Pertanika Journal of

# SCIENCE & TECHNOLOGY

JST

VOL. 28 (2) APR. 2020

PERTANIKA JOURNALS

A scientific journal published by Universiti Putra Malaysia Press

*Journal of Science & Technology*

# About the Journal

## Overview

Pertanika Journal of Science & Technology (JST) is the official journal of Universiti Putra Malaysia published by UPM Press. It is an open-access online scientific journal which is free of charge. It publishes the scientific outputs. It neither accepts nor commissions third party content.

Recognized internationally as the leading peer-reviewed interdisciplinary journal devoted to the publication of original papers, it serves as a forum for practical approaches to improving quality in issues pertaining to science and engineering and its related fields.

JST is a **quarterly** (January, April, July and October) periodical that considers for publication original articles as per its scope. The journal publishes in **English** and it is open to authors around the world regardless of the nationality.

The Journal is available world-wide.

## Aims and scope

Pertanika Journal of Science and Technology aims to provide a forum for high quality research related to science and engineering research. Areas relevant to the scope of the journal include: bioinformatics, bioscience, biotechnology and bio-molecular sciences, chemistry, computer science, ecology, engineering, engineering design, environmental control and management, mathematics and statistics, medicine and health sciences, nanotechnology, physics, safety and emergency management, and related fields of study.

## History

Pertanika was founded in 1978. A decision was made in 1992 to streamline Pertanika into three journals as Journal of Tropical Agricultural Science, Journal of Science & Technology, and Journal of Social Sciences & Humanities to meet the need for specialised journals in areas of study aligned with the interdisciplinary strengths of the university.

After almost 28 years, as an interdisciplinary Journal of Science & Technology, the revamped journal now focuses on research in science and engineering and its related fields.

## Goal of *Pertanika*

Our goal is to bring the highest quality research to the widest possible audience.

## Quality

We aim for excellence, sustained by a responsible and professional approach to journal publishing. Submissions are guaranteed to receive a decision within 14 weeks. The elapsed time from submission to publication for the articles averages 5-6 months.

## Abstracting and indexing of *Pertanika*

The journal is indexed in SCOPUS (Elsevier), Clarivate-Emerging Sources Citation Index [ESCI (Web of Science)], EBSCO, DOAJ, Agricola, ASEAN CITATION INDEX [ISC], Microsoft Academic, Google Scholar, National Agricultural Science (NAL) and MyCite.

## Future vision

We are continuously improving access to our journal archives, content, and research services. We have the drive to realise exciting new horizons that will benefit not only the academic community, but society itself.

## Citing journal articles

The abbreviation for Pertanika Journal of Science & Technology is *Pertanika J. Sci. Technol.*

## Publication policy

Pertanika policy prohibits an author from submitting the same manuscript for concurrent consideration by two or more publications. It prohibits as well publication of any manuscript that has already been published either in whole or substantial part elsewhere. It also does not permit publication of manuscript that has been published in full in Proceedings.

## Code of Ethics

The Pertanika Journals and Universiti Putra Malaysia takes seriously the responsibility of all of its journal publications to reflect the highest in publication ethics. Thus all journals and journal editors are expected to abide by the Journal's codes of ethics. Refer to Pertanika's **Code of Ethics** for full details, or visit the Journal's web link at http://www.pertanika.upm.edu.my/code_of_ethics.php

## International Standard Serial Number (ISSN)

An ISSN is an 8-digit code used to identify periodicals such as journals of all kinds and on all media–print and electronic. All Pertanika journals have ISSN as well as an e-ISSN.

Journal of Science & Technology: ISSN 0128-7680 (*Print*); ISSN 2231-8526 (*Online*).

## Lag time

A decision on acceptance or rejection of a manuscript is reached in 3 to 4 months (average 14 weeks). The elapsed time from submission to publication for the articles averages 5-6 months.

## Authorship

Authors are not permitted to add or remove any names from the authorship provided at the time of initial submission without the consent of the Journal's Chief Executive Editor.

## Manuscript preparation

Refer to Pertanika's **Instructions to Authors** at the back of this journal.

## Editorial process

Authors are notified with an acknowledgement containing a *Manuscript ID* on receipt of a manuscript, and upon the editorial decision regarding publication.

Pertanika follows a **double-blind peer-review** process. Manuscripts deemed suitable for publication are usually sent to reviewers. Authors are encouraged to suggest names of at least three potential reviewers at the time of submission of their manuscript to Pertanika, but the editors will make the final choice. The editors are not, however, bound by these suggestions.
Notification of the editorial decision is usually provided within ten to fourteen weeks from the receipt of manuscript. Publication of solicited manuscripts is not guaranteed. In most cases, manuscripts are accepted conditionally, pending an author's revision of the material.

## The Journal's peer-review

In the peer-review process, three referees independently evaluate the scientific quality of the submitted manuscripts.

Peer reviewers are experts chosen by journal editors to provide written assessment of the **strengths** and **weaknesses** of written research, with the aim of improving the reporting of research and identifying the most appropriate and highest quality material for the journal.

Journal of Science & Technology
Journal of Science & Technology
Journal of Science & Technology

Journal of Science & Technology
Journal of Science & Technology
Journal of Science & Technology

## Operating and review process

What happens to a manuscript once it is submitted to *Pertanika*? Typically, there are seven steps to the editorial review process:

1. The Journal's Chief Executive Editor (CEE) and the Editorial Board Members (EBMs) examine the paper to determine whether it is appropriate for the journal and should be reviewed. If not appropriate, the manuscript is rejected outright and the author is informed.

2. The CEE sends the article-identifying information having been removed, to three reviewers who are specialists in the subject matter represented by the article. The CEE requests them to complete the review in three weeks.

   Comments to authors are about the appropriateness and adequacy of the theoretical or conceptual framework, literature review, method, results and discussion, and conclusions. Reviewers often include suggestions for strengthening of the manuscript. Comments to the editor are in the nature of the significance of the work and its potential contribution to the field.

