therapy (Ref No.-SCOT/NOV-24/ECNeuro-09) and data was collected from the Divya Neuro Rehabilitation Clinic and the Indian NeuroRehab & Physio Centre, Ghaziabad. 36 participants in total were tested using the Screening tools, Montreal Cognitive Assessment (MoCA), Brunnstorm Recovery Stage (BRS), and Monofilament before being randomly assigned.

Using Cochran's formula with a 95% confidence level and 5% margin of error, the minimum sample size was calculated to be approximately 18 participants per group. Participants in the experimental group received sensory stimulation combined with conventional occupational therapy program and control group received only conventional occupational therapy program12. Intervention delivered four days per week in 45-minute sessions for six-weeks to all the participants. Sensory Intervention include Proprioceptive Stimuli - Weight bearing, Heavy joint compression, stretch pressure and Exteroceptive Stimuli – Brushing, icing and stretch pressure. Brushing of lower limb Applied to L3, L4, L5 dermatomes to stimulate knee and ankle extensors and icing to stimulates sensory organs in lower limb13. Conventional Occupational therapy program includes lower extremity range of motion exercises, fine motor movement exercises and strengthening of lower extremity muscles13.

Outcome Measures: The following outcome measurements were taken at baseline and again after 6 weeks of training. The assessment tools included Fugl-Meyer Assessment – Lower Extremity (FMA-LE) a three-point ordinal scale, rating 17 elements is as follows: full is 2, half is 1, and none is 0. Overall score 34 is the maximum score; a score of 34 indicates normal function to assess motor deficits in the lower extremities following stroke. Barthel Index (BI) to determine how well a person can perform essential daily living tasks. It assesses disability, functional independence, and tracks changes in functional status over time14. Modified Ashworth scale (MAS) to measure muscle spasticity by observing resistance to passive motion of the limb15.

RESULTS

Total 36 patients were enrolled in the study and data were gathered through the Fugl-Meyer Assessment for Lower Extremity (FMA-LE), the Barthel Index, and the Modified Ashworth Scale for Lower Limb (MAS-LL). Eighteen subjects were randomly allocated in control and experimental group. Outcomes were analysed by contrasting pre- and post-intervention scores between the control and experimental groups. Paired t-tests were used within each group to compare pre- and post-intervention scores. Independent t-tests were used to compare the post-intervention scores between the experimental and control groups.

All tests were two-tailed with a significance level set at $p < 0.05$. The results across all tests demonstrated statistically significant improvements in the experimental group compared to the control group in all three outcome domains. Findings indicated that the experimental group showed markedly higher gains compared to the control group on all three outcome measures. Group received Sensory stimulation with conventional Occupational therapy program and Control Group received Conventional Occupational Therapy.

Table 1. Baseline characteristic

Outcome Measure	EG				CG				t	P-value
	Mean		SD		Mean		SD			
	Pre test	Post test	Pre test	Post test	Pre test	Post test	Pre test	Post test		
Fugl Meyer Assessment-Lower Extremity	35.89	74.78	3.27	5.63	35.89	58.28	3.27	4.85	0.0	1.0
Barthel Index	48.22	81.44	4.77	4.57	48.22	68.94	4.77	5.33	0.0	1.0
Modified Ashworth Scale (Lower Limb)	2.61	1.11	0.50	0.32	2.61	2.11	0.50	0.32	0.0	1.0

CG: Control Group, EG: Experimental Group, SD: Standard deviation

DISCUSSION

The present study focuses on examining how occupational therapy interventions affect sensory–motor function, daily activity performance, and spasticity of the lower limbs in individuals recovering from stroke. Analysis of the FMA-LE revealed improvements in motor function across both groups, with the experimental group showing superior gains. The average baseline score was 35.89 for both groups. After treatment, the experimental group's mean

increased to 74.78, whereas the control group improved more modestly to 58.28. Similar patterns were shown by the Barthel Index, which is used to gauge performance in everyday life tasks. The initial mean score of 48.22 was the same for both groups. After intervention, the control group improved to 68.94, whereas the experimental group reached 81.44.

Findings reveal that the experimental approach significantly improved independence in daily living activities among participants. Spasticity, evaluated using the MAS for lower limbs, was initially the same in both groups (mean = 2.61). Post-intervention, the control group's score declined to 2.11, whereas the experimental group achieved a more pronounced reduction to 1.11. A lower score on this scale indicates reduced spasticity, implying that the intervention was more effective in managing muscle tone abnormalities in the experimental group.

