

# BJMS

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## Main session abstracts

### Session 1: Culture and Health Adaptation

## Unveiling the Importance of Social Support in Maternal Health among the Kota Kinabalu Urban Poor Amidst COVID-19

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**Abstract:** Maternal health during the COVID-19 pandemic has been profoundly affected, emphasizing the critical role of a robust social support system in mitigating these challenges. The pandemic has brought financial hardships to many families, including pregnant mothers, making it difficult for them to access healthcare services in hospitals or clinics due to the associated financial burden. Cultural preferences also influence the choice of seeking support from traditional elites such as the traditional midwife also known as *bidan kampung*. These individuals are respected figures in many communities, possessing cultural knowledge and practices related to pregnancy and childbirth. Pregnant mothers often seek their guidance, advice, and support based on traditional beliefs and practices that align with their cultural background. Additionally, difficulties related to accessing healthcare services, such as lack of proper documentation, further drive the preference for *bidan kampung*. These individuals are well-known and trusted within their communities, offering more accessible services, especially for pregnant mothers who face barriers in accessing formal healthcare facilities. Their presence provides a familiar and comfortable environment for pregnant mothers to seek necessary care and support during the pandemic. This paper is based on research about the vulnerable urban poor community living around the metropolitan of Kota Kinabalu. Both mothers and the *bidan kampung* were interviewed and focus group discussions were carried out among the mothers. While hospitals and clinics continue to play a crucial role in providing comprehensive maternal health services, the preference for seeking support from influential individuals and *bidan kampung* underscores the importance of a multifaceted social support system. Recognizing and incorporating these informal sources of support into the healthcare system can help bridge gaps in access and meet the specific needs of pregnant mothers during COVID-19.

**Keywords:** social support system, pregnant mothers, urban poor community, *bidan kampung*, collaborations

## Session 1: Culture and Health Adaptation

# Nature's Gift? Plant-Based Alternatives to Breastmilk During COVID-19 in Sabah, Malaysia

Trixie Marjorie Tangit

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**Abstract:** This study explores the adaptive strategy of urban poor mothers to replace breastmilk or infant formula with suitable alternatives during COVID-19. The pandemic had impacted peoples in all areas of life, especially breastfeeding urban poor mothers who were unable to breastfeed, express body milk (EBM) or afford infant formula. While plant-based alternatives such as diluted rice crema is not new among the ethnic communities in Sabah, Malaysia, some mothers among the urban poor in the city of Kota Kinabalu resorted to using sweetened condensed milk also known locally as “susu junjung” (“junjung” means to carry something on one’s head in the Malay language; an ode to a popular tinned milk brand depicting a milk maid carrying a bucket on her head). Cheap and full of sugar, this kind of tinned milk however neither contains an adequate amount of milk (less than 20% per serve) to be of a healthy replacement for human milk nor does it provide the necessary antibodies to the growing child. As these mothers do not or cannot breastfeed exclusively, the challenge therein is thus financial rather than cultural or medical. The researcher aims to provide a keen understanding on alternative food replacements by breastfeeding mothers during COVID-19 that are plant-derived to offer deeper insight into the relationship between the environment and health of very young children.

**Keywords:** breastmilk, urban poor mother, plant-based alternative, health, environment

**Session 1: Culture and Health Adaptation**

## **Tamu and Health**

**Jurry Foo\*, Rosdiana Yandre, Marion Anak Ricky**

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**Abstract:** The term "Tamu" refers to a distinctive name for a local marketplace situated in the state of Sabah. Tamu is home to a variety of cultural items and treasures that can be used to explain daily life. This research aims to examine the medical culture of the locals of Sabah, specifically their preference for obtaining plant-based medication from Tamu as instead of contemporary clinics. The issue of discussion refers to the scenario of dependence of people on Tamu as a primary means of getting medication, as well as the various factors that contribute to this dependency. The research was carried out in a specific set of Tamu markets located on the West Coast of Sabah. The data collection methods employed included interviews, surveys, and literature review in order to gather relevant information. The study's findings indicate that the Tamu continues to serve as a significant hub for accessing plant-based medical resources. The primary determinant for the community's continued reliance on the Tamu, instead of going to the clinic, is its element of confidence in natural resources.

**Keywords:** tamu, medical culture, local, Sabah, daily life

## Zoonotic Malaria: How It Occurs and Why It Matters

Richard Cullenton

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**Abstract:** The malaria parasite has a history of jumping between hosts. Three common “human” malaria parasites, *Plasmodium falciparum*, *Plasmodium vivax* and *Plasmodium malariae* all became parasitic on humans following a host-switch from non-human primates. Zoonotic malaria continues to pose a problem for human health worldwide, with several large outbreaks of malaria recently reported amongst humans caused by parasites previously thought to be restricted to non-human primates. I will discuss the history of a malaria as a zoonotic infection, and discuss modern zoonotic malaria caused by *Plasmodium knowlesi* in South-East Asia and by *Plasmodium simium* in Brazil.

**Keywords:** malaria, zoonosis, genetics, epidemiology, *Plasmodium*

**Session 2: Eco-Epidemiology of Zoonotic Malaria**

## **Non-invasive Methods for the Study of the Diseases of Monkeys in Nature**

**Michael Alan Huffman**

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**Abstract:** Conservation medicine is an emerging, interdisciplinary field that investigates the relationship between human and animal health and the environmental conditions affecting the emergence of infectious diseases. In collaboration with veterinarians, virologists, parasitologists and other experts in the bio-medical sciences, primatologists have begun to investigate the role of diseases in primates and as a tool for the conservation of endangered wildlife populations. A key role of primatologist in this multidisciplinary research is the collection of behavioral and ecological data necessary to elucidate the impact of disease on a group and to collect the relevant samples (urine, feces, hair, postmortem tissues) needed for laboratory identification and quantification of the disease and host species. Many advances in the ability to identify parasite and viral infections from non-invasively collected samples have strengthened our ability to determine and monitor disease affecting wild primate populations. Such diseases as malaria, SIV (the precursor to HIV), anthrax and Ebola, all potentially life-threatening diseases to humans and animals are now readily detectable from feces and urine. Primatologists also play a key role in long-term health monitoring of populations. This is important for understanding seasonal and individual specific processes of disease transmission and for the early detection of emergent diseases in a population that, if unchecked can propose a serious health risk to both local human and animal safety. Health monitoring is not labor intensive and can easily be incorporated into general observational protocol. Given the non-invasive nature of sample collection, it does not compromise with a policy of limited contact and proximity to study subject. This talk will introduce basic collection techniques and describe some recent findings from primates in the wild, with special reference to work conducted by the author in Tanzania, Uganda, Sri Lanka and Vietnam.

**Keywords:** non-invasive sampling, parasite infections, fecal & urological analyses, behavioral ecology

## Session 2: Eco-Epidemiology of Zoonotic Malaria

# Rosette Formation of *Plasmodium knowlesi*-Infected Red Blood Cells

Stephen C. Ezenwanne<sup>1,2</sup>, Huai Chuang<sup>2</sup>, Yuko Katakai<sup>3</sup>, Satoru Kawai<sup>4</sup>, Bruce Russell<sup>2,5</sup>, Miako Sakaguchi<sup>6</sup>, Osamu Kaneko<sup>2,\*</sup>

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**Abstract:** Cytoadherence of *Plasmodium falciparum*-infected red blood cells (iRBCs) is a hallmark of malaria pathogenesis which has been implicated in the development of severe malaria during human infections. The binding of iRBCs has two forms; one to vascular endothelial cells and the other to uninfected RBCs, which is called "rosetting". Rosetting is a pathognomonic feature of severe falciparum malaria infection, causing occlusion in the microvasculature in the organs, including the brain. Rosetting is seen in the infection of the other *Plasmodium* species. It is suggested to reduce iRBC clearance by the spleen and as a mode of physical drug resistance via shielding of iRBCs to prevent the entry of antimalarials into iRBCs. In *P. falciparum*, parasite-derived ligands produced and transported to the surface of the iRBCs mediate rosetting, but the ligands of other *Plasmodium* species are still unclear. Recently, Lee et al. (2022) showed that the zoonotic malaria parasite *Plasmodium knowlesi* is capable of forming steady rosettes *in vitro* only in the presence of serum (Type II rosetting). In this study, we show that *P. knowlesi* can form steady rosettes *in vitro* in the absence of antibodies or serum factors (Type I). Using a *P. knowlesi* cloned line, we show that this rosette-forming phenotype can be enriched by a Ficoll density gradient and is reversed after a month without enrichment, suggesting an epigenetic basis. Finally, we developed an imaging flow cytometric method to quantitate rosetting rates, hence providing higher statistical precision. Future plans involve the determination of the exact ligand(s) responsible for rosetting in *P. knowlesi* via transcriptomics. Together, these findings would further advance the understanding of the possible roles of rosettes in malaria biology and disease severity.