3. The CEE, in consultation with the Editor-in-Chief (EiC), examines the reviews and decides whether to reject the manuscript, invites the author(s) to revise and resubmit the manuscript. The CEE may seek additional reviews. Final acceptance or rejection rests with the CEE and EiC, who reserve the right to refuse any material for publication. In rare instances, the manuscript is accepted with almost no revision. Almost without exception, reviewers' comments (to the author) are forwarded to the author. If a revision is indicated, the editor provides guidelines for attending to the reviewers' suggestions and perhaps additional advice about revising the manuscript.

4. The authors decide whether and how to address the reviewers' comments and criticisms and the editor's concerns. The authors return a revised version of the paper to the chief executive editor along with specific information describing how they have answered' the concerns of the reviewers and the editor, usually in a tabular form. The author(s) may also submit a rebuttal if there is a need especially when the author disagrees with certain comments provided by reviewer(s).

5. The CEE sends the revised paper out for re-review. Typically, at least one of the original reviewers will be asked to examine the article.

6. When the reviewers have completed their work, the CEE in consultation with the EiC and EBMs examine their comments and decide whether the paper is ready to be published, needs another round of revisions, or should be rejected.

7. If the decision is to accept, an acceptance letter is sent to all the author(s), the paper is sent to the Press. The article should appear online in approximately three months.

   The Publisher ensures that the paper adheres to the correct style (in-text citations, the reference list, and tables are typical areas of concern, clarity, and grammar). The authors are asked to respond to any minor queries by the Publisher. Following these corrections, page proofs are mailed to the corresponding authors for their final approval. At this point, **only essential changes are accepted**. Finally, the article appears in the pages of the Journal and is posted online.

Pertanika Journal of

# SCIENCE & TECHNOLOGY

**Vol. 28 (2) Apr. 2020**

A scientific journal published by Universiti Putra Malaysia Press

JST
Journal of Science & Technology
AN INTERNATIONAL PEER-REVIEWED JOURNAL

## EDITOR-IN-CHIEF
**Luqman Chuah Abdullah**
*Chemical Engineering*

## CHIEF EXECUTIVE EDITOR
**Abu Bakar Salleh**
*Biotechnology and Biomolecular Science*

## CHAIRMAN
**UNIVERSITY PUBLICATIONS COMMITTEE**
**Zulkifli Idrus**

## EDITORIAL STAFF
**Journal Officers:**
Kanagamalar Silvarajoo, *ScholarOne*
Siti Zuhaila Abd Wahid, *ScholarOne*
Tee Syin-Ying, *ScholarOne*
Ummi Fairuz Hanapi, *ScholarOne*

**Editorial Assistants:**
Siti Juridah Mat Arip
Zulinaardawati Kamarudin

## PRODUCTION STAFF
**Pre-press Officers:**
Nur Farrah Dila Ismail
Wong Lih Jiun

## WEBMASTER
**IT Officer:**
*To be appointed*

## PUBLICITY & PRESS RELEASE
Magdalene Pokar *(ResearchSEA)*

## EDITORIAL OFFICE
**JOURNAL DIVISION**
Office of the Deputy Vice Chancellor (R&I)
1st Floor, IDEA Tower II
UPM-MTDC Technology Centre
Universiti Putra Malaysia
43400 Serdang, Selangor Malaysia.
Gen Enq.: +603 9769 1622 | 1616
E-mail:
executive_editor.pertanika@upm.edu.my
URL: www.journals-jd.upm.edu.my

## PUBLISHER
UPM Press
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor, Malaysia.
Tel: +603 9769 8851
E-mail: penerbit@putra.upm.edu.my
URL: http://penerbit.upm.edu.my

## EDITORIAL BOARD
**2018-2020**

**Adem Kilicman**
*Mathematical Sciences*
Universiti Putra Malaysia, Malaysia.

**Ali A. Moosavi-Movahedi**
*Biophysical Chemistry*
University of Tehran, Tehran, Iran.

**Amu Therwath**
*Oncology, Molecular Biology,*
Université Paris, France.

**Angelina Chin**
*Mathematics, Group Theory and Generalisations, Ring Theory,*
University of Malaya, Malaysia.

**Bassim H. Hameed**
*Chemical Engineering: Reaction Engineering, Environmental Catalysis & Adsorption,*
Universiti Sains Malaysia, Malaysia.

**Biswa Mohan Biswal**
*Medical, Clinical Oncology, Radiotherapy*
Universiti Sains Malaysia, Malaysia.

**Christopher G. Jesudason**
*Mathematical Chemistry, Molecular Dynamics Simulations, Thermodynamics and General Physical Theory,*
University of Malaya, Malaysia.

**Hari M. Srivastava**
*Mathematics and Statistics,*
University of Victoria, Canada.

**Ivan D. Rukhlenko**
*Nonliner Optics, Silicon Photonics, Plasmonics and Nanotechnology*
Monash University, Australia.

**Kaniraj R. Shenbaga**
*Geotechnical Engineering,*
India.

**Kanury Rao**
*Senior Scientist & Head, Immunology Group, International Center for Genetic Engineering and Biotechnology, Immunology, Infectious Disease Biology and System Biology*
International Centre for Genetic Engineering & Biotechnology, New Delhi, India.

**Ki-Hyung Kim**
*Computer and Wireless Sensor Networks*
AJOU University, Korea.

**Kunnawee Kanitpong**
*Transportation Engineering-Road Traffic Safety, Highway Materials and Construction*
Asian Institute of Technology, Thailand.

**Megat Mohd Hamdan Megat Ahmad**
*Mechanical and Manufacturing Engineering*
Universiti Pertahanan Nasional Malaysia, Malaysia.

**Mirnalini Kandiah**
*Public Health Nutrition, Nutritional Epidemiology*
UCSI University, Malaysia.

**Mohamed Othman**
*Communication Technology and Network, Scientific Computing*
Universiti Putra Malaysia, Malaysia

**Mohd. Ali Hassan**
*Bioprocess Engineering, Environmental Biotehnology*
Universiti Putra Malaysia, Malaysia.

**Mohd Sapuan Salit**
*Concurrent Engineering and Composite Materials*
Universiti Putra Malaysia, Malaysia.

**Narongrit Sombatsompop**
*Engineering & Technology: Materials and Polymer Research*
King Mongkut's University of Technology Thonburi (KMUTT), Thailand.

**Prakash C. Sinha**
*Physical Oceanography, Mathematical Modelling, Fluid Mechanics, Numerical Techniques*
Universiti Malaysia Terengganu, Malaysia.