The statistical analysis affirms the observations from the descriptive statistics. For Females, both the experimental ($t = -54.86$, $p = 0.00$) and control ($t = -48.85$, $p = 0.00$) groups showed highly significant pre-post differences. More importantly, the post-intervention comparison between groups ($t = 9.42$, $p = 0.00$) revealed a substantial and statistically significant advantage in the experimental group. The Barthel Index scores showed a significant improvement within both groups as well (experimental: $t = -67.06$, control: $t = -30.68$, both $p = 0.00$).

Table 2. Result of baseline and post test scores of the outcome measures in experimental and control group

Outcome measure	EG		CG	
	T	P	T	P
FMA-LE	-54.86	0.0	-48.85	0.0
Barthel Index	-67.06	0.0	-30.68	0.0
MAS-LL	12.37	0.0	4.12	0.001

EG: Experimental group, CG: Control group

Table 3. Result of post data analysis of the outcome measures, Experimental vs Control group

Scale	t- Value	p- Value
FMA- LE	9.42	0.0
Barthel Index	7.56	0.0
MAS-LL	-9.28	0.0

The impact of the improved intervention was shown by a significant post-intervention difference between groups ($t = 7.56$, $p = 0.00$), which further supported the superiority of the experimental group. Both groups showed a substantial decrease in spasticity for MAS (control: $t = 4.12$, experimental: $t = 12.37$). According to the post-intervention difference ($t = -9.28$, $p = 0.00$), the experimental group saw a considerably greater reduction in spasticity, which is consistent with the clinical objective of enhancing lower limb function and lowering muscular rigidity. The result of our study is similar to the study done by Majlessi KH et al (2023)16 to investigate how occupational therapy affects stroke survivors' motor function and everyday living activities.

The results demonstrate the effectiveness of occupational stroke patients' functional abilities are measured every two weeks using the Barthel index. Data analysis indicates that a group with a larger percentage of discharges to home is defined by an initial score of more than 40 on the Barthel index, while patients with starting scores over 60 had shorter lengths of stay. Additional research indicates that the functional skill development of this population developed predictably; a Barthel score of less than 40 indicates that no one was autonomous in movement abilities, and less than 50% in very basic activities such as feeding, grooming, and sphincter control. With a score of 60, patients appear to move from dependency to assisted independence.

Despite its contributions, this study has some limitations. The sample size was relatively small and limited to a single institution, which may affect the generalizability of the results. The absence of a longitudinal design limits the ability to infer causality. Future studies with larger, more diverse samples and objective assessment tools are recommended to strengthen the evidence base. Future research should be conducted on a larger scale with more diverse demographic groups to improve the generalizability of results. Integration of sensory-based virtual reality or wearable devices could be explored to enhance engagement and precision in therapy.

CONCLUSION

The results of this randomized controlled trial indicate that combining sensory stimulation—through both exteroceptive and proprioceptive techniques—with conventional occupational therapy produces significantly better outcomes in stroke rehabilitation. Participants receiving the combined intervention showed greater improvements in motor function, decreased lower limb spasticity, and enhanced ability to perform activities of daily living (ADLs) compared to those receiving conventional therapy alone. These results support the growing recognition of sensory-based rehabilitation strategies in stroke care and underscore the role of occupational therapy in designing comprehensive, client-centred interventions.

Ethical Clearance:
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Conflict of interest statement - NONE

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Effect of Vestibular Training on Gait and Quality of Life in Parkinsonism: A Randomised Controlled Trial

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ABSTRACT

Parkinson's disease (PD) is a progressive neurological disorder affecting around 10 million people globally. It is characterised not only by motor impairments but also by behavioural, cognitive, autonomic, and sensory disturbances. Common symptoms include fatigue, depression, sleep problems, cognitive decline, and gait and balance impairments, which collectively contribute to disability and reduced quality of life. Gait and balance issues in PD increase the risk of falls, while pain—often underrecognized—further worsens patients' well-being. This randomised controlled trial aimed to investigate the efficacy of vestibular training in improving gait and enhancing the quality of life in individuals with Parkinsonism. Thirty-six participants were recruited from the Indian Head Injury Foundation, AASC Multi-Speciality Centre, and Amar Jyoti Charitable Trust, following inclusion and exclusion criteria. Participants provided informed consent and were randomly divided into experimental and control groups. The experimental group received vestibular rehabilitation for 12 weeks, three times per week. The outcomes were measured using the Gait Assessment Rating Scale Modified (GARSM) and the Parkinson's Disease Questionnaire (PDQ-39) through pre- and post-assessment evaluations. Results showed a significant improvement in quality of life among the experimental group, as reflected by a reduction in PDQ-39 scores from 54.68 (±18.578) to 40.647 (±14.515). Statistical analysis ($t = 10.795$, $p = 0.000$) confirmed that vestibular training led to meaningful improvements in the participants' quality of life. In conclusion, the study highlights the effectiveness of vestibular rehabilitation in enhancing gait and quality of life among individuals with Parkinson's disease. It emphasises the need for integrating specialized rehabilitation approaches into standard PD care to promote better functional and health outcomes.