**Keywords:** *Plasmodium knowlesi*, malaria, zoonosis, erythrocyte, rosetting

## Session 2: Eco-Epidemiology of Zoonotic Malaria

# The Effectiveness of Epidemiological Studies of Mosquito Vectors for the Understanding of Zoonotic Malaria

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**Abstract:** Natural human infection with non-human primate malaria parasites such as *Plasmodium knowlesi*, *P. cynomolgi*, and others, has been on the rise in many Southeast Asian countries, particularly in Malaysia, where it is responsible for most malaria cases. This trend has been attributed to the use of molecular diagnostics, land-use change, deforestation, population growth, urbanization, climate change, international travel, and other factors increasing human-monkey or mosquito contact. Current epidemiologic studies have mainly analyzed humans and reported a variety of results, but few have also analyzed vector mosquitoes and have not been able to identify the site of infection and transmission. Therefore, we examined whether the analysis of non-human primate malaria parasites infecting vector mosquitoes would complement the results obtained in humans and provide new findings. We conducted a molecular epidemiological study of malaria parasite vector mosquitoes in seven provinces in southern Vietnam. The vectors collected in the study area were fifteen species of anopheline mosquitoes. *Anopheles dirus* was the predominant vector in these vector mosquitoes. Analyzing the malaria parasites infecting the vector mosquitoes revealed human and non-human primate malaria species. The malaria parasite infections were monospecific or mixed infections of two or multiple species. In cases of mixed infections, mixed infections with human and non-human primate malaria species were also observed. The results of a comprehensive analysis of the detected malaria parasites in combination with the malaria parasites detected in human samples and the behavioral patterns of the inhabitants showed that the genetic characteristics of the malaria parasites in the mosquitoes collected in the forest and the infected inhabitants were related. In addition, the behavioral patterns of residents active in the forest were found to be associated with the infectious units in the parasite-carrying mosquitoes. This study suggests that mosquito analysis is essential for understanding zoonotic malaria.

**Keywords:** malaria, mosquito, epidemiology, zoonotic malaria

## Session 2: Eco-Epidemiology of Zoonotic Malaria

# Drone Technology for Malaria Control: Locating and Managing Mosquito Breeding Sites

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**Abstract:** This study aims to effectively manage mosquito populations and reduce the spread of mosquito-borne diseases. The use of drone technology allows accurate identification of mosquito breeding sites and targeted application of insecticides to minimize dosage. Drones are used to detect, map and control mosquito breeding sites. Advanced techniques such as Normalized Difference Water Index (NDWI), high-resolution aerial imagery and AI computer vision algorithms are used to identify these sites. Promising early results include improved mapping of water surfaces and accurate detection of mosquito larvae with minimal training data. The study addresses the challenges faced in areas where malaria is prevalent, but resources are limited, resulting in uncontrolled mosquito breeding in small bodies of water. The research aims to develop effective interventions to identify and manage these breeding sites, complementing the World Health Organization's Integrated Vector Management (IVM) recommendations. The ultimate goal is to integrate insecticide applicators into drones for targeted control of both larval and adult mosquitoes. This integrated approach would allow a single operator to monitor and manage mosquito breeding sites over large areas on a weekly basis, improving the management of mosquito-borne disease outbreaks. Sustainability is a critical issue for such activities. While advanced technical expertise is required initially, day-to-day operations become more straightforward. Long-term viability depends on working with local communities, providing maintenance support, minimizing labor and energy consumption, and addressing technological uncertainties. In addition, using the citizen science approach engages young people in the beneficiary communities. Creating meaningful employment opportunities for young people in malaria-endemic regions is also essential. In conclusion, this study highlights the potential of drone technology to identify and manage mosquito habitats for malaria control. By using aerial imagery, AI computer vision, and targeted insecticide application, it offers a promising solution to combat vector-borne diseases and reduce the global burden of malaria.

**Keywords:** mosquito populations, vector-borne diseases, drone technology, mosquito breeding sites, malaria control

## Session 2: Eco-Epidemiology of Zoonotic Malaria

# Urban Climate, Vector Mosquito and Dengue

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**Abstract:** Changes in urban climate patterns due to global climate change may increase the risk of mosquito-borne diseases. This is because precipitation may expand the habitats and breeding grounds needed by vector mosquitoes such as *Aedes aegypti* and *Aedes albopictus*. I will share information on my two case studies that investigated the impact of urban climate on the spatial distribution and temporal variation of vector-borne mosquitoes and dengue cases in Bandung, Indonesia, and Metro Manila, the Philippines. We found significant correlations between local climatic parameters such as temperature, precipitation, and humidity, vector mosquito abundance, and temporal variation in dengue incidence. Accurate dengue prediction through environmental epidemiology modeling relies on data on both vector mosquito and meteorological parameters, and machine learning proved to be a powerful tool when large data sets such as satellite image data were available. We also found that the spatial distribution and temporal variation of dengue incidence within city scale are determined not only by local climatic factors, but also by synergistic effects with urban landscape factors such as land use classification.

**Keywords:** Aedes mosquitoes, habitat, landscape, satellite image, machine learning

## Session 3: SENSOR Project

# SENSOR Project: Socio-Ecological Dynamics of Emerging Zoonotic and Vector-Borne Diseases in Changing Landscapes

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**Abstract:** Landscape changes disrupt infectious disease dynamics, requiring new approaches to characterise risks and prevent outbreaks. Focusing on emerging zoonotic and vector-borne diseases in Sabah, Malaysia, the SENSOR project aims to design and evaluate enhanced surveillance systems linking health and environmental data to detect and prevent pathogen spillover and transmission. Within this session, we will provide an overview of the research which has led to this project, including the epidemiological and ecological studies conducted on the emergence of zoonotic malaria in Malaysia by the Universiti Malaysia Sabah, Ministry of Health Malaysia, University of Malaya and London School of Hygiene and Tropical Medicine. We will discuss the implications of zoonotic malaria in Malaysia and the region as well as potential Building on this work, we will present future research activities aiming to identify how land management can reduce disease risks and how control programmes can integrate new sources of environmental data to improve disease surveillance.

**Keywords:** zoonotic malaria, emerging diseases, environmental change, surveillance, land use

**Session 5: Land-Use Change Drives Zoonotic Disease Emergence**

## **Land-Use Change Drives Disease Emergence**

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**Abstract:** Land-use change is a significant driver of emerging infectious diseases. Through the Infectious Disease Emergence and Economics of Altered Landscapes Project, we elucidated the benefits of keeping forests intact to regulate diseases and estimate the economic cost of disease emergence that are avoided by reducing deforestation.

**Keywords:** land-use, emerging, infectious diseases, economic

## Zoonotic Disease Surveillance in Malaysia

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**Abstract:** As part of Conservation Medicine's zoonotic disease surveillance efforts in Malaysia, we have sampled and tested humans, wildlife, and domestic animals at high-risk interfaces in Peninsular Malaysia and Sabah. Our findings highlight the importance of continued surveillance efforts and capacity building to help manage the risk of zoonotic disease emergence.

**Keywords:** zoonotic disease, surveillance, Malaysia

**Session 5: Land-Use Change Drives Zoonotic Disease Emergence**

**The Illegal Pangolin Trade: Unravelling Its Role in the  
Emergence of COVID-19**

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**Abstract:** The lack of any coronavirus detection in 'upstream' market chain pangolin samples suggests that the detections of COVID-19 related virus in 'downstream' animals more plausibly reflect exposure to infected humans, wildlife or other animals within the wildlife trade network and emphasise the importance of ending the wildlife trade globally.

**Keywords:** COVID-19, pangolin, wildlife trade

**Oral abstracts**

**OR001**

## **Head Suspension Can Reduce Stress and Improve Nocturnal Sleep**

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**Abstract:** Human head is always supported by the neck, causing stiffness in the neck and shoulder. Stiffness results in physical and mental stress. A suspension pillow (SP) is devised to disperse the pressure on the neck while user lays oneself down on a mat. In the first experiment, we showed stress-relieving effect of the SP by measuring and analyzing fluctuation of heart-beat interval. A participant was instructed to lay the head on the pillow and exercise lightly to stretch neck muscles and facilitate cardiovascular circulation. On the other day, he or she was asked to do the same exercise without the SP. LF/HF ratio was decreased significantly after exercise with the pillow. This fact indicates that the SP can be a tool for stress-reduction. In the second experiment, we performed a sleep study to show sleep-promoting effect of the SP. We recruited six middle- and aged participants for this experiment to show sleep-promoting effect by the SP. They slept with the SP or a Japanese traditional and popular pillow stuffed with buckwheat chaff (JP) in their own bedrooms for 4-5 consecutive nights. The results demonstrated that the SP improved sleep efficiency, increased amount of deep sleep in NREM, but decreased the counts and amount of nocturnal awakening. These results proved that the SP improves sleep quality in middle and aged people. In the last experiment, one participant had obstructive sleep apnea syndrome (SAS) caused by overweight. We found that the frequency of hypoxia and counts of nocturnal wakening also decreased with the SP compared with the JP. The findings obtained from three experiments revealed that the SP holds head and secures the airway, resulting in reducing stress by activating parasympathetic nervous system and in improving sleep quality.

**Keywords:** stress, sleep, pillow, polysomnography, obstructive sleep apnea syndrome

## **How Outdoor Leisure and Recreational Users Coping With Physical and Mental Health During Covid-19 Pandemic in Malaysia?**

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**Abstract:** The lockdowns during the COVID-19 pandemic or restrictions of using green spaces have some impact on physical and mental health of those leisure and outdoor recreational users. An on-line study was conducted to investigate how the users were coping with their mental and physical health during the pandemic. The 606 users were selected from several social network platforms. Majority were disrupted (28.2%) and moderately disrupted (30.2%) in terms of their general health during the confinement period in Malaysia. Only about 18.8% felt not at all disrupted. This was further explained from the GHQ-12 items where respondents were moderately distressed from being self-isolation and quarantined. However, majority of the respondents were coping with varieties of physical and mental activities at home such as with household chores (85.5%) as their main physical activity as well as watching TV (71.3%) as part of their main mental activity. Though the respondents were coping with varieties of physical and mental activities, in the long run this would not be sustainable. The government needs to develop guidelines to optimize the benefits of performing physical and mental activities at home and also try alternative ways of using the green spaces for the public during the pandemic.