**Rajinder Singh**
*Biotechnology, Biomolecular Sciences, Molecular Markers/ Genetic Mapping*
Malaysia Palm Oil Board, Kajang, Malaysia.

**Renuganth Varatharajoo**
*Engineering, Space System*
Universiti Putra Malaysia, Malaysia.

**Riyanto T. Bambang**
*Electrical Engineering, Control, Intelligent Systems & Robotics*
Bandung Institute of Technology, Indonesia.

**Roslan Abd-Shukor**
*Physics & Materials Physics, Superconducting Materials*
Universiti Kebangsaan Malaysia, Malaysia.

**Sabira Khatun**
*Engineering, Computer Systems & Software Engineering, Applied Mathematics*
Universiti Malaysia Pahang, Malaysia.

**Shiv Dutt Gupta**
*Director, IIHMR, Health Management, Public Health, Epidemiology, Chronic and Non-communicable Diseases*
Indian Institute of Health Management Research, India.

**Suan-Choo Cheah**
*Biotechnology, Plant Molecular Biology*
Asiatic Centre for Genome Technology (ACGT), Kuala Lumpur, Malaysia.

**Wagar Asrar**
*Engineering, Computational Fluid Dynamics, Experimental Aerodynamics*
International Islamic University, Malaysia.

**Wing Keong Ng**
*Aquaculture, Aquatic Animal Nutrition, Aqua Feed Technology*
Universiti Sains Malaysia, Malaysia.

**Yudi Samyudia**
*Chemical Engineering, Advanced Process Engineering*
Curtin University of Technology, Malaysia.

## INTERNATIONAL ADVISORY BOARD
**2018-2021**

**Adarsh Sandhu**
*Editorial Consultant for Nature Nanotechnology and Contributing Writer for Nature Photonics, Physics, Magnetoresistive Semiconducting Magnetic Field Sensors, Nano-Bio-Magnetism, Magnetic Particle Colloids, Point of Care Diagnostics, Medical Physics, Scanning Hall Probe Microscopy, Synthesis and Application of Graphene*
Electronics-Inspired Interdisciplinary Research Institute (EIIRIS), Toyohashi University of Technology, Japan.

**Graham Megson**
*Computer Science*
The University of Westminster, U.K.

**Kuan-Chong Ting**
*Agricultural and Biological Engineering*
University of Illinois at Urbana-Champaign, USA.

**Malin Premaratne**
*Advanced Computing and Simulation*
Monash University, Australia.

**Mohammed Ismail Elnaggar**
*Electrical Enginering*
Ohio State University, USA.

**Peter J. Heggs**
*Chemical Engineering*
University of Leeds, U.K.

**Ravi Prakash**
*Vice Chancellor, JUIT, Mechanical Engineering, Machine Design, Biomedical and Materials Science*
Jaypee University of Information Technology, Indian.

**Said S.E.H. Elnashaie**
*Environmental and Sustainable Engineering*
Penn. State University at Harrisburg, USA.

**Suhash Chandra Dutta Roy**
*Electrical Engineering*
Indian Institute of Technology (IIT) Delhi, India.

**Vijay Arora**
*Quantum and Nano-Engineering Processes*
Wilkes University, USA.

**Yi Li**
*Chemistry, Photochemical Studies, Organic Compounds, Chemical Engineering*
Chinese Academy of Sciences, Beijing, China.

## ABSTRACTING AND INDEXING OF PERTANIKA JOURNALS

Pertanika is over 40 years old; this accumulated knowledge has resulted in the journals being abstracted and indexed in SCOPUS (Elsevier), Clarivate-Emerging Sources Citation Index [ESCI (Web of Science)], EBSCO, DOAJ, Agricola, ASEAN CITATION INDEX [ISC], Microsoft Academic, Google Scholar, National Agricultural Science (NAL) and MyCite.

The publisher of Pertanika will not be responsible for the statements made by the authors in any articles published in the journal. Under no circumstances will the publisher of this publication be liable for any loss or damage caused by your reliance on the advice, opinion or information obtained either explicitly or implied through the contents of this publication.

All rights of reproduction are reserved in respect of all papers, articles, illustrations, related materials, published in Pertanika. Pertanika provides free access to the full text of research articles for anyone, web-wide. It does not charge either its authors or author-institution for refereeing/publishing outgoing articles or user-institution for accessing incoming articles.

No material published in Pertanika may be reproduced or stored on microfilm or in electronic, optical or magnetic form without the written authorization of the Publisher.

**Copyright © 2019 Universiti Putra Malaysia Press. All Rights Reserved.**

**Pertanika Journal of Science & Technology**
**Vol. 28 (2) Apr. 2020**

# Contents

Foreword
*Abu Bakar Salleh* i

**Engineering Sciences**

Remote Sensing of Seagrass and Seabed using Acoustic Technology in Bintan Seawater, Indonesia 421
*Henry Munandar Manik and Dony Apdillah*

Time Frequency Analysis of Peking Gamelan 441
*Sinin Hamdan, Iran Amri Musoddiq, Ahmad Fauzi Musib and Marini Sawawi*

Timbre Spectrum of Gamelan Instruments from Four Malay Gamelan Ensembles 459
*Sinin Hamdan, Ahmad Faudzi Musib, Iran Amri Musoddiq and Marini Sawawi*

Support Vector Machine Classification Method for Predicting Jakarta Bay Bottom Sediment Type Using Multibeam Echosounder Data 477
*Steven Solikin, Henry Munandar Manik, Sri Pujiyati and Susilohadi*

System Identification of Helical Strakes Suppressed Vortex-induced Vibration for Flexible Pipes 493
*Ching Sheng Ooi, Meng Hee Lim, Kee Quen Lee, Hooi Siang Kang and Mohd Salman Leong*

Analysis of pH and Color of Fermented Cocoa (*Theobroma cacao* L) Beans using Response Surface Methodology 509
*Sri Hartuti, Nursigit Bintoro, Joko Nugroho Wahyu Karyadi and Yudi Pranoto*

Experimental (ADV & PIV) and Numerical (CFD) Comparisons of 3D Flow Pattern around Intact and Damaged Bridge Piers 523
*Ehsan Oveici, Omid Tayari and Navid Jalalkamali*