KEY WORDS: OCULOMOTOR TRAINING, PARKINSON DISEASE, PDQ-39, VESTIBULAR TRAINING

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INTRODUCTION

Parkinson's disease (PD) is a progressive, chronic neurological disorder that affects around 10 million people worldwide. In addition to movement difficulties, it is

defined by behavioural, cognitive, autonomic, and sensory impairments. When motor-related issues occur, it is common to experience autonomic dysfunction, fatigue, indifference, sensory abnormalities, sleep difficulties, depression, cognitive impairment, and, ultimately, a deterioration in overall life quality1. Gait and balance impairments in Parkinson's disease present considerable therapeutic challenges, as they increase the risk of falls and play a major role in disability and physical decline. Furthermore, pain is a common but frequently underrecognized symptom of Parkinson's disease, which can substantially diminish patients' quality of life2. Furthermore, approximately 90 known genetic risk variants account for 16–36 of the heritable risk for non-monogenic Parkinson's disease3.

Another risk factor for Parkinson's disease or tremor is having a family history of the condition. Other risk factors include chronic constipation, not smoking, and having a family history of the ailment. In industrialized nations, according to estimates, the general population has a 0.3% prevalence of Parkinson's disease (PD), but those over 60 have a 1.0% prevalence and those 80 years of age or more have a 3.0% prevalence (Fan J-Q 2020). Incidence rates as reported by prospective, population-based research range from 8 to 18 incidences per 100,000 person-years4.

The typical time from diagnosis to death is about 15 years, and the median age at onset is about 60 years., though many patients live for decades with the disease. Age and male sex are notable risk factors, with PD being 1.5 to 2 times more common in men than women. Women tend to present with a milder phenotype, with a higher incidence of tremor (67% vs. 48%) and a slower course of motor symptoms. They also typically develop Parkinson's disease (PD) 2.1 years later than men (53.4 vs. 51.3 years)1. Men are 1.5–2.0 times higher than women to have Parkinson's disease (PD), both in terms of incidence and prevalence. Women's age at onset is 53.4 years, 2.1 years later than men's (51.3 years). A slower incidence of motor impairment and a higher appearance of tremor (67%) compared to men (48%) indicate that women have a milder PD phenotype at presentation5.

Research has revealed clear central and peripheral changes in PD patients' vestibular function. Prior research has demonstrated Vestibulo-ocular reflex dysfunction6. In PD patients with lateral trunk flexion, the caloric test revealed unilateral peripheral vestibular hypofunction. When compared to the control group, the latencies and amplitudes of the cervical and ocular vestibular evoked myogenic potentials showed both unilateral and bilateral missing responses7. On the other hand, there is scant information regarding its use in PD patients. The clinical, social, and economic ramifications of Parkinson's disease (PD) are substantial; dexterity loss, speech difficulties, fatigue, social and emotional issues, and difficulties with walking, washing, and dressing all contribute to disability and a bad quality of life for patients and their carers8.

Vestibular rehabilitation methods have not been incorporated into many of the research that have examined the connection between gait performance and quality of life. Investigating how vestibular therapy impacts gait performance and, in turn, improves quality of life is necessary to fill this research gap. To improve quality of life, this study intends to assess how vestibular rehabilitation affects gait performance.

MATERIAL AND METHODS

This study was reviewed and approved by the Institutional Ethical Committee (REF NO.-SCOT/NOV-24/ECNeuro-04) of Santosh College of Occupational Therapy and by using Cochran's formula with a 95% confidence level and 5% margin of error, the minimum sample size was calculated to be approximately 36 participants which was further divided in to two groups of 18 each. Permission to conduct the study was obtained from Indian Head Injury Foundation, Amar Jyoti Charitable Trust and All About Special Child. Participants were informed about the intervention protocol tailored for the study.