**Keywords:** self-isolation, distressed, GHQ-12, recreational users, well-being

## **Coupling Relationship Between Urban Forest Environment Healthcare Benefits and Green Exercise – A Case Study in Fuzhou, Fujian Province, China**

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**Abstract:** Rapid urbanization has led to the rapid deterioration of ecological environments and human habitats in most cities around the world, with a particular emphasis on this issue in China. High-density environments, life pressures, and environmental pollution have resulted in compromised residents' health, leading to an increase in the rates of mental and chronic illnesses. Urban forest environments serve as crucial spaces for green exercise for urban residents, although the benefits of these environments on the health of residents in densely populated Chinese cities remain uncertain. This study is grounded in the theory of perceptual ecology and focuses on six representative urban forest parks in Fuzhou, Fujian, China. By employing the System for SOPARC, constructing a cognitive evaluation model for urban forest environment perception, employing psychophysiological instrument detection, and using the Restoration Scale questionnaire, the study analyzes the interrelationship between urban forest environments and patterns of green exercise behavior. The research reveals that users exhibit the following patterns: elderly individuals are predominant during daytime on workdays, while middle-aged and young adults are more prevalent during evenings and non-workdays, often involving family outings. The type, intensity, and duration of green exercise are cross-correlated with participants' background characteristics. Results indicate that vision plays a dominant role in respondents' perception of urban forest parks, followed by tactile perception, while auditory perception is generally less emphasized, and olfactory and taste perceptions are relatively neglected. The perceptual evaluation of elements such as plants, pathways, landscape recognizability, and visual perception of topography proves to be pivotal. The utilization of urban forest parks has a significantly positive impact on respondents' physiological and psychological well-being. Thus, we conclude that this study elucidates the mechanism of the therapeutic benefits of urban forest environments and their influence on green exercise, providing a theoretical foundation for the enhancement of health-promoting effects through urban forest environments guided by wellness principles.

**Keywords:** urban forest environment, metropolitan area, healthcare, landsenses ecology, green exercise

## Effects of Tool Use on Differences Between Dominant and Non-dominant Hands

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**Abstract:** Many studies of right/left differences in motor performance related to handedness have examined arm or hand movements rather than movements with tool. We therefore explored tasks grasped and moved an object from start position to target position with two digits (no tool), chopsticks (familiar tool) and hemostat (unfamiliar tool) in healthy right-handed individuals. We used small or large target for each task. Three-axis force sensors were used to determine the time and maximum exerted force to move the object. The time taken to move the object tended that tasks by non-dominant hand were slower than tasks by dominant hand in all conditions. Significant right/left differences in the time were found only in the chopstick condition, and no significant differences were found for the digit and hemostatic conditions. Interestingly, in dominant hand, the time for the hemostatic condition was significantly slower than for the digit condition, while there was no significant difference between digit and chopsticks conditions. On the other hand, in non-dominant hand, the time for the digit condition was significantly faster than for chopsticks and hemostatic conditions. The peak force during tasks for hemostatic conditions was significantly stronger than for digit and chopsticks conditions in dominant and non-dominant hands. Effect of target size was not observed in the time and peak force for all conditions. This study showed tool use, familiar tool such as chopsticks, on differences between dominant and non-dominant hands were apparent in the taken to move the object. Although the time during using unfamiliar tool, such as hemostatic, was slower than for movements with the digits and chopsticks in dominant hand, there was no different among the conditions in non-dominant hand. These findings indicate that tool use and habituation can be important factors for differences between dominant and non-dominant hands.

**Keywords:** handedness, tool use, finger, grasp

## Effects of the Visual Input of Outdoor Light-Dark Changes on Human Time Perception

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**Abstract:** Using artificial lighting may hinder the recognition of daylight transitioning from day to night, leading to a diminished awareness when the sun sets. This may disrupt the sleep schedules and cause a phase delay in the sleep-wake cycle. In this study, we explored how the visual inputs of outdoor light-dark changes affect human time perception. The experiment took place in a windowless room (width 1560 × depth 1560 × height 2000 mm) with an illuminance of 500 lx at eye level and a CCT of 5000K. Twenty healthy adults ( $22.5 \pm 1.2$  years, male: female = 9:11) participated under three conditions: No Video (control), Video (sunset at 16:30 h), and Delayed Video (sunset delayed by 40 min). The experimental videos were pre-recorded between the afternoon and evening, spanning a period of 3 to 4 hours. The experiment started at 15:00 and lasted 180 minutes, as the recordings were displayed randomly on a computer screen. Each participant performed time estimations for each video condition three times at 40-minute intervals. The measurements taken included subjective time estimation, alertness (KSS, PVT), and state anxiety scale (STAI). As a result, a significant difference in time perception was observed at the 80 minutes mark of the outdoor daylight transition. The delayed video condition showed a time estimation significantly shorter ( $71.6 \pm 14.2$  min) than both the video ( $82.6 \pm 9.8$  min) and no video conditions ( $77.2 \pm 18.2$  min) ( $p < 0.05$  in both). However, the estimated time in the no video condition showed no statistically significant difference compared to video condition. These suggest that human time perception may be influenced by the visual input of outdoor light-dark changes. It may also imply that the human sense of time is attuned to the daily light-dark cycle and manifests even in situations without external visual cues.

**Keywords:** human, light-dark cycles, time perception, visual stimuli, alertness

## Developing a Time Series Predictive Model for Dengue in Kota Kinabalu Sabah Using Dengue Surveillance Data and Meteorological Data

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**Abstract:** Dengue is a major public health issue, with 3.9 billion people living in the 129 dengue-endemic countries globally and at risk of contracting dengue fever. Sabah has the most dengue cases in Malaysia. Kota Kinabalu had 22% of Sabah's dengue cases in 2022. The objective of this study is to develop prediction models of dengue incidence using meteorological, entomological, and environmental parameters in Kota Kinabalu, Sabah. An ecological study was conducted from 2016 to 2021 using the eDengue database and meteorological data. Pearson's correlation was used to test the correlation between the predictor variables and the number of cases of dengue in Kota Kinabalu. R software used the seasonal autoregressive integrated moving average (SARIMA) model to anticipate dengue incidence. The model was fitted to weekly dengue incidence from 2016 to 2020 and validated using January to December 2021 data. The study found a significant negative association ( $r = -0.28$ ,  $p < 0.01$ ) between weekly maximum temperature and dengue cases. A significant negative correlation ( $r = -0.22$ ,  $p < 0.01$ ) was identified between the weekly minimum temperature and dengue cases. A significant positive correlation was seen between weekly *Aedes Albopictus* ( $r = 0.65$ ,  $p < 0.01$ ) and Aedes index ( $r = 0.64$ ,  $p < 0.01$ ) and dengue cases. A significant correlation ( $r = 0.39$ ,  $p < 0.01$ ) was found between weekly vacant lots and dengue cases. SARIMA (1,1,1) (1,1,0)52 with external regressor maximal temperature, Aedes index, and vacant lot had the lowest measurement error, with mean absolute error (MAE) values of 3.038045, root mean square error (RMSE) of 4.430211, and Akaike information criterion (AIC) of 1354.82. The predicted values in 2021 have the accuracy and forecasting capability to serve as an early warning system for proactive dengue measures. This information is deemed valuable to healthcare administrators in enhancing the level of preparedness.

**Keywords:** dengue fever, entomological parameters, environmental parameters, meteorological parameters, prediction modelling

## Molecular Insights: Unravelling the Identification of Novel Rotaviruses of Animal-Origins in the Sabah Local Community

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**Abstract:** Rotavirus is the leading cause of acute gastroenteritis (AGE) worldwide, and the burden is particularly high in Africa and Southeast Asia. Despite its global impact, there remains a significant gap in the knowledge of rotavirus burden and genotype distribution for the past 20 years in Malaysia that hindered the rotavirus vaccination. This study aimed to elucidate the rotavirus burden among Sabahan children under 5 years old with AGE in Kota Kinabalu and Kunak districts and their genotypic distribution. Watery stool samples were tested for rotavirus antigen using ELISA test followed by Polyacrylamide gel electrophoresis to assess their genomic diversity. Sociodemographic information was obtained. Rotaviruses detected were subjected to RNA extraction then PCR targeting VP7 and VP4 genes, followed by PCR for G and P genotyping. PCR products of VP7 and VP4 were sequenced and further examined for phylogenetic analysis and in-silico analysis. From January 2018 to February 2020, 27% (96/422) of samples were rotavirus-positive. Males (the ratio male to female, 5:3), children aged 12-35 months (n=50), and of Bajau ethnicity (n=23) were more likely to be infected. Sabahan rotavirus displayed considerable genomic diversity and evolving as indicated by various electropherotype patterns. G3P[8] genotype was dominant in both districts during the first study phase. In the second phase, G3P[8] was dominant in Kota Kinabalu followed by G9P[8]. In Kunak, G9P[8] was dominant. This study discovered novel rotaviruses of animal origin that exhibited amino acid variations on VP7 antigenic epitope in comparison with vaccine strains. Equine-like G3P[8] rotavirus was prevalent, followed by G9P[8]-lineage VI that epidemiologically linked to porcine and bovine-like G8P[8]. This study shed the light that rotavirus cross-species transmission is occurring in the local community and there is a need to explore epidemiology, socioeconomic, lifestyle, and human-animal interaction.

**Keywords:** rotavirus identification, molecular analysis, local community, emerging infectious disease, zoonotic transmission

## Sero-Epidemiological Survey for HTLV-1 Infection in the Sabah State of Northern Borneo, Malaysia

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**Abstract:** Geographic, anthropological and socioeconomic factors are among the aspects influencing the prevalence of HTLV-1 in specific areas and countries. Although it has been recognized that the pan-Pacific zone is one of the endemic areas of HTLV-1, thorough survey of HTLV-1 prevalence in Southeast Asia has not been well conducted so far. We collected 3,915 blood samples from the Sabah state including volunteer blood donors and municipal workers residing in the metropolitan area of Kota Kinabalu (1,586) and the febrile patients in Kota Belud (382) between August 2016 and July 2018. We also collected 1,947 samples from rural districts of Kudat between October 2014 and January 2015. Serological evaluation of HTLV-1 infection was performed with particle agglutination method (SERODIRR®-HTLV-1, Fujirebio, Tokyo, Japan) and further diagnosed with line-blot (INNO-LIA®-SCORE HTLV, Fujirebio, Tokyo, Japan). Blood samples were collected from 40 different ethnic groups. While all the samples from Kota Kinabalu (0/1,586) were negative, one inconclusive from Kota Belud

(1/382) and 45 positive (2.3%) or 61 inconclusive (3.1%) were recognized from Kudat area. We further conducted line-blot evaluation and 8/18 (44.4%) were identified as HTLV-1 positive so far. We hereby report the first results of HTLV-1 prevalence in the northern area of Borneo, Malaysia. Expanding surveillance to provide the detailed epidemiological profiles of HTLV-1 in the relevant area is ongoing.