**Mathematical Sciences**

Metaheuristics Approach for Maximum *k* Satisfiability in Restricted Neural Symbolic Integration 545
*Saratha Sathasivam, Mustafa Mamat, Mohd Shareduwan Mohd Kasihmuddin and Mohd. Asyraf Mansor*

Instantaneous Speed Ratio of Traffic Flowing through a Merging Area at Kilometer 31.6 on the Highway from Shah Alam to Kuala Lumpur 565
*Nur Syahirah Husin Basri, Nurul Akmal Mohamed, Muhammad Akram Adnan, Nurul Farihan Mohamed and Nurul Hila Zainuddin*

Scale-3 Haar Wavelets and Quasilinearization based Hybrid Technique for the Solution of Coupled Space-Time Fractional - Burgers' Equation 579
*Geeta Arora, Ratesh Kumar and Harpreet Kaur*

Comparison of Sparse and Robust Regression Techniques in Efficient Model Selection for Moisture Ratio Removal of Seaweed using Solar Drier 609
*Anam Javaid, Mohd. Tahir Ismail and Majid Khan Majahar Ali*

Effects on Parameter Estimates and Goodness of Fit Measures: Comparing Item-Level and Item-Parcel Models in Structural Equation Modeling 627
*Ainur Amira Kamaruddin, Bee Wah Yap and Sayang Mohd Deni*

**Medical and Health Sciences**

The Effect of Deep Breathing Exercises on Menstrual Pain Perception in Adolescents with Primary Dysmenorrhea 649
*Kurniati Devi Purnamasari, Tita Rohita, Dini Nurbaeti Zen and Widya Maya Ningrum*

Effects of Prolonged Confined Isolation on Status of Inflammation, Endothelial Activation and Function: In Preparation for Possible Future Manned Space Expedition to Mars 659
*Thuhairah Rahman, Radzi Ahmad, Suhaila Muid, Tengku Saifudin Tengku Ismail, Ludmila B Buravkova and Hapizah Nawawi*

Virulence Genes Detection among the Antibiotic Resistant *Enterococcus faecalis* Isolated from Bird Industry in Borneo 673
*Sui Sien Leong, Samuel Lihan and Hwa Chuan Chia*

Comparison of Neurotoxic Effects of Ethanol and Endosulfan on Biochemical Changes of Brain Tissues in Javanese Medaka (*Oryzias javanicus*) and Zebrafish (*Danio rerio*) 689
*Nurul Farhana Ramlan, Noraini Abu Bakar, Emmellie Laura Albert, Syaizwan Zahmir Zulkifli, Syahida Ahmad, Mohammad Noor Amal Azmai, Che Azurahanim Che Abdullah and Wan Norhamidah Wan Ibrahim*

Effect of Different Application Techniques on Marginal Adaptation of Class II Cavities Filled with Three Different Bulkfill Composite Filling Material: An *In Vitro* Study using Confocal Microscopy 703
*Aulfat Ahmed Albahari, Mohammed Ahmed Dubais, Ahmed Abdullah Madfa and Waled Abdul Malek Alanesi*

**Earth Sciences**

Comparison of Catches of Skipjack Tuna (*Katsuwonus pelamis* Linnaeus 1758) Purse Seines Inside and Outside of the FADs Areas 717
*Achmar Mallawa*

**Environmental Sciences**

Comparison of Leaf Area Index from Four Plant Species on Vertical Greenery System in Pasir Gudang, Malaysia 735
*Azmiah Abd Ghafar, Ismail Said, Amalina Mohd Fauzi, Mohd Shariman Shai-in and Badrulzaman Jaafar*

**Information, Computer and Communication Technologies**

Congestion Control in Implementing Multi Coding Schemes for Energy Optimisation in Wireless Sensor Networks 749
*Samirah Nasuha Mohd Razali, Kamaruddin Mamat and Nor Shahniza Kamal Bashah*

Pertanika Journal of Science & Technology
Vol. 28 (2) Apr. 2020

# Contents

**Foreword**
*Abu Bakar Salleh* i

**Engineering Sciences**
Remote Sensing of Segrass and Seabed using Acoustic Technology in Bintan Seawater, Indonesia 421
*Henry Munandar Manik and Dony Apdillah*

Time Frequency Analysis of Peking Gamelan 441
*Sinin Hamdan, Iran Amri Musoddiq, Ahmad Fauzi Musib and Marini Sawawi*

Timbre Spectrum of Gamelan Instrument from Four Malay Gamelan Ensembles 459
*Sinin Hamdan, Ahmad Faudzi Musib, Iran Amri Musoddiq and Marini Sawawi*

Support Vector Machine Classification Method for Predicting Jakarta Bay Bottom Sediment Type using Multibeam Echosounder Data 477
*Steven Solikin, Henry Munandar Manik, Sri Pujiyati and Susilohadi*

System Identification of Helical Strakes Supressed Vortex-induced Vibration for Flexible Pipes 493
*Ching Sheng Ooi, Meng Hee Lin, Kee Quen Lee, Hooi Siang Kang and Mohd Salman Leong*

Analysis of pH and Color of Fermented Cocoa (*Theobroma cacao* L) Beans using Response Surface Methodology 509
*Sri Hartuti, Nursigit Bintoro, Joko Nugroho Wahyu Karyadi and Yudi Pranoto*

Experimental (ADV & PIV) and Numerical (CFD) Comparisons of 3D Flow Pattern around Intact and Damaged Bridge Piers 523
*Ehsan Oveici, Omid Tayari and Navid Jalalkamlai*

**Mathematical Sciences**
Metaheuristics Approach for Maximum *k* Satisfiability in Restricted Neural Symbolic Integration 545
*Sarayha Sathasivam, Mustafa Mamat, Mohd Shareduwan Mohd Kasihmuddin and Mohd. Asyraf Mansor*

**Pertanika Editorial Office, Journal Division**
Putra Science Park
1st Floor, IDEA Tower II,
UPM-MTDC Technology Centre
Universiti Putra Malaysia
43400 UPM Serdang
Selangor Darul Ehsan
Malaysia

http://www.pertanika.upm.edu.my
E-mail: executive_editor.pertanika@upm.edu.my
Tel : +603 9769 1622/1616