Additionally, two outcome measures were administered: the GARSM Modified Gait Abnormality Rating Scale to assess the gait performance and the PDQ-39, which assessed the participants' quality of life and functional status. This study was conducted at Santosh College of Occupational Therapy and 36 participants recruited for the study using simple random sampling, and they were split into two groups: the Experimental Group and the Control Group. Before the study's commencement, the therapist informed detailing. Following consent, an initial assessment was conducted. Participants included were those in Hoehn and Yahr stages 1–4, aged between 30–70 years, able to walk independently, and without significant hearing impairments that could interfere with auditory cue interpretation, and excluded with severe depression, apathy, or daytime sleepiness, as well as those with diabetes, severe osteoarthritis, osteoporosis of the lower limbs, or other neurological disorders were excluded. The experimental group performed vestibular training protocol9 lasted 20 minutes with a 5-minute rest. Static balance exercises including standing, half-kneeling, and activities on firm, foam, trampoline, and tilt board surfaces, each practiced with open and closed eyes, head rotations, and ball throwing or catching. Dynamic balance training involved tandem gait (forward and backward), walking with a ball while turning or tracking it, stop-and-start walking, 180° rotations, and single-leg standing.

Oculomotor training included saccades—rapid eye movements between two targets in horizontal, vertical, and diagonal directions—and smooth pursuit, where participants tracked a moving object in four directions with a stable head. Vestibulocochlear movements consisted of head rotations (side-to-side, up-and-down) while maintaining gaze on a fixed target. The control group followed the conventional occupational therapy treatment6, which included a 5-minute warm-up with slow walking, 25 minutes of stretching (scapular muscles, pelvic flexors, hamstrings, and gastrocnemius), 15 minutes of body rotation exercises with rest as needed, and 12 minutes of strengthening exercises such as sit-to-stand, followed by a 3-minute rest. Pre-assessment questionnaires, including the PDQ-39 and the Modified Gait Abnormality Rating Scale (GARSM), were administered to eligible participants before the intervention, and post-assessment using the same

outcome measures was conducted after completing the 12-week intervention program.

Outcome Measures: The PDQ-39 is the most widely used questionnaire to assess the quality of life in individuals with Parkinson's disease, aiming to evaluate how the condition affects various aspects of daily life and overall well-being from the patient's perspective. It comprises 39 questions divided into eight categories: mobility, activities of daily living (ADL), mental health, social support, stigma, communication, cognition, and physical discomfort. Each item is scored from 0 (never) to 4 (always), with scores transformed to a 0–100 scale for each domain, where higher values indicate poorer quality of life10.

Modified Gait Abnormality Rating Scale (GARSM) is a clinical observational tool designed to assess gait abnormalities through visual observation, aiding in the identification of neurological or musculoskeletal impairments. It quantifies and describes gait deviations for diagnostic, treatment planning, and progress monitoring purposes, particularly useful in conditions such as Parkinson's disease, stroke, or other movement disorders. Each domain is scored from 0 (normal) to 3 (severe abnormality), with higher total scores representing more significant gait impairment11.

RESULTS

The detailed individual scores in the outcome measures PDQ-39 and GARSM, with the analysis of data, give the following, showing test results. Table 2 show the post baseline analysis shows, the Intervention group showed statistically and clinically meaningful improvements from pre- to post-intervention, while the Control group did not experience any significant changes over the same period.

Table 1. Descriptive Statistics of outcome measure

Outcome Measures	Experimental				Conventional			
	Mean		Std. deviation		Mean		Std deviation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
PDQ-39	54.68	40.647	18.578	14.515	54.861	54.528	13.182	13.302
GARSM	15.278	11.167	1.873	2.618	15.222	15.056	2.557	3.190

Table 2. Post outcome measure experimental vs control group by using independent t -test

Scale	t- value	p- value	Interpretation
PDQ-39	-2.991	0.005	Significant
GARSM	-3.999	0.000	Significant

DISCUSSION

When compared to the control group, the results of this research show the substantial influence of the vestibular rehabilitation intervention on the PDQ-39 and the GARSM scores. Specifically, experimental group exhibited a noteworthy improvement in PDQ-39 scores post-intervention, with a mean reduction from 54.68 (±18.578) to 40.647 (±14.515), which suggests a marked enhancement in the quality of life for individuals participating in the intervention. Statistically, this change was supported by a paired t-test result (t = 10.795, p = 0.000), demonstrating that the intervention had a significant impact on this population's quality of life measurements.

The mean change in the CG., on the other hand, was insignificant, demonstrating the limited effectiveness of traditional treatment approaches alone. The Control group, in contrast, exhibited a minimal change from 54.861 (±13.182) to 54.528 (±13.302), suggesting that conventional treatment alone may not significantly affect PDQ-39 outcomes.