**Keywords:** HTLV-1, sero-prevalence, Sabah

## Differences in Perception of Pseudo-Haptics Between Individuals

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**Abstract:** Tactile sensation is essentially caused by physical force applied to the body; however, it is also known that tactile sensation can be modulated by changes in visual stimuli. For example, when the Display/Control (D/C) ratio changes visually during cursor manipulation on a computer screen, the hand operating the mouse may perceive an increase or decrease in resistance even though no physical force is applied. Such tactile illusions are called pseudo-haptics and have been widely studied. Few studies, however, have focused on individual differences in the occurrence of pseudo-haptics. This is because previous studies have evaluated pseudo-haptics qualitatively, making quantitative inter-subject comparisons difficult. Here, we quantified pseudo-haptics with Newtons as the unit of force using a probit model, a type of psychophysical technique. We were then able to compare the magnitude of perceived pseudo-haptics between subjects. A high correlation was observed between the D/C ratio change rate and the amount of pseudo-haptics generated for all subjects in our experimental environment, with correlation coefficients ranging from 0.88–0.99. On the other hand, pseudo-haptics equivalent to  $0.041 \pm 0.024$  N (Mean  $\pm$  SD) were generated per 10% D/C ratio change rate, and the values varied among subjects in the range of 0.12–0.92 N. This indicates that we obtained a regression line showing the relationship between D/C ratio change rate and amount of pseudo-haptic generation with a high correlation for each subject. It also suggests that the slope of this line could be used as an indicator of the ease of pseudo-haptic generation, and that the value varies from subject to subject.

**Keywords:** pseudo-haptics, touch, illusion, visual-haptic integration, cursor

## **Division of Labor and Physical Activity Levels Among Caregivers in the Context of Childcare in the Baka Hunter-Gatherers Living in the African Rainforest**

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**Abstract:** The study aimed to investigate the division of labor and physical activity levels among caregivers in the context of childcare in the Baka hunter-gatherers living in the African rainforest. The study included five infants aged between 10 and 18 months and 57 caregivers, including adults and children. We observed childcare activities every 30 seconds using a modified checklist for five infants, recording activities for nine hours per day for three consecutive days. The total number of observations was 16,200 bouts. To measure physical activity levels, caregivers were asked to wear an accelerometer with a built-in pedometer on their waist. The study found that for each infant, 15.8 people, excluding the mother, were engaged in childcare activities. Mothers were the primary caregivers, providing more than five hours of childcare, followed by fathers and older siblings. Children played a vital role in childcare, especially girls, who spent an average of one hour per day caring for infants. Besides, there was a trade-off between childcare and the physical activity of caregivers. Daily steps decreased as childcare time increased for fathers, mothers, and children. The findings suggest that the division of labor between childcare and subsistence enabled the maintenance of efficiency in the life of the group. The study sheds light on the importance of understanding the division of labor and physical activity levels among caregivers in the context of childcare in different societies. The study also highlights the significance of children's involvement in caregiving activities, which may have implications for their development and well-being. In conclusion, the study provides valuable insights into the division of labor and physical activity levels among caregivers in the Baka society. The findings have implications for understanding childcare practices in other societies and for developing interventions that support caregivers' well-being and children's development.

**Keywords:** division of labor, physical activity, caregivers, childcare practices, hunter-gatherers

## The Main Driving Forces in Human Evolution

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**Abstract:** The aim is to prove that being a vertical torso causes the fetal skull to enlarge, specifically to do a thought experiment that aims to implant a chimpanzee embryo in the human womb, to develop it there, and to produce an *Australopithecus* offspring. Humans went through three important leaps until they became an intelligent living thing. These leaps were respectively 1) bipedal leap, 2) cognitive flip leap and 3) cognitive threshold leap.

1) Bipedal leap: 6-7 million years ago, changing living conditions (habitat) forced this creature to walk on two legs in shallow waters or marshes and swamps. This was walking on two legs, which initiated radical changes in the skeletal structure of this creature, as required by the laws of physics. The most effective of these changes was forcing this creature to have a vertical body. *Australopithecus*.

2) Cognitive flip leap: Two million years ago, when the vertical angle of the trunk reached a certain level, the embryo-fetus in the womb turned 180 degrees, did a somersault and turned its head to the mother's diaphragm. All this happened in accordance with the laws of physics. It was this mind flip that triggered and initiated the growth of the skull, and therefore the brain. *Homo habilis*.

3) Cognitive threshold leap: When the brain growth reached a certain level (650-700 cc), he was able to reason to use stick and stone as a defensive and offensive weapon, and this accelerated the transition and transformation to *Homo sapiens*. *Homo erectus*.

He later developed fire management, use and language, because he now had the brain capacity to do all these things.

**Keywords:** human evolution, vertical trunk, bipedalism, obstetrics, interspecies embryo transfer

## Effects of Ice Slurry Ingestion on Body Temperature and Softball Pitching Performance in a Hot Environment

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**Abstract:** Although softball players are often required to play in hot environments, scarce evidence is available regarding the effects of ice slurry ingestion on body temperature and pitching performance in softball pitchers. Thus, this study investigated the effects of ice slurry ingestion before and between innings on body temperature and softball pitching performance in a hot environment. In a randomized crossover design, seven heat-acclimatized amateur softball pitchers (four male and three female) completed simulated softball games consisting of 15 best-effort pitches per inning for seven innings. Participants were assigned to either a control trial (CON: ingestion of 5.0 g/kg of cool fluid [ $9.8\pm2.2^{\circ}\text{C}$ ] before simulated softball games and 1.25 g/kg of cool fluid between inning intervals) or ice trial (ICE: ingestion of ice slurry [ $-1.2\pm0.1^{\circ}\text{C}$ ] based on the same timings and doses as the CON). Participants performed both trials in an outdoor ground during the summer ( $30.8\pm2.7^{\circ}\text{C}$ ,  $57.0\pm7.9\%$  relative humidity). Ice slurry ingestion before the simulated softball game (pre-cooling) resulted in a greater reduction in rectal temperature compared with cool fluid ingestion ( $p=0.021$ ,  $d=0.68$ ). No significant differences were observed between the trials in rectal temperature changes during the simulated softball game ( $p>0.05$ ). Compared to the CON, the ICE significantly decreased heart rate ( $p<0.001$ ,  $d=0.43$ ) and increased handgrip strength ( $p=0.001$ ,  $d=1.16$ ) during the game. Ratings of perceived exertion, thermal comfort, and thermal sensation were improved in the ICE compared to the CON ( $p<0.05$ ). Ball velocity and pitching accuracy were not affected by the ICE. In conclusion, ice slurry ingestion before and between innings reduced thermal, cardiovascular, and perceptual strain. However, it did not affect softball pitching performance compared to cool fluid ingestion.

**Keywords:** ball velocity, body cooling, heat, muscle strength, pitching accuracy

## Skin Ageing in the Ethnic Chinese Is Associated With Diet

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**Abstract:** Skin ageing is a complex process involving both intrinsic and extrinsic ageing. In our recent meta-analysis and systematic review, we identified notable risk factors for skin ageing. They are age, gender, ethnicity, air pollution, nutrition, smoking, sun exposure, and genetics. Skin ageing presents itself through phenotypes such as wrinkling, sagging, pigment spots, and facial photoageing. We studied skin ageing phenotypes in a cohort comprising of 2,158 ethnic Singapore and Malaysia Chinese. Using Principal Component Analysis (PCA), we discovered that the first Principal Component (PC1) explains the biggest share (13.2%) of all phenotypic variation in skin ageing. This first Principal Component mostly captures variance arising in wrinkling phenotypes (e.g., nasolabial folds) and sagging phenotypes (e.g., sagging of the jawline). Using survey data on the self-reported eating frequency of various foods and nutritional data from the Singapore Health Promotion Board (HPB), we estimated the total intake amount of various macronutrients (e.g., fats) by all 2,158 participants. We found that a moderate/high estimated total fat consumption per week increases the odds of PC1 skin ageing phenotypes (AOR 1.22, 95% CI 1.01, 1.48, p-value 0.04). Notably, moderate/high estimated total saturated fatty acid amount (AOR 1.27, 95% CI 1.05, 1.53, p-value 0.02) and moderate/high estimated trans-fatty acid amount (AOR 1.25, 95% CI 1.03, 1.51, p-value: 0.02) are significantly associated with PC1 (i.e., wrinkling and sagging). Through our work, we show associative evidence between fat consumption and skin ageing in an ethnic Chinese cohort.