PENERBIT UPM UNIVERSITI PUTRA MALAYSIA PRESS

http://penerbit.upm.edu.my
E-mail : penerbit@upm.edu.my
Tel : +603 9769 8851

ISSN 0128-7680
04 >
9 770128 768083

Pertanika J. Sci. & Technol. 28 (2): 649 - 657 (2020)

PERTANIKA JOURNALS

SCIENCE & TECHNOLOGY

Journal homepage: http://www.pertanika.upm.edu.my/

# The Effect of Deep Breathing Exercises on Menstrual Pain Perception in Adolescents with Primary Dysmenorrhea

**Kurniati Devi Purnamasari*, Tita Rohita, Dini Nurbaeti Zen and Widya Maya Ningrum**

*Faculty of Health Sciences, Universitas Galuh, 46274, Ciamis, West Java Indonesia*

## ABSTRACT

Cyclic menstrual pain, one of the most common gynecologic complaints, is a crucial issue. Unfortunately, only limited studies have focused on how to care for the menstrual pain in adolescents. This paper reports on the effective treatment for menstrual pain to mitigate or preclude menstrual pain perception, which is non-invasive to patients, in adolescents aged from 13 to 15 years. The treatment was conducted by positioning the patient in a supine position. Each patient was guided to take 30 minutes of breathing relaxation techniques. The use of Visual Analogue Scale (VAS) was intended to measure the subjects' painfulness level. This study included 47 respondents whose menstrual pain was monitored in 30 minutes after the intervention. The findings of this study indicate a significant reduction of patients' pain. The study suggests that further studies should focus on complementary treatments for overcoming menstrual pain.

*Keywords:* Adolescents, deep breathing, pain perception, primary dysmenorrhea

## INTRODUCTION

Menstrual pain is one of the most common gynecologic complaints defined as a cyclic pain that occurs in association with menstruation (Bektaş et al., 2010; Tu et al., 2010). The menstrual disturbances as health problems among young girls affect not only reproductive, but also physical health and quality of life (Rad et al., 2018). Around 1.2 billion people, or 1 in 6 of the world's population, are adolescents aged from 10 to 19 (World Health Organization, 2014). Estimates of the prevalence of females experiencing dysmenorrhea vary widely from 16.8% to 81%. It can be severe enough to interfere

ARTICLE INFO

*Article history:*
Received: 28 April 2019
Accepted: 27 November 2019
Published: 15 April 2020

*E-mail addresses*:
kurniatidevip@gmail.com (Kurniati Devi Purnamasari)
titarohita@gmail.com (Tita Rohita)
dininurbaeti@gmail.com (Dini Nurbaeti Zen)
widyamayaningrum@gmail.com (Widya Maya Ningrum)
* Corresponding author

ISSN: 0128-7680
e-ISSN: 2231-8526

© Universiti Putra Malaysia Press

with daily activities as well as causing absence from school and work (Yonglitthipagon et al., 2017). Studies conducted in Asia and New Zealand showed that around 42% to 73% of women experienced moderate to severe dysmenorrhoea (Chen et al., 2015).

Pharmacological efforts can be performed by administering analgesic drugs as pain relievers (Smeltzer et al., 2008). Pain management experienced by individuals can be through pharmacological intervention, collaborated with physicians or other primary care providers to the patient. The interaction that occurs in this therapy has a mutually synergistic effect between the two that can be mutually augmented by the therapeutic work without adding the ill effects of pain (Widyawati et al., 2016). This is supported by research that proves that there are side effects when patients take them for a long time. It is therefore against this background that Deep Breathing Exercises (DBE) are suggested as an alternative source of treatment for primary dysmenorrhea (Sosorburam et al., 2019).

Relaxation techniques provide us with excellent methods that can be practiced with awareness anytime at our discretion (Romas & Sharma, 2017). One specific respiratory maneuver in breathing is both popularly and scientifically linked to Deep Breathing Relaxation (Vlemincx et al., 2016). Mind-body science has now reached a stage where it should be accepted (Rakel, 2017). A meta-analysis of 47 actively-controlled trials with 3,515 participants shows that participation in mindfulness instruction programming is effective for improving self-reported symptoms of anxiety, depression, and pain (Sibinga, 2016). The prevalence of dysmenorrhea in adolescents in Indonesia is reported to be 55% (Astutik et al., 2015). In a relaxed state, human body will stop the production of adrenaline hormones and all the hormones that are needed during stress (Bennett, 2017; Bojorquez et al., 2017; Boyanova, 2017). When reducing stress, human body reduces the production of cortisol hormones (Navas et al., 2012), because of the need for relaxation to provide an opportunity for the body to produce hormones, which are important to get menstruation that avoids pain (Droit-Volet et al., 2015).

Spontaneous breathing in healthy persons is characterized by substantial variability (Jafari et al., 2016; Mailhot-Larouche et al., 2017; Romas & Sharma, 2017; Vlemincx et al., 2010). First, taking a deep breath can reduce hypoxia and hypercapnia (Vlemincx et al., 2010). The patient is verbally coached through a modified slow vital capacity maneuver and brought to a reproducible deep inspiration breath-hold level.

Lower rates (84.2%) have been reported for Asia, with 84.2% for Southeast Asia, 68.7% for Eastern Asia, 74.8% for the Middle East, and 54.0% for Southern Asia. Relaxation techniques provide us with excellent methods that can be practiced with awareness anytime at our discretion. Research on alternative treatments in the process of pain management to intensity of pain in menstrual pain will be very helpful in identifying and providing care by midwives (Moyer et al., 2011). The results of the study are expected to be basic data as a cut-off point for midwives in handling menstrual pain in patients on a non-pharmacological basis, thereby reducing unnecessary interventions in midwifery services.

## MATERIALS AND METHODS

### Data Collection

The location of this study was Junior High School in Ciamis district. The duration of the research data collection was 1 month. This research began by making and modifying movements of deep breath relaxation exercises. Before taking the data, the researcher identified respondents in accordance with the criteria, then the respondents were given informed consent if the respondents agreed to the data collection by questionnaire. Informed consent was obtained from all volunteers and the study was approved by the local ethics committee. The respondents performed deep breathing exercises to eliminate menstrual pain. Exclusion criteria were as follows: any cardiac or respiratory diseases, a history of migraines or other (chronic) pain syndromes, or the use of pain medication or psychotropic drugs.