These results align with previous study and this review discovered that vestibular rehabilitation improved stroke patients' gait performance12.

The E. G PDQ-39 scores before and after the intervention differed significantly (t = 3.09, p = 0.007) according to the paired t-test, however the Control group's scores did not change significantly (t = 0.02, p = 0.983). The success of the intervention was further supported by the statistical significance of the post-intervention comparison between the groups (t = -2.95, p = 0.006). The GARSM scores in Experimental group decreased from a mean of 15.278 (±1.873) to 11.167 (±2.618), showing an improvement in gait-related outcomes. These results suggest that both interventions were somewhat effective, with greater gains in the E. G.

Additional evidence of the experimental intervention's increased effectiveness given by Robertson, M. C in 2002 on Preventing falls in older people 13. A systematic review of community-based interventions emphasizes that multifactorial interventions includes exercise components, which are effective in reducing falls among community-dwelling older adults. It calls for the integration of these interventions into public health initiatives to enhance safety and mobility in this population whereas Fritz, S., conducted a research on Walking Speed.

The Sixth Vital Sign' and concluded that walking speed is a critical indicator of functional mobility and overall health status in older adults and suggested that regular assessment of walking speed can aid in identifying those at risk of mobility impairment, emphasizing the need for interventions aimed at maintaining or improving walking speed as a vital component of health promotion14. Systematic review on effects of resistance training on health-related outcomes in older adults which concludes that resistance training significantly enhances muscle strength, bone density, and functional performance in older adults. It advocates for the inclusion of resistance training in exercise programs tailored for this age group to improve overall health outcomes and reduce the risk of disability15. According to a systematic review of OT interventions for individuals with Parkinson's disease conducted by Ellana Welsby, occupational therapy interventions that emphasise meaningful activities have been demonstrated to enhance perceived occupational performance16.

Programs for upper limb rehabilitation have been shown to improve upper limb function in the short term, but the long-term effects are uncertain17. Limitations of the study are cognitive status, which can influence gait and rehabilitation engagement, was no assessed or controlled for in the study. Furthermore, we did not formally track participant adherence or compliance with the intervention, which could impact the validity of the results. Future research should examine vestibular training combined with balance, strength, or cognitive training to improve outcomes. Studies could target specific groups (e.g., stroke, Parkinson's, MS, age-related vestibular decline) to develop tailored protocols.

CONCLUSION

This study reinforces the effect of integrating specialized rehabilitation protocols into standard observation for patients with PD, advocating for further research to maintain and expand upon these findings to ensure optimal health and mobility outcomes in this vulnerable population.

Ethical Clearance
SCOT/NOV-24/ECNeuro-04,9/11/2024.

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Comparison of the Effectiveness of Play-Based Learning Activities in Improving Performance Among Boys and Girls Diagnosed with Attention Deficit Hyperactivity Disorder

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent neurodevelopmental condition in children, marked by inattention, hyperactivity, and impulsivity, often leading to academic and social challenges. While pharmacological and behavioral therapies are common, their limitations underscore the need for more engaging, child-centered alternatives. This quasi-experimental study aimed to evaluate the effectiveness of play-based occupational therapy in improving performance among boys and girls with ADHD (inattentive type), using the Vanderbilt ADHD Diagnostic Teacher Rating Scale. A total of 46 children (23 boys and 23 girls), aged 6–12 years, participated. They received 24 structured play-based sessions, conducted four times per week over 1.5 months. Pre- and post-intervention assessments revealed significant improvements in both groups. Boys' scores increased from 100.00 ± 8.70 to 108.50 ± 7.40 ($p = 0.003$), while girls' scores improved from 101.00 ± 7.95 to 107.20 ± 8.91 ($p = 0.006$). Although boys showed slightly greater gains, the gender difference was not statistically significant. These findings suggest that play-based occupational therapy is an effective, gender-neutral intervention for enhancing academic and behavioral outcomes in children with ADHD. As a non-pharmacological and developmentally appropriate approach, it holds promise for broader application in educational and therapeutic contexts.

KEY WORDS: ADHD, BEHAVIOR, EXECUTIVE FUNCTION, GENDER, NON-PHARMACOLOGICAL INTERVENTION, PLAY-BASED LEARNING.