**Keywords:** skin ageing, nutrition, fat consumption, wrinkles, sagging

## Unraveling Inequities in Zoonotic Malaria Prevention Challenges: An Exploration in Rural Kudat, Sabah

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**Abstract:** Malaria caused by *Plasmodium knowlesi*, a non-human simian parasite, is increasingly common in rural Malaysia, particularly in the Kudat district of Sabah. The rising incidence poses a significant challenge to malaria elimination efforts in Malaysia. This zoonotic disease is transmitted by *Anopheles* mosquitoes from monkeys to humans. This study aimed to understand why zoonotic malaria continues to be a problem in rural Kudat. The research focused on challenges related to *P. knowlesi* malaria exposure from the perspective of the local community. We conducted a study using qualitative methods between January and October 2022. Four rural villages in the Kudat district of Sabah, Malaysia, were chosen for the research. Twelve focus group discussions, engaging 26 participants through photovoice, were complemented with nine in-depth interviews with community and faith leaders. The interviews were conducted in the local Malay Sabah dialect and recorded with consent from participants. Thematic analysis was utilised to identify patterns in the data and generate the study findings. The study findings highlighted the significant impact of social disparity on malaria prevention. Participants described limited/inadequate access to essential resources, such as water access, telecommunication lines, and electricity, posed challenges. Livelihood issues, socioeconomic difficulties, and environmental disruptions were also identified as factors that hindered efforts to prevent malaria. This research emphasises the importance of addressing health disparities in rural communities vulnerable to zoonotic malaria. It calls for collective action to bring about change. The study underscores the crucial role of community perspectives in understanding the reasons behind malaria transmission. By addressing issues like resource access and socioeconomic challenges, malaria prevention strategies can be more effective in these areas.

**Keywords:** inequities, malaria prevention, *P. knowlesi* malaria, participatory research, qualitative methods

## **Variation of Dermatoglyphic Patterns on Different Digits Among Sabah's Kadazandusun and Bajau Males and Females**

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**Abstract:** At present genetic, evolutionary, and bio-anthropological perspectives, dermatoglyphics have been used extensively to characterize populations, analyze the nature and origin of human variation and population structure, and evaluate the micro-differentiation of populations. Scientists also have established a significant association between dermatoglyphic patterns and various diseases. Since dermatoglyphics variation may be associated with physiological and pathological, there must be data regarding physiological variation which would facilitate identifying the pathological variation. The paucity of literature about dermatoglyphic patterns in both sexes for different ethnicities of Sabah intrigued the researcher to investigate the variation of dermatoglyphic patterns on different digits among Sabah's Kadazandusun and Bajau males and females. A total of four hundred (397) persons (Kadazandusun 247, Bajau 150) who fulfilled the selection criteria were included in this study by stratified random sampling from different villages of Kudat, Ranau, Kota Belud, Kota Kinabalu, and Papar, Sabah. The study design, objectives, and methodology were explained to the selected subjects and their written consent was acquired. The participants' fingers and palms of both hands were photographed using the Nikon D5200 camera and manually grouped into different dermatoglyphic patterns. The association between the variables was investigated using the chi-squared test. The dermatoglyphic patterns of the right thumb, right and left middle finger, left ring finger, and left little fingers significantly ( $p<0.05$ ) varied between the males and females. Furthermore, when the males and females were stratified by ethnicity, Bajau males varied significantly ( $p<0.05$ ) from females in the right thumb, left index, right middle, left middle, and right little fingers. In contrast, Kadazandusun males only differed from females in the right index finger pattern. The study demonstrated dermatoglyphic variations among the participants stratified by sex and ethnicity, which would be a reference while researching an association between dermatoglyphic variation and disease.

**Keywords:** dermatoglyphics, cross-sectional study, sex, ethnicity, Sabah

## Effects of Gender and Body Mass Index (BMI) on Cardiorespiratory Status of Young Adults of Kota Kinabalu, Sabah

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**Abstract:** Overweight and obesity are growing public health problems affecting developing countries. The prevalence of obesity in Malaysia (11.4% in males; 16.7% in females) was observed. Overweight and obesity cause hypertension, other cardiovascular dysfunctions, as well as pulmonary dysfunctions. The objective of the study was to determine the relationship between gender and BMI with cardiopulmonary function parameters among young adults in Kota Kinabalu, Sabah, Malaysia. After taking the written informed consent, subject filled out one questionnaire about their personal demographic data, health status, physical activities, diet etc. Body height, body weight, and waist circumference, total body fat were measured. Cardiac parameters such as pulse and blood pressure were measured. Respiratory parameters such as forced vital capacity (FVC), forced expiratory volume in 1 sec (FEV1), FEV1 as a percentage of FVC (FEV1%), FEV1/FVC were recorded on a computerized spirometer. PEFR was measured by peak flow meter. Out of 368 participants, 259 (70%) were female and 109 (30%) were male. Among the participants 58 were obese, 84 were overweight, 52 were underweight and the rest 174 were normal. There were significant differences ( $p<0.05$ ) between the mean pulse rate of male and that of female where female had higher rate. There were significant differences ( $P<0.05$ ) of FVC, FEV1, PEFR and FEV1% between male and female participants. However, there were significant ( $p<0.05$ ) differences of pulse between the different BMI groups. Pulse rate of underweight group had significant ( $p<0.05$ ) differences with normal and overweight groups. However, FEV1% had significant ( $p<0.05$ ) differences between BMI groups. FEV1% of underweight group had significant ( $p<0.05$ ) differences with normal, overweight and obese groups. In conclusion, there were variations of pulse and respiratory parameters between genders and different BMI categories. These cardiorespiratory variations can serve as reference ranges or for further evaluation on abnormalities.

**Keywords:** cardiorespiratory, BMI, gender, Sabah, Malaysia

## Perceived Restorativeness of Landscape Characteristics on University Campuses: A Case Study in Shanxi Province, China

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**Abstract:** The perceived restorativeness of individuals is crucial in the landscape design process, closely linked to the behaviours involved. However, the correlation between the perceived restorativeness of students and faculty members and the complexity of the landscape in numerous green spaces in universities in Shanxi Province well needed to be better understood. The current situation indicates that most universities need to devote more time to creating green spaces, leading to numerous inconsistencies. Therefore, this study investigated the influence of landscape complexity on preference ratings and gaze fixation in settings involving lawns, pathways, plazas, and waterside green spaces. Participants' average assessments of landscape complexity were used to categorise nine photographs, chosen as reference points for each type of situation within each scene. Through a questionnaire survey, 100 useful responses were obtained. The findings of the study support this point. Despite high expectations for benefits in enjoyment, health, air quality, and microclimate, a complete understanding of the advantages related to the environment and water resources still need to be improved. Respondents strongly favoured simple decorative planting designs, low vegetation with low biomass structure and complexity, and leisure amenities like benches, pavilions, and walkways, alongside soft landscapes such as lawns, charming flowers, trellises, and hedges. The outcomes of this research can be utilised to shape recreational venues and landscapes. The results will aid designers, school administrators, and governmental bodies in effectively incorporating public perception into the design and decision-making process. Furthermore, this study can bring further attention to campus green spaces and human-centrism campus landscape design.

**Keywords:** green spaces, perceived restorativeness, psychological well-being, students, university campus

## SNP Analysis of Mitochondrial DNA of *Plasmodium knowlesi* Isolated From Malaria Patients in Sabah, Malaysia

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**Abstract:** Since ancient times, malaria has been one of the most significant infectious diseases affecting humanity worldwide. Thanks to the successful management programs, Malaysia has not reported any indigenous cases of traditional human malaria in recent years. However, people in the country including those in Sabah, Borneo are at risk to an emerging zoonotic malaria caused by *Plasmodium knowlesi*, instead. Control of this malaria is challenging because the main natural reservoir of the causative parasite is wild population of macaques. Widening and deepening epidemiological knowledge and understanding is essential for effective management of this disease. Variations in the genome such as single nucleotide polymorphisms (SNPs) are potentially useful for origin identification of the infectious agent in molecular epidemiological analysis. To search for SNPs usefulness as molecular markers, we analysed the mitochondrial genome of *P. knowlesi* infecting 16 malaria patients identified in Sabah in 2020 and 2022. Overlapping sections of the parasite's mitochondrial genome were amplified by PCR from DNA extracted from the blood of the *P. knowlesi* malaria patients, and their nucleotide sequences were determined by Sanger sequencing. The determined sequences were aligned with the reference sequence of the parasite in the sequence database to identify SNPs. Some of the variations identified were shared by all the determined Sabahan sequences. Distribution of other SNPs indicated that there were at least four subgroups in *P. knowlesi* causing malaria in humans in Sabah. This suggests that this species of parasite had a human infectivity since before differentiation of these subgroups. *P. knowlesi* probably has been infecting people who frequently accessed the forest, where the parasite prevails, for a long time, but the malaria it caused could not have been recognised as a health concern until recently because it was hidden behind traditional human malaria.

**Keywords:** genetic variation, malaria, mitochondrion, molecular marker, *Plasmodium knowlesi*

## Physiological Responses and Individual Differences in Acute Hypobaric Hypoxia in Lowlanders

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**Abstract:** When people living in lowland are exposed to hypobaric hypoxia (HH) environments such as high mountains, mainly hemodynamic changes (increase in heart rate, ventilation, respiratory rate, cardiac output and hemoglobin concentration) occur to prevent lower oxygen levels in the body. However, changes to other physiological functions during HH have yet to be fully clarified. This study aimed to clear changes to endocrine, inflammatory and immune responses and individual differences during acute HH exposure using a climatic chamber (75 min of exposure to conditions mimicking 3500 m) in healthy Japanese lowlanders. We also focused on its individual differences. In result, aldosterone and cortisol were significantly decreased after HH. On the other hand, interleukin (IL)-6, IL-8 and white blood cell (WBC) count were significantly increased. In individual differences, lower peripheral oxygen saturation ( $SpO_2$ ) was correlated with higher IL-6 and WBC count, and higher IL-8 was correlated with higher cortisol. These results suggest that not only hemodynamics changes, but also endocrine, inflammatory and immune responses are evoked even with an acute HH. Interestingly, individuals with lower  $SpO_2$  showed more pronounced responses of them. Probably these results depend on individual difference of adaptability to high-altitude. Our data contribute more understanding about physiological responses and interactions of homeostatic systems in acute HH.