### Procedure

All participants completed the Beck Depression Inventory (BDI) and the "Trait anxiety" part of the State and Trait Anxiety Inventory (STAI-X2). All subjects were instructed not to practice at home and were furthermore not allowed to participate in any breathing exercises or meditation programs during the washout period. After inclusion, all subjects received written handouts explaining the course of the study and an instruction manual for Deep Breathing Exercises (DBE), according to the recommendations from breathing literature (Scheibenbogen & Prieler, 2002). The use of positions of the client and movement lines mentioned for the basic position is in accordance with the operational standard shown in Figure 1.

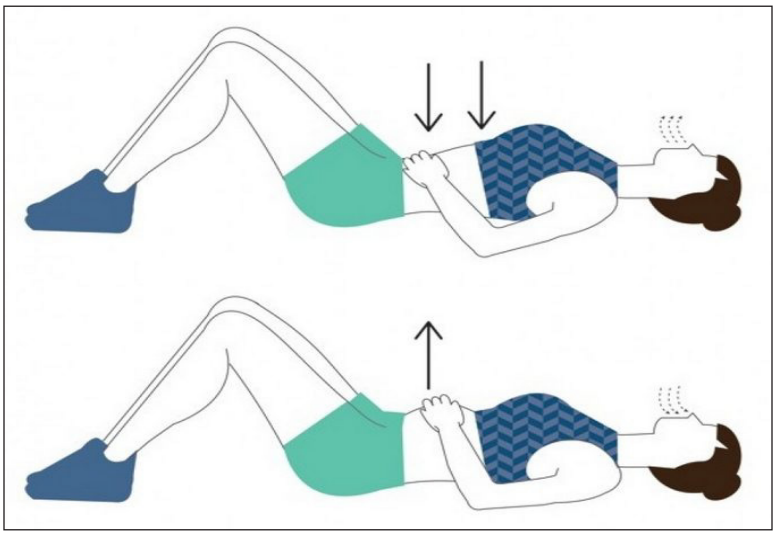

*Figure 1.* The reference position of breath relaxation technique

## Study Design and Samples

The research design used pre-experiment, in which the factors considered were Deep Breathing Exercises (DBE) and pain perception in pre-test and post-test. The results of intervention were analyzed using Wilcoxon ranks test. The number of samples was 47 respondents of adolescents with menstrual pain by choosing subjects whose representation was determined based on the inclusion criteria. Data retrieval was done after the respondents had agreed with breath relaxation techniques.

Data retrieval began when respondents experienced menstrual pain with a 5-10 VAS pain scale, experiencing menstrual pain in the first 24 -48 hours of menstruation, then the intervention was carried out for 30 minutes. A baseline assessment before the intervention was conducted using a questionnaire to collect data on the demographics of the participants and their pain levels. The questionnaire included questions on pain measured using a tenth-point scale. This instruction was provided by a trainer who was certified.

The results of the respondent pain scale questionnaire were collected and then taken to be analyzed by researchers with the assistance from enumerators. Furthermore, the data is presented in the form of an average value distribution of the results of data retrieval. The data that appears is created by the trend results from the measurement results. The research flow chart is shown in Figure 2.

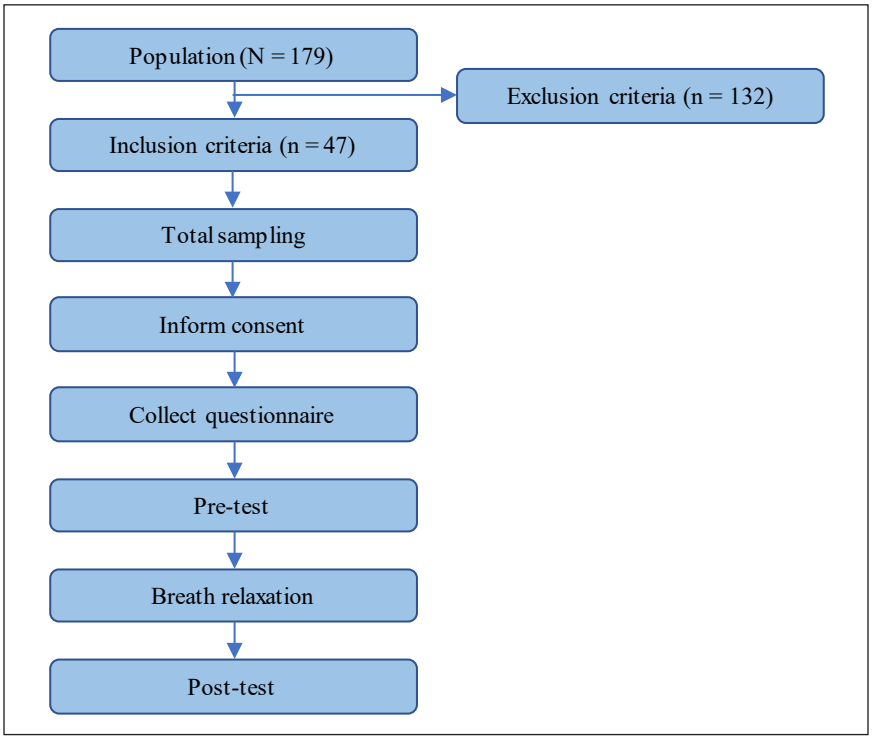


*Figure 2.* Flowchart measurement

## RESULT AND DISCUSSION

### Demographic Data of Respondents

This study shows that the average age of respondents were 13.97 ± 2.71 years while the age range of respondents was 13–15 years. The average respondents' grade was 7 ± 14.69 with a range of 7th- 8th. The average pain scale of the respondents' Visual Analogue Scale (VAS) was (6.33 ± 1.63) with a range of 5-10 pain scales. Demographic data of respondents is shown in Table 1.