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INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder of childhood, characterized by symptoms of inattention, hyperactivity, and

impulsivity that significantly impact academic performance and classroom behavior. Globally, ADHD affects 5–10 % of children, with many continuing to experience symptoms into adulthood 1. While traditional interventions, including pharmacological and behavioral therapies, have demonstrated effectiveness, challenges such as side effects, incomplete symptom relief, and low engagement limit their overall success 2.

In the Indian context, ADHD prevalence ranges from 3–20%, yet the condition remains underdiagnosed and undertreated due to stigma, lack of awareness, and limited access to trained professionals 3,4. Misinterpretation of symptoms as behavioral issues rather than neurodevelopmental conditions by parents and teachers further delays timely intervention 5. Moreover, India's strong cultural emphasis on academic achievement, coupled with rigid educational systems, places additional pressure on children with ADHD, affecting their performance and well-being 6. These difficulties are compounded by the shortage of mental health services and a lack of trained professionals to provide early intervention and sustained support 7.

Furthermore, educational institutions often lack adequate support systems, such as special education services and individualised education plans (IEPs), leaving children without necessary accommodations 8,9. In light of these barriers, play-based occupational therapy has emerged as a promising approach. It engages children through enjoyable, structured activities that promote attention, executive function, and behavioural regulation, offering a developmentally appropriate alternative to conventional treatment. This study, therefore, aims to explore gender-based differences in the effectiveness of such interventions, contributing to more inclusive clinical and educational strategies for ADHD management.

Table 1. Tests of Normality (Kolmogorov–Smirnov and Shapiro–Wilk)

Tests of Normality Scale	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-Total Score	.060	46	.200*	.988	46	.909
Post-Total Score	.137	46	.030	.946	46	.034
Pre-Reading	.183	46	.001	.842	46	.000
Pre-Mathematics	.197	46	.000	.893	46	.001
Pre-Written Expression	.158	46	.006	.890	46	.000
Pre-Relationships with Peers	.212	46	.000	.875	46	.000
Pre-Following Directions	.185	46	.000	.891	46	.000
Pre-Disrupting Class	.190	46	.000	.880	46	.000
Pre-Assignment Completion	.199	46	.000	.827	46	.000
Pre-Organizational Skills	.149	46	.012	.893	46	.001
Post-Reading	.169	46	.002	.884	46	.000
Post-Mathematics	.208	46	.000	.844	46	.000
Post-Written Expression	.201	46	.000	.884	46	.000
Post-Relationships with Peers	.172	46	.002	.861	46	.000
Post-Following Directions	.158	46	.006	.878	46	.000
Post-Disrupting Class	.174	46	.001	.883	46	.000
Post-Assignment Completion	.178	46	.001	.858	46	.000
Post-Organizational Skills	.177	46	.001	.844	46	.000

Table 2. Group Comparison of Age Based on Gender (Independent Samples t-test)

Gender	N	Mean ± SD	t-value	df	p-value
Boys	23	10.65 ± 1.90	-0.140	44	0.889
Girls	23	10.74 ± 2.30			

Age comparison (Table 2) revealed no significant difference between boys (10.65 ± 1.90) and girls (10.74 ± 2.30; p = 0.889).

MATERIAL AND METHODS

A quasi-experimental study was conducted to evaluate performance skills in children with Attention Deficit Hyperactivity Disorder (ADHD) through structured play-based interventions. This study was reviewed and approved by the Institutional Ethical Committee of Santosh College of Occupational Therapy (Ref No. SCOT/NOV-24/ECPEADS-04). Permission to conduct the study was obtained from VQURA Child Development Services, Old Rajinder Nagar, New Delhi. All subjects Parent's were informed about the nature and purpose of the study, and written informed consent was obtained prior to their

participation. Based on a statistical power of 80% and an alpha level of 0.05, the required sample size was calculated to be 46 participants per group. A total of 46 children, aged 6–12 years, diagnosed with ADHD (inattentive type) by developmental paediatricians, were recruited using convenience sampling. Both boys and girls were included, while children with severe behavioural issues or co-existing physical, psychological, or medical conditions were excluded to maintain homogeneity. Participants were divided into two groups based on gender—Group A (boys) and Group B (girls)—with both receiving identical interventions.