**Keywords:** hypobaric hypoxia, individual differences, high-altitude adaptation

## Unveiling Changes in Harmful Algal Blooms Along the Coast of Sabah, Malaysia: Fostering Health and Sustainability

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**Abstract:** In Malaysia, harmful algal blooms (HABs) pose a significant threat to human health, as they lead to the accumulation of toxic substances in seafood consumed by local communities. Ingesting contaminated seafood has resulted in various health issues, ranging from nausea, vomiting, and diarrhea to severe outcomes like paralysis or even death due to neurotoxic effects. This underscores the importance of understanding HAB patterns to protect the health and livelihoods of Malaysians who heavily depend on coastal resources. We aimed to understand the dynamics of HABs in Sabah and develop a predictive model utilizing monitoring data by the Department of Fisheries (DOF) Sabah. Sabah's coastal waters are particularly susceptible to HABs caused by two dinoflagellate species, *Margalefidinium polykrikoides* and *Pyrodinium bahamense*. Monitoring data spanning from 2004 to 2018 across 13 sites consistently showed the presence of these species. *Margalefidinium* densities varied from 3 cells L<sup>-1</sup> yr<sup>-1</sup> (2015–2018) to 83 cells L<sup>-1</sup> yr<sup>-1</sup> (2004–2007), and *Pyrodinium* ranged from 3 - 783 cells mL<sup>-1</sup> yr<sup>-1</sup>. Despite negative trends for both species, blooms have seemingly decreased over the past 15 years. Generalized additive models revealed periodic coexistence cycles occurring roughly every 3 years, suggesting potential niche differentiation and allelopathy effects. To predict HAB behavior, machine learning models were developed using the data available. These models, incorporating factors like sea surface temperature, salinity, wind velocity, solar irradiance, and chlorophyll a, showed mixed results. While the *Pyrodinium* model exhibited low prediction accuracy ( $R^2 = -0.298$ ), the *Margalefidinium* model demonstrated promise ( $R^2 = 0.597$ ). This predictive tool can aid in assessing HAB risks in Sabah's coastal waters, contributing to informed decision-making. Overall, this comprehensive study offers valuable insights into HAB dynamics, coexistence patterns, and predictive modelling. These findings hold significance for enhancing coastal management strategies to safeguard the health and well-being of the population in Sabah.

**Keywords:** harmful algal blooms (HAB), monitoring, risk assessment, machine learning (ML) model, Sabah

## The Effects of Human Shape on Recall of Color Schemes: An ERP Study

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**Abstract:** The memory of color combinations, known as color schemes, is affected by shape. However, it remains unclear how human shapes, which are associated with specialized processing areas in the human brain, affect color scheme memory. Sixteen subjects participated in this study, which used event-related potentials (ERPs) to confirm the effect of human shape presented during recall on color schemes memory. The subjects engaged in two tasks (recognition task and associative task) to memorize and recall color schemes. In recognition task, the shapes presented during encoding were human shape or rectangle, and the shapes presented during recall were identical. In associative task, the shapes presented during encoding were novel shapes, and the shapes presented during recall were human shape or rectangle. Human shape, rectangle, and novel shapes were all composed of five colors (light blue, beige, blue, orange, green), and the novel shapes had three different patterns. Based on signal detection theory, accuracy was assessed using the discriminability index ( $d'$ ) to determine the ability to discriminate between memorized and non-memorized color schemes, and the response bias index ( $c'$ ) to assess response tendencies. ERPs were analyzed for the P3b amplitude, reflecting decision-making and memory load. In  $d'$ , there was no effect of the presented figure, but in  $c'$ , it was found that errors were reduced by recalling the color scheme using the human shape. In P3b, only when the same color scheme as encoding was presented during recall, the human shape P3b amplitude was larger than rectangle. Furthermore, when the human shape was presented with the same color scheme as the encoding during the associative task, the P3b amplitude increased compared to a different color scheme. These results suggest that human shapes presented as cues for recalling color schemes appear to be figures that encourage more accurate color schemes recall.

**Keywords:** visual working memory, color schemes, human shape, ERPs, P3b

## Relationships Between Peripheral Cold Tolerance Based on Finger Cold-Induced Vasodilation and Body Morphological Characteristics

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**Abstract:** The hands or ears are especially vulnerable to cold stress because they are not usually protected by clothing like the trunk of the body, and they have a greater surface area relative to their volume. It is known that there is a correlation between whole-body morphological characteristics and overall cold tolerance, but few studies have reported on the relationships between morphological characteristics and local cold tolerance. We investigated relationships between various morphological parameters and local cold tolerance. Local cold tolerance was evaluated through the characteristics of finger cold-induced vasodilation (CIVD). Nine young males ( $24.3 \pm 3.5$  y in age,  $177.3 \pm 4.1$  cm in height,  $73.1 \pm 10.4$  kg in body weight,  $14.0 \pm 3.4\%$  in total body fat, and  $23.2 \pm 2.9$  kg/m<sup>2</sup> in BMI) participated in a finger cold-induced vasodilation test and subjects immersed the 3<sup>rd</sup> finger in a 4°C water bath. A trial consisted of 10-min rest, 30-min finger immersion to the cold water, and 10-min recovery at an air temperature of 25°C. The maximum and minimum temperatures on the finger (Tmin and Tmax), the onset time of CIVD, frequency of the CIVD waves were  $5.7 \pm 1.7$  °C,  $12.3 \pm 2.3$  °C,  $3.8 \pm 1.1$  min, and  $6.6 \pm 1.1$  times. There were significant relationships between total body fat (%BF) or BMI and the CIVD parameters (all  $P < 0.05$ ). A higher %BF or BMI was associated with elevated Tmin and Tmax. In addition, a higher frequency of CIVD corresponded to increased finger temperature during recovery. These results suggest that overall morphological parameters can be indicative of the local cold tolerance of the hands. Individuals with larger body physiques tend to exhibit greater tolerable to cold stress in their hands.

**Keywords:** cold strain, cold resistance, physical fitness, body mass index, total body fat

## Age-Related Differences in Cutaneous Thermal Thresholds Depend on Initial Skin Temperature

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**Abstract:** Few studies reporting all cutaneous warm, hot, and heat pain sensitivity under conductive and radiative heat exposure were found. The purpose of this study was to investigate the cutaneous warm, hot, and heat pain thresholds for young and elderly males during contact and radiant heat exposure. Fifteen young males ( $23.7 \pm 1.8$  y) and 15 elderly males ( $74.7 \pm 4.2$  y) participated in this study. Contact heat trials were conducted using a thermo-probe ( $6.25 \text{ cm}^2$ ) with Method of Limits ( $0.1^\circ\text{C/s}$ ) on eight body regions (the neck, upper back, abdomen, waist, palm, buttock, posterior thigh, and sole). Radiant heat trials were conducted using a radiant heating panel ( $400 \text{ cm}^2$ ,  $200^\circ\text{C}$  in surface temperature) and kept distance at 10 cm on four body regions (the forehead, forearm, abdomen, and instep). Subjects responded when they initially felt warm, hot, and heat pain sensation on the stimulated skin. In the contact heat trials, the initial temperature on the posterior thigh was higher for the elderly than the young group, while the upper back temperature was lower for the elderly group ( $P < 0.05$ ). The elderly showed higher warm thresholds on the posterior thigh, and the young group had higher warm and hot thresholds on the upper back ( $P < 0.05$ ). In the radiant heat trials, the elderly had a higher initial temperature on the forearm, with higher warm thresholds on the forearm than the young group ( $P < 0.05$ ). Age-related differences in thermal thresholds were not found on the body parts where the initial skin temperature showed no differences between the elderly and young groups. Interestingly, heat pain thresholds showed no age- or body region-specific differences. Age-related differences in cutaneous warmth and hotness thresholds depend on the initial skin temperature, but heat pain sensation is not contingent upon the initial skin temperature for both young and elderly individuals.

**Keywords:** thermal sensitivity, heat pain, ageing, body regional difference, radiant heater

## Poster abstracts

PO001

# Association Between Sarcopenia and Disability Among Elderly Orthopedic Outpatients

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**Abstract:** The disability risk was higher in the sarcopenia and severe sarcopenia groups than in the non-sarcopenia group. The purpose of this study was to assess the association between sarcopenia and disability among elderly orthopedic outpatients in Japan. The participants included 102 elderly outpatients aged  $\geq 65$  years with orthopedic diseases. All participants had sufficient cognitive function to complete the questionnaire and were asked if they had any comorbidities (heart disease, lung disease, stroke, or diabetes mellitus). Body mass index (BMI) was calculated as weight divided by height squared ( $\text{kg}/\text{m}^2$ ). Sarcopenia was defined as low grip strength and a low muscle mass. The classification was established on the recommendations of the Asian Working Group for Sarcopenia. Muscle mass was measured by bioelectrical impedance analysis using an InBody 430. We used the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC). The TMIG-IC is a multidimensional 13-item scale that consists of three subscales: instrumental activities of daily living, intellectual activity, and social role. The association between sarcopenia and disability was assessed using logistic regression analysis, adjusting for age, sex, BMI, and comorbidities. The prevalence of sarcopenia and severe sarcopenia were 14.7% and 11.8%, respectively. Older age was associated with severe sarcopenia. The percentage of disability for social role was significantly higher in severe sarcopenia than non-sarcopenia group. After adjustment for age, sex, BMI and comorbidity, the severe sarcopenia group was significantly associated with disability for social role among orthopedic outpatients. The sarcopenia group had no significant association with social role disability. Sarcopenia is suspected to be a serious problem among elderly orthopedic outpatients. Our study showed that severe sarcopenia was associated with a disability for social roles among elderly orthopedic outpatients.