Table 1
*Demographic data of respondents*

| Characteristics | | Number of Respondents (N) | Percentage (%) | Mean |
|---|---|---|---|---|
| Age | 13 y.o | 22 | 46.80 | |
| | 14 y.o | 4 | 8.51 | 13.97 |
| | 15 y.o | 21 | 44.69 | |
| Grade | 7th | 24 | 51.06 | 7 |
| | 8th | 23 | 49.94 | |
| | Low | 0 | 0 | 0 |
| VAS scale | Mid | 32 | 68.08 | 7.02 |
| | High | 15 | 31.02 | |

### Result of Pre and Post Intervention

It indicated that the median post-test ranks, *Mdn* = 1.48, was statistically and significantly higher that the median of pre-test ranks, $p < .000$. Based on Table 2 above, it can be seen that the average frequency of menstrual pain in forty-seven respondents enrolled in this study was decreased in terms of pain that was equal to 9–4 after being given breath relaxation.

Table 2
*Distribution and average of menstrual pain*

| Variable | Pre | | Post | | *p value* |
|---|---|---|---|---|---|
| | median | Max-min | median | Max-min | |
| Menstrual Pain | 6.39 | 10-5 | 1.48 | 6-2 | 0.000 |
| Frequency of the pain | 4.45 | 7-2 | 1.02 | 4-1 | |

**Pretest.** The results of this study indicate the frequency of menstrual pain in adolescents that had a tendency to vary between one and the other. The average maximum frequency that occurred in menstrual pain was on a scale of ten and the average minimum pain is on a scale of six.

**Posttest.** The average maximum frequency that occurred in menstrual pain after intervention is on a scale of 6 and the minimum pain average is on a scale of 2. VAS scale of menstrual

pain had a tendency to be directly proportional to pretest of breath relaxation technique, moderate to heavy scale with a scale of moderate as many as 30 people (63.83%), and scale of heavy as many as 17 people (36.17%), with an average pain scale of 7.02. VAS scale for post-test proportion of breath relaxation technique was moderate to mild scale with a scale of moderate as many as 6 people (12.77%), scale of mild as many as 31 people (87.23%), with an average pain scale of 3.04. The comparison trend of VAS scale trends in pretest and post-test breathing exercises is shown in Figure 3.

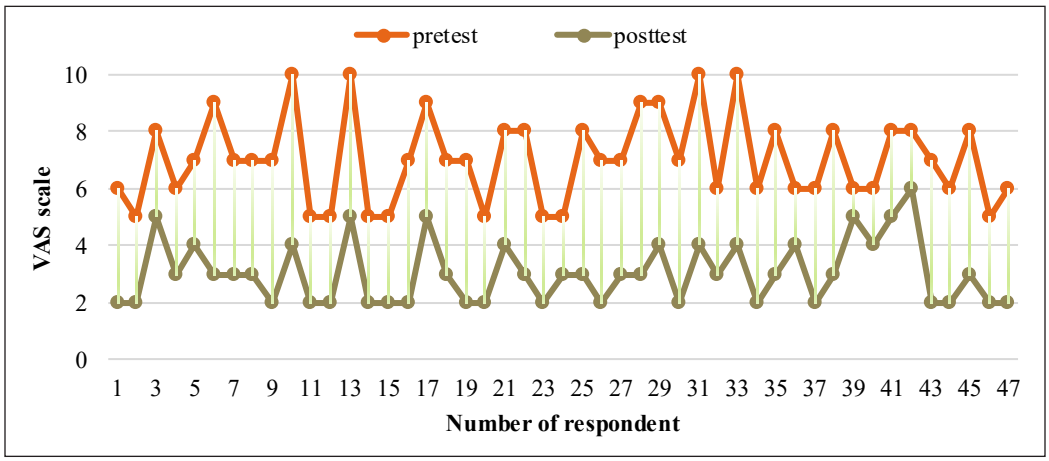


*Figure 3.* Comparison of VAS scale trends in pretest and posttest deep breathing exercises

The decrease in the intensity of menstrual pain occurs because the students practice breathing relaxation technique within 30 minutes, done when students feel menstrual pain. Previous study shows that the technique of deep breath relaxation is a form of nursing care in which case the health worker teaches the client how to do a deep breath, slow breath (hold maximum inspiration) and how to breathe slowly, in addition to reducing the intensity of pain (Bojorquez et al., 2017). Deep breathing relaxation techniques can also improve lung ventilation and increase blood oxygenation (Smeltzer et al., 2008). These findings corroborate previous studies showing significant decreases in acute negative effect in response to a breath relaxation session (Lin et al., 2014; Lindenmann et al., 2012) and suggest that breath relaxation can buffer against negative effect, perhaps by decreasing rumination and changing affective appraisals and coping with stress (Thelwall, 2017).

Breathing exercises can boost the relaxation and allow participants to focus in mind-body to change their thought on their pain. Based on the results of the study, there was a decrease in the intensity of menstrual pain in female students when practicing breathing relaxation techniques in approximately 30 minutes. This study still used questionnaire instruments in determining the results of research, so enabling the occurrence of bias. Further research should be developed with pain measurements using biomarkers to improve the objectivity of the study results.

## CONCLUSION

The decrease of menstrual pain in adolescents with primary dysmenorrhea using breath relaxation technique shows a more quantitative value when compared to pre-test and post-test. The results of this study indicate that the prevalence of menstrual pain in active adolescents with primary dysmenorrhea decreases from 76% to 22% of menstrual pain. There was a decrease in menstrual pain scores in 46.6% of respondents with moderate to severe criteria for pain experienced on the first day. Breathing relaxation interventions have a tendency to be directly proportional to the reduction in the scale of VAS pain experienced by patients.

We will remind you in this paper on how observational studies regarding the perception of menstrual pain in respondents who are prone to various structural biases and limitations are. These biases lead us to be extremely cautious regarding the implementation of the results of this study in clinical practices, and to question the reliability of this study in terms of subjectivity. We recommend the use of another group in similar problem in future studies to get more accurate results.

## ACKNOWLEDGEMENT

The authors gratefully acknowledge Galuh University for funding this publication and also express their appreciation to the Faculty of Health Sciences, Galuh University for sponsoring the publication of this research. No grants or any other forms of support were given for this study.

## REFERENCES

Astutik, H., Santoso, A. H., & Yuliwar, R. (2015, November 16-17). The effect of noni fruit juice (*Morinda citrifolia*) in decreasing menstrual pain (Dysmenorrhea)-phase II experiment. In *The Proceeding of 6th International Nursing Conference: Emphasize the Art of Nursing on Research, Education into Clinical and Community Practice* (pp. 111-123). Surabaya, Indonesia.