Table 3. Gender-wise Comparison of Pre- and Post-Total Scores (Mann–Whitney U Test)

Variable	Gender	N	Mean ± SD	U-value	p-value
Pre-Total	Boys	23	100.00 ± 8.70	233	0.279
	Girls	23	101.00 ± 7.95		
Post-Total	Boys	23	108.50 ± 7.40	260	0.802
	Girls	23	107.20 ± 8.91		

Table 4. Within-Group Comparison of Pre- and Post-Total Scores (Wilcoxon Signed- Rank Test)

Gender	Pre (Mean ± SD)	Post (Mean ± SD)	Z-value	p-value	Median Difference
Boys	100.00 ± 8.70	108.50 ± 7.40	-2.95	0.003**	8.50
Girls	101.00 ± 7.95	107.20 ± 8.91	-2.73	0.006**	6.20

Total scores (Table 3) showed no significant gender difference in pre- or post-intervention performance ($p > 0.05$). However, within-group analysis (Table 4) demonstrated significant improvements for both boys ($Z = -2.95$, $p = 0.003$) and girls ($Z = -2.73$, $p = 0.006$).

Table 5. Gender-Wise Comparison of Individual Performance Parameters (Mann– Whitney U Test)

Parameter	Time	Boys (Mean ±SD)	Girls (Mean ±SD)	U-value	p-value
Reading	Pre	2.74 ± 1.69	3.35 ± 1.47	210	0.223
	Post	3.09 ± 1.44	2.91 ± 1.47	282.5	0.694
Mathematics	Pre	2.70 ± 1.36	2.87 ± 1.36	244	0.652
	Post	2.91 ± 1.62	2.96 ± 1.55	260	0.928
Written Expression	Pre	3.39 ± 1.31	3.13 ± 1.46	291.5	0.550
	Post	3.22 ± 1.48	2.83 ± 1.34	306	0.356
Relationships with Peers	Pre	3.04 ± 1.36	2.70 ± 1.36	308	0.327
	Post	2.91 ± 1.62	3.17 ± 1.44	241.5	0.611
Following Directions	Pre	3.48 ± 1.16	3.04 ± 1.52	305	0.368
	Post	3.52 ± 1.44	2.78 ± 1.41	342	0.083
Disrupting Class	Pre	2.91 ± 1.51	2.70 ± 1.40	286	0.637
	Post	3.57 ± 1.38	3.00 ± 1.38	328.5	0.152
Assignment Completion	Pre	3.52 ± 1.68	2.39 ± 1.41	363	0.026*
	Post	2.61 ± 1.41	3.26 ± 1.63	200.5	0.152
Organizational Skills	Pre	3.22 ± 1.35	2.65 ± 1.40	325.5	0.173
	Post	2.48 ± 1.47	3.09 ± 1.62	209	0.213

Domain-wise analysis (Table 5) indicated no significant gender differences in most areas. An exception was observed in Assignment Completion (pre-intervention), where boys scored higher ($p = 0.026$). This difference was not significant post-intervention, suggesting greater improvement among girls.

Each session incorporated elements of problem-solving, motor coordination, and peer-based social play, with the overarching goal of enhancing sustained attention, task completion, and overall academic and behavioural performance, as evaluated by the Vanderbilt scale10. In the study design, gender was treated as the independent

variable, while performance outcomes, ,measured using the Vanderbilt ADHD Diagnostic Teacher Rating Scale (performance section), served as the dependent variable.

The intervention consisted of 24 structured play-based therapy sessions, conducted in a controlled clinical setting over 6 weeks. Activities included block building, puzzles, mazes, Ludo, drawing, stacking cups, word searches, UNO cards, and painting, supported by maze sheets and other materials. These sessions were designed to promote attention span, behavioral regulation, executive functioning, and social interaction 11.

Outcome Measures: The following outcome measurements were taken at baseline and again after 6 weeks of training. The Vanderbilt ADHD Diagnostic Teacher Rating Scale (VADTRS) is a standardised tool used to identify ADHD symptoms based on teachers' observations. It includes 35 core items aligned with DSM criteria assessing inattention, hyperactivity, impulsivity, and conduct behaviours, rated on a 4-point scale (0 = never to 3 = very often). In addition, 8 performance items evaluate academic and behavioural functioning (e.g., reading, math, peer relationships, organisation) on a 5-point scale (1 = problematic to 5 = above average). The VADTRS has established validity and reliability, with strong internal consistency and good convergence with other ADHD measures. Its comprehensive design makes it particularly useful for intervention planning and outcome monitoring in school-based programs such as play-based therapy 10.

RESULTS

The present study aimed to assess and compare the effectiveness of play-based learning activities on academic and behavioral performance among boys and girls diagnosed with attention deficit hyperactivity disorder (ADHD). A total of 46 children (23 boys, 23 girls) participated. Tests of normality (Table 1) showed that most variables deviated from normal distribution; hence non-parametric tests were applied.