**Keywords:** sarcopenia, disability, elderly, orthopedic outpatients, social role

## Can Combination of Self-Weight Load Exercise and Dynamic Stretching Prevent Musculoskeletal Deterioration and Movement Disorder?

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**Abstract:** There is a large difference between the healthy and normal life expectancies. Motor dysfunction caused by muscle weakness and a reduced flexibility is one of the main factors which makes the difference larger. It is well-known that muscle function is improved by strength and/or flexibility trainings. So, it is expected that motor dysfunction caused by muscle weakness and a reduced flexibility due to aging would be prevented or improved by practicing trainings mentioned above. Thus, the present study was designed to investigate the possibilities of self-weight load strength training with dynamic stretching for preventing and/or improving motor dysfunction caused by muscle weakness and a reduced flexibility. Five middle-aged men ( $52.0 \pm 5.9$  yrs) and five middle-aged women ( $54.4 \pm 3.7$  yrs) participated in this study. The standing-up test and 2-step test for comprehensively evaluating muscle strength, balance ability, and flexibility of the lower extremities were performed both pre and post training. The training was consisted of forward lunge, one leg squat and a dynamic stretching for hip joints. The subjects trained for eight weeks with frequency of three times/week. The results obtained were analyzed using paired T-tests. The significance level was established by  $P < 0.05$ . The post-training 2-step distance ( $254.6 \pm 28.4$  cm) was improved by 7.8% compared to the pre-training value ( $237.1 \pm 28.4$  cm) ( $p < 0.001$ ). Post-training stand-up test values were improved by an average of 1.2 points compared to pre-training one (4.8  $\pm$  1.3 points vs. 6.0  $\pm$  1.0 points,  $P < 0.001$ ). In the present study we confirmed that motor dysfunction caused by muscle weakness and a reduced flexibility can be improved by combination of lower extremity self-weight load strength exercises (forward lunge and one leg squat) and dynamic stretching.

**Keywords:** musculoskeletal deterioration, movement disorder, self-weight strength training, dynamic stretching, healthy and normal life expectancies

## Analysis of the Effect of Gender Differences on Sports Performance

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**Abstract:** Despite the differences in physical fitness between males and females, there have been only a few studies that investigate the extent of gender differences in terms of sports performance. With this in mind, this study aimed to analyze the gender differences in the physical demand of rugby union. The subjects were male and female athletes from an elite rugby union team. Using a global navigation satellite system (GNSS) device, the subjects' total distance, high-speed running, and maximum speed were measured during the match. Since the athletes have played in multiple matches, a mixed model with athletes as a variable effect was performed in the analysis. No significant gender difference was noted in the total distance ( $F=1.924$ ,  $p=0.166$ ). On the other hand, females (3.1%) were significantly lower in high-speed running compared to males (5.7%) in FW ( $p<0.01$ ), indicating that the results of females were about half that of males. Females (7%) were also significantly lower than males (10.4%) in BK ( $p<0.01$ ). Females also had a significantly lower maximum speed ( $p<0.01$ ). These results clarified that although females performed the same match volume as that of males, the match intensity was lower. As such, these results also support the usefulness of intensity-focused training for improving female's performance. Based on the gender difference in the physical demands of rugby union, we believe that we were able to clarify the effect of gender differences on sports performance.

**Keywords:** gender differences, sports, global navigation satellite system, rugby union

## Individual Differences in Sensory Processing Sensitivity: Association of Nature Experience with Feelings Toward Nature

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**Abstract:** Improving mental health and environmental conservation behavior is important, as mentioned in the Sustainable Development Goals. One psychological factor related to both is “feelings toward nature,” which consists of five factors: restorativeness, the extent to which one feels comfort in nature; oneness, reflecting closeness and connectedness to nature; mystery, similar to awe of nature; care, reflecting conservation awareness toward nature; and aversion, reflecting negative feelings toward nature. The amount of nature experience plays a key role in enhancing positive feelings toward nature as suggested in previous studies. However, there might be individual differences in the effects of nature experience based on the level of Sensory Processing Sensitivity, a temperamental trait whose core characteristics are stronger reactivity to and deeper processing of internal and external information. This study investigated the associations of sensitivity and the amount of nature experience with each component of feelings toward nature. A web survey using psychological scales was completed by 468 Japanese adolescents (244 girls; mean age =  $15.4 \pm 1.7$  years). Multiple regression analysis revealed that sensitivity was significantly positively associated with each component of feelings toward nature ( $\beta = .12$  to  $.32$ ). Furthermore, the interaction term between sensitivity and the amount of nature experience showed a marginally significant association with aversion. The simple slope test showed that the amount of nature experience was likely to be negatively associated with aversion only when sensitivity was low ( $\beta = -.21$ ,  $p = .08$ ). These results suggest that prolonged exposure to nature is effective in reducing aversion toward nature for low-sensitivity adolescents. However, for high-sensitivity adolescents, the “quality” of the type of activity may be more important than the quantity. Our findings have implications for outdoor education practices and future research.

**Keywords:** nature experience, feelings toward nature, environmental sensitivity, adolescent

## **Aerobic Capacity, Muscle Strength, and Jumping Ability in Older Recreational Marathon Runners: From Case Studies of 50-, 60-, and 70-Year-Old Runners With Comparable Records**

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**Abstract:** The purpose of this study is to compare the aerobic, muscular strength, and jumping ability of 50-, 60-, and 70-year-old runners with the same level of record of 3 hours and 30 minutes, and to determine their physical fitness characteristics. The five male recreational marathon runners who participated were 48, 50, 52, 60, and 69 years old, and their 2018 marathon annual records were 3:35:04, 3:27:08, 3:29:31, 3:29:18, and 3:30:15, respectively, all at similar levels. Tests to assess maximal oxygen uptake and running economy quantified as oxygen cost of running at given three velocities were performed on a treadmill. Knee joint isokinetic torque in three angular velocities was measured. Squat jump (SJ), counter-jump without and with arm-swing (CJ and CJAS, respectively) and five rebound jumps (RJ) were evaluated from airtime and contact time measured using a mat-switch. The average values of the three runners, all around 50 years old, were compared with those of the 60- and 69-year-old runners. Running economy were 33.3, 29.2 and 39.5 ml/kg/min in the first stage, 39.0, 37.0 and 46.7 ml/kg/min in the second stage and 46.1, 48.9 and 47.9 ml/kg/min in the third stage, respectively. Oxygen uptake were 51.1, 46.7 and 50.0 ml/kg/min, respectively. Knee joint torque were 88.7, 66.0 and 85.0 Nm in extension and 54.3, 49.0 and 43.0 Nm in flexion at 180 deg/sec, respectively. Jump height in CJAS were 29.0, 22.0 and 33.5 cm, respectively. RJ-index were 1.02, 0.65 and 0.96 m/sec, respectively.

**Keywords:** maximal oxygen uptake, running economy, knee joint torque, vertical jump, rebound jump

## **Molecular Epidemiological Research of Newly Viruses Bufavirus and Salivirus Among Children With Diarrhea in Sabah, Malaysia**

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**Abstract:** Every year in the world, many children die from diarrhea caused by pathogenic microorganisms. Norovirus, rotavirus, adenovirus, astrovirus, sapovirus and parechovirus are the main viruses known to cause diarrhea due to viral gastroenteritis, and new viruses such as bufavirus (BuV) and salivirus (SalV) and others have been identified and reported. These are associated with diarrhea and have been reported from Africa, Europe and Asia. In 2018-2019, one case of BuV and one case of SalV were detected in pediatric diarrheal stool samples that were collected from hospitals in Sabah, Malaysia. The objective of the research was to determine the genetic characteristics of these viruses. BuV and SalV were detected by nested PCR and nested RT-PCR, respectively; BuV by amplification of the NS1 region and SalV, by amplification of the 3D region. Virus genome sequences were determined by direct sequencing and phylogenetic tree analysis was performed using MEGA-7.0. In addition, Bayesian phylogenetic analysis was performed using BEAST 2. Both BuV and SalV were detected in one out of 299 samples (0.3%) in each case. Phylogenetic tree analysis revealed that the genotype of BuV was not determined and SalV was classified as genotype A2. Bayesian phylogenetic analysis that BuV was classified as a genotype 1. This indicates that it was evolved approximately 19 years ago from the Burkina Faso BuV1 strain, which was the first strain reported in the world. In addition, SalV was classified as SalV A2, suggesting that it was evolved from a German strain about 32 years ago.

**Keywords:** Bufavirus, Salivirus, diarrhea, epidemiology, children

## Seasonal Variations in Atmospheric Oxidant Levels and Their Effects on the Sex Ratio at Birth on Fukue Island, Japan

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**Abstract:** The sex ratio at birth has been reported to be 1.03-1.07 in many countries. However, the sex ratio at birth was decreased among pregnant women who were exposed to high levels of atmospheric PM2.5. On the other hand, the effects of air pollutants carried from afar by monsoons on the sex ratio at birth in downstream areas have not been evaluated. The objective of this study was to clarify the effects of the atmospheric level of each pollutant on the sex ratio at birth on the Goto Islands. I extracted monthly data of particulate matter 2.5, sulfur dioxide, oxidants, nonmethane hydrocarbons, and methane. In addition, the monthly sex ratio at birth on the Goto islands was calculated. To evaluate the effect of substance exposure just before fertilization on the sex ratio at birth, I analyzed the relationship between the observed pollutant level and the sex ratio at birth 10 months later. Regarding the seasonal variation in air pollutant levels, particulate matter 2.5 ( $r = 0.3655$ ), sulfur dioxide ( $r = 0.2262$ ), and nonmethane hydrocarbons ( $r = 0.3586$ ) tended to have lower levels from summer to autumn. Oxidants had the highest correlation coefficient with the observed months ( $r = 0.5569$ ) and tended to peak in spring and autumn. In addition, as a result of multivariate analysis, the higher the observed oxidant level was, the lower the sex ratio at birth ( $p = 0.047$ ). In conclusion, it was clarified that an increase in oxidant levels just before and after conception may be a risk factor for a lower sex ratio at birth. It is necessary to evaluate the effects of oxidants on various aspects of pregnancy and childbirth.