Bektaş, H., Bilsel, Y., Sarı, Y. S., Ersöz, F., Koç, O., Deniz, M., . . . & Huq, G. E. (2010). Abdominal wall endometrioma; a 10-year experience and brief review of the literature. *Journal of Surgical Research, 164*(1), e77-e81.

Bennett, J. (2017). Beneficial redundancy—Did we forget the benefit of auscultation of breath sounds? *Journal of Oral and Maxillofacial Surgery, 75*(5), 886-887.

Bojorquez, J. Z., Bricq, S., Acquitter, C., Brunotte, F., Walker, P. M., & Lalande, A. (2017). What are normal relaxation times of tissues at 3 T? *Magnetic Resonance Imaging, 35*, 69-80.

Boyanova, L. (2017). Stress hormone epinephrine (adrenaline) and norepinephrine (noradrenaline) effects on the anaerobic bacteria. *Anaerobe, 44*, 13-19.

Chen, H. M., Wang, H. H., Chiu, M. H., & Hu, H. M. (2015). Effects of acupressure on menstrual distress and low back pain in dysmenorrheic young adult women: An experimental study. *Pain Management Nursing, 16*(3), 188-197.

Droit-Volet, S., Fanget, M., & Dambrun, M. (2015). Mindfulness meditation and relaxation training increases time sensitivity. *Consciousness and Cognition, 31*, 86-97.

Jafari, H., Van de Broek, K., Plaghki, L., Vlaeyen, J. W., Van den Bergh, O., & Van Diest, I. (2016). Respiratory hypoalgesia? Breath-holding, but not respiratory phase modulates nociceptive flexion reflex and pain intensity. *International Journal of Psychophysiology, 101*, 50-58.

Lin, I., Tai, L., & Fan, S. (2014). Breathing at a rate of 5.5 breaths per minute with equal inhalation-to-exhalation ratio increases heart rate variability. *International Journal of Psychophysiology, 91*(3), 206-211.

Lindenmann, J., Matzi, V., Neuboeck, N., Maier, A., Stark, G., & Smolle-Juettner, F. M. (2012). When swallowing takes your breath. *Surgery, 151*(4), 628-629.

Mailhot-Larouche, S., Lortie, K., Marsolais, D., Flamand, N., & Bossé, Y. (2017). An in vitro study examining the duration between deep inspirations on the rate of renarrowing. *Respiratory Physiology and Neurobiology, 243*, 13-19.

Moyer, C. A., Seefeldt, L., Mann, E. S., & Jackley, L. M. (2011). Does massage therapy reduce cortisol? A comprehensive quantitative review. *Journal of Bodywork and Movement Therapies, 15*(1), 3-14.

Navas, M., Jiménez, A., & Asuero, A. (2012). Human biomarkers in breath by photoacoustic spectroscopy. *Clinica Chimica Acta, 413*(15), 1171-1178.

Rad, H. A., Basirat, Z., Bakouei, F., Moghadamnia, A. A., Khafri, S., Farhadi Kotenaei, Z., . . . & Kazemi, S. (2018). Effect of ginger and novafen on menstrual pain: A cross-over trial. *Taiwanese Journal of Obstetrics and Gynecology, 57*(6), 806-809.

Rakel, D. (2017). *Integrative medicine e-book*. Philadelphia, USA: Elsevier Health Sciences.

Romas, J. A., & Sharma, M. (2017). *Practical stress management: A comprehensive workbook*. London, UK: Academic Press.

Scheibenbogen, O., & Prieler J. (2002). *Biofeedback aided psychotherapy (BAP)*. New York, NY: Kluwer Academic/ Plenum Publishers.

Sibinga, E. M. (2016). "Just this breath…" How mindfulness meditation can shift everything, including neural connectivity. *EBioMedicine, 10*, 21-22.

Smeltzer, S., Bare, B., Hinkle, J., Cheever, K., Townsend, M. C., & Gould, B. (2008). *Brunner and Suddarth's textbook of medical surgical nursing* (12th Ed.). Philadelphia, USA: Lippincott Williams and Wilkins.

Sosorburam, D., Wu, Z. G., Zhang, S. C., Hu, P., Zhang, H. Y., Jiang, T., . . . & He, X. (2019). Therapeutic effects of traditional Chinese herbal prescriptions for primary dysmenorrhea. *Chinese Herbal Medicines, 11*(1), 10-19.

Thelwall, M. (2017). TensiStrength: Stress and relaxation magnitude detection for social media texts. *Information Processing and Management, 53*(1), 106-121.

Tu, C. H., Niddam, D. M., Chao, H. T., Chen, L. F., Chen, Y. S., Wu, Y. T., . . . & Hsieh, J. C. (2010). Brain morphological changes associated with cyclic menstrual pain. *Pain, 150*(3), 462-468.

Vlemincx, E., Taelman, J., Van Diest, I., & Van den Bergh, O. (2010). Take a deep breath: The relief effect of spontaneous and instructed sighs. *Physiology and Behavior, 101*(1), 67-73.

Vlemincx, E., Van Diest, I., & Van den Bergh, O. (2016). A sigh of relief or a sigh to relieve: The psychological and physiological relief effect of deep breaths. *Physiology and Behavior, 165*, 127-135.

Widyawati, M. N., Hadisaputro, S., Anies, A., & Soejoenoes, A. (2016). Effect of massage and aromatherapy on stress and prolactin level among primiparous puerperal mothers in Semarang, Central Java, Indonesia. *Belitung Nursing Journal, 2*(4), 48-57.

World Health Organization. (2014). Adolescents: health risks and solutions. *Fact sheet, 345*. Retrieved February 20, 2019, from https://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions

Yonglitthipagon, P., Muansiangsai, S., Wongkhumngern, W., Donpunha, W., Chanavirut, R., Siritaratiwat, W., . . . & Janyacharoen, T. (2017). Effect of yoga on the menstrual pain, physical fitness, and quality of life of young women with primary dysmenorrhea. *Journal of Bodywork and Movement Therapies, 21*(4), 840-846.