DISCUSSION

The findings of this study demonstrate that structured play-based interventions can significantly improve academic and behavioral performance in children with ADHD, irrespective of gender. The improvement was observed in both boys and girls, though boys showed slightly higher gains. This may reflect differences in symptom presentation, as boys with ADHD tend to display more externalizing behaviours, making them more responsive to behaviorally structured interventions. In contrast, girls often present with internalizing or inattentive symptoms, which may require more nuanced or individualized support 12,13.

These results are consistent with prior research showing that structured play enhances executive functioning, attention regulation, and social skills in children with ADHD 14. The intervention's theoretical grounding in executive function theory, Vygotsky's theory of play, and social learning theory further supports its application in both clinical and school-based contexts 15,16. Moreover, the involvement of caregivers has been noted to enhance long-term outcomes 17.

Despite these promising findings, the study has some notable limitations. First, it did not control for ADHD subtypes or the presence of comorbid conditions, which may have influenced individual responsiveness to the intervention. Second, parental and teacher feedback was not formally integrated into the assessment process, limiting the scope of behavioral insights across different environments. Third, the study was conducted in a controlled school-based setting, and outcomes may differ in home or community contexts. Given these limitations, future research should explore the differential impact of play-based interventions across ADHD subtypes, such as inattentive vs. hyperactive-impulsive presentations. Additionally, incorporating multi-informant feedback from parents and teachers would provide a more comprehensive evaluation of real-world effectiveness. Developing gender-specific intervention modules that consider the unique cognitive and behavioral profiles of boys and girls with ADHD may also enhance engagement and outcomes.

CONCLUSION

This study demonstrates that structured play-based learning significantly improves academic and behavioural performance in children with ADHD. Both boys and girls benefited, with boys showing slightly higher gains, though differences were not statistically significant. These findings highlight the value of play-based, non-pharmacological interventions in supporting children with ADHD and emphasise the need for gender-responsive approaches in educational and therapeutic settings.

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Systematic Reviews or Meta-Analysis should be systematic, critical assessments of most recently updated literature and data sources pertaining to basic biological or bio-medical science topics that include a statistical technique for quantitatively combining the results of multiple studies that measure the same outcome into a single pooled investigation. Data must be searched for and selected systematically for inclusion and critically evaluated, and the search and selection process for compiling the review must be mentioned. The text should NOT exceed 5000 words excluding abstract, references, tables and figures.

Each of the sections of the **Systematic Review** or **Meta Analysis** articles should include specific sub-sections as follows:

1. **Structured Abstract:** (Not exceed 250 words):Objectives, Methodology, Results and Conclusion
2. **Introduction:** Rationale, Objectives, Research questions
3. **Methodology:** Study design, Participants, interventions, comparators
4. **Systematic Review Protocol:** Search strategy, Data sources, Studies Sections and Data Extraction, Data analysis/ Statistical tools used
5. **Results and Discussion:** In results provide flow diagrams / attractive tables / figures of the studies retrieved for the review, study selection characteristics synthesized findings, risk of bias etc.
6. **Summary:** Abstract of main findings, Limitations, Conclusions etc.**For all other information including title page, typing and reference style etc, please follow the instructions to authors for Research Articles.**

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The case reports, of two or more patients must contain genuinely new interpretational information, discussed with up to date literature. The reports should have clinical significance, new adverse effect(s) of a drug or other unique first time observations, etc. Patient consent for publication must be obtained from the patient in written or, if this is not possible, the next of kin before submission. The author(s) must have been involved in the care of the patient.

Case Reports: Case Reports should be followed as per the guidelines of SCARE criteria

Case Report /case description should start with a single paragraph abstract followed by text, which should not exceed 2000 words (excluding references, tables and figures) with maximum 10 bibliographic references and either three figures or three tables. Case report / case presentation must contain:

1. Brief Abstract (should not exceed 150 words)
2. Introduction
3. Case Presentation
4. Reviews & Discussion
5. Conclusion
6. References

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(V) Letters to the Editor/Editorials / Perspectives / Correspondence

Opinions on topics and articles recently published in the journal will be considered for publication if they are objective and constructive in nature and provide academic interest to the readers. These letters may also be forwarded to the author of the cited article for possible response. The editor reserves the right to shorten these letters, delete objectionable comments, make other changes, or take any other suitable decision to comply with the style and policies of the journal. For writing and references style, follow the same instructions listed above.

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Editorial will be written by one member of the editorial board as solicited by the Editor-in-Chief. The editorial is generally a scientific review on one or two of the current topics pertaining to biomedical sciences.

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