**Keywords:** oxidant, sex ratio at birth, island

## Association Between Body Composition and Bone Health Among Postmenopausal Japanese Women

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**Abstract:** The purpose of this study was to evaluate the association between body composition and bone mass measured by quantitative ultrasonography (QUS) in postmenopausal Japanese women, on the viewpoint of physiological anthropology. We conducted a cross-sectional study including 577 postmenopausal women ( $69.4 \pm 8.6$  years old) residing in Goto islands, western Japan, at general medical check-up in 2017. The stiffness index (SI) determined by QUS was measured on the right heel using a Lunar Achilles device. Body composition (appendicular skeletal muscle mass and fat mass) was measured using InBody470. Data were collected about current smoking (yes/no), alcohol consumption ( $\geq 20$  g/day), exercise (at least 30 min twice per week) and any comorbidities (heart disease, lung disease, stroke or diabetes mellitus) through interviews. The Jonckheere-Terpstra test was used to evaluate trends among age groups for SI, appendicular skeletal muscle mass, and fat mass. Multiple regression analysis was employed to evaluate the independent effects of appendicular skeletal muscle mass and fat mass on SI. Appendicular skeletal muscle mass and fat mass were positively correlated with SI ( $r=0.176$ ,  $p<0.001$  and  $r=0.270$ ,  $p<0.001$ , respectively). Median of SI and appendicular skeletal muscle mass increased with age group, but not one of fat mass ( $p<0.001$ ,  $p<0.001$ , and  $p=0.174$  for trend, respectively). High appendicular skeletal muscle mass and fat mass were independently associated with high SI ( $B=0.822$ ,  $p=0.043$  and  $B=0.215$ ,  $p=0.026$ , respectively), after adjustment for age, height, comorbidities, alcohol consumption, current smoking and exercise. In conclusion, both appendicular skeletal muscle mass and fat mass were significantly associated with bone mass among postmenopausal women. Variations in body composition and bone mass can help us understand the adaptive capacity of humans to changes in the environment and living conditions.

**Keywords:** bone health, body composition, appendicular skeletal muscle mass, fat mass, postmenopausal women

## Potential Severity of Dengue Fever as Prior Sars-CoV-2 Infection From Bangladesh

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**Abstract:** Dengue fever (DF), caused by the dengue virus, has shown increasing trends, becoming the fastest-growing tropical infectious disease worldwide. While initial COVID-19 pandemic phases saw reduced DF cases, later stages witnessed a surge, particularly in Asian countries, accentuated by environmental disturbances favoring dengue mosquito breeding. Bangladesh, a DF-endemic nation, experienced rising hospitalizations and deaths during the middle and later COVID-19 pandemic phases, with severe manifestations and atypical symptoms were observed. This study examines the potential impact of SARS-CoV-2 antibodies on severe DF outcomes in Bangladesh. Therefore, immunoglobulin measurements against the nucleocapsid protein (N-protein) of SARS-CoV-2 were performed. Analysis revealed that 81% of DF patients during the pandemic had IgG antibodies against SARS-CoV-2 N-protein, with higher titers in severe cases. Notably, a positive correlation existed between higher SARS-CoV-2 IgG titers and severe DF manifestations. No co-infections were detected, but the possibility of antibody-dependent enhancement (ADE) was suggested due to cross-reactivity between the two viruses. In other words, ADE induced by SARS-CoV-2 antibodies might contribute to severe DF. As countries relaxed COVID-19 restrictions and implemented mass vaccinations, the risk of severe DF increased due to widespread SARS-CoV-2 antibodies and conducive environmental factors. Urgent investigation into SARS-CoV-2 antibodies' role in severe DF at the cellular and molecular levels, considering ADE, is crucial for managing hospitalized DF patients.

**Keywords:** dengue fever, SARS-CoV-2 antibodies, severe clinical outcomes, antibody-dependent enhancement, atypical symptoms

## Effects of Positive Feedback From Others in Adults With Autism Spectrum Disorder: An Investigation Focusing On Its Short-Term Effects on the Executive Function

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**Abstract:** Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by social communication deficits, restricted interests, and repetitive or stereotyped behaviors. The social motivation hypothesis suggests that individuals with ASD may have reduced motivation or reward value for social information, impacting their social development, whereas some studies indicate that social information could be rewarding for children with ASD. This study investigated whether social feedback improves response inhibition in adults with ASD, building on previous findings in children with ASD. Participants included 42 adults with ASD diagnosis who performed a social incentive go/no-go task under three feedback conditions: meaningless (providing a mosaic picture for correct and incorrect inhibition), certain-social (rewarding correct inhibition with a happy face), and uncertain-social (presenting a happy face for correct inhibition in most cases but not consistently) feedback conditions. The uncertain-social feedback condition was added to the original task to consider the variability of social feedback provided by surrounding people in society during real-life interactions. False alarm rate and correct reaction times were obtained as indices reflecting inhibitory and executive responses, respectively. The results showed no statistically significant difference in the performance between the feedback conditions, suggesting that the social feedback used in this study did not significantly improve executive function in adults with ASD. Exploratory correlational analysis indicated no significant associations between the attenuated effects of the feedback and clinical symptoms. Although our findings support attenuated effects of social feedback on the performance of executive function in adults with ASD, direct evidence of ASD traits influencing social feedback effects was not observed. Future studies can provide insight into the effects of social rewards in adults with ASD, including the complexity of clinical symptoms in adulthood.

**Keywords:** autism spectrum disorders, social feedback, happy face, response inhibition, neurodevelopmental disorders

## **Effects of Voluntary Exercise on Physiological Indices, Brain Monoamines, and Emotional Behavior in Rats in Group (Pair) Rearing Conditions**

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**Abstract:** Numerous experiments conducted on rodents and humans have shown that exercise is beneficial for physical and mental health. However, most studies in rats have been performed under isolated rearing conditions. The present study aimed to clarify the effects of voluntary exercise on physiological indices, brain monoamines, anxiety-like behavior, and social behavior in paired rats. Male Wistar rats were housed at  $23 \pm 1^{\circ}\text{C}$ , with 12-hour light and dark cycles and free access to food and water. The rats were paired and denoted as either the exercise (in a voluntarily rotating cage) or non-exercise (kept in a normal cage) groups. Before the start of the experiment, a nanotag® device was surgically implanted into the abdominal cavity of rats to measure core body temperature and locomotor activity. After four weeks, the rats underwent open field and social interaction tests or were sacrificed to analyze the levels of monoamines, such as serotonin, dopamine, and noradrenaline, in the cell bodies and several projection areas. Although the results for body weight and monoamine levels in the brain showed that voluntary exercise in paired rearing had favorable effects, the results for core body temperature and emotional behavior indicated that voluntary exercise in paired rearing might increase mental stress. Adding voluntary exercise to the group rearing of rats may cause unnecessary stress; therefore, more appropriate rearing methods must be considered to maximize the effects of voluntary exercise.

**Keywords:** voluntary exercise, group rearing, body temperature, monoamine, emotional behavior

## Investigation of Changes in Physiological Indices, Anxiety-Like Behavior, and Brain Monoamines in Rats Subjected to Rotating Shift Work Model

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**Abstract:** Shift work has been reported to cause a misalignment between the biological clock and everyday life, increasing the risk of diseases such as cancer, hypertension, obesity, stroke, circulatory and digestive diseases, sleep disorders, and depression. However, we are yet to understand the changes in brain monoamines, which regulate various biological functions, during shift work. The present study aimed to clarify the effects of shift work systems on physiological indices, anxiety-like behavior, and brain monoamines in rats. Male Wistar rats were housed at  $23 \pm 1^\circ\text{C}$ , with 12-hour light and dark cycles and free access to food and water. The shift work group experienced day and night shifts and holidays, whereas the day shift group experienced only day shifts and holidays. Before the start of the experiment, a telemetry device (TA11TA-F40, Date Science) was surgically implanted into the abdominal cavity of rats to measure the core body temperature, heart rate, and locomotor activity. After one week of working, open field tests were conducted to measure anxiety-like behavior. After another week, the rats were sacrificed to analyze brain monoamines in the cell bodies and several projection areas containing serotonin, dopamine, and noradrenaline. Stress-related adrenal glands and the thymus were also removed. The content of monoamines in the brain varied with working conditions. The results of the open field tests showed a decreasing trend in the central spending time in the shift work group compared to that of the day shift group. Moreover, the thymus mass and body weight ratio were significantly lower in the shift work group than in the day shift group. These results suggest that shift work can cause higher levels of stress.

**Keywords:** shift work, circadian rhythm, physiological indices, anxiety-like behavior, brain monoamines

## **Evaluation of New Physical Fitness Measurement Items for Elderly People Living in the Community - Standing Motor Function Measurement (zaRitz) and Twisting Strength Measurement**

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**Abstract:** The purpose of this study was to confirm the validity of a new functional measurement system, standing motor function (kinetic function) and wrist twisting force (twisting force), as a test of physical fitness among elderly participants in a health exercise class. Physical fitness was measured in female community-dwelling elderly people aged 65 to 90 ( $\pm 5.95$ ) who were participating in two health exercise classes for care prevention conducted in Miyazaki City. In this study, in addition to the usual physical fitness measurement events (grip strength, standing up, normal and maximum speed walking), body composition (skeletal muscle mass index, SMI), motor function, and twisting strength, which are not usually measured, were also measured. As a result, only grip strength (.536,  $p<.01$ ) showed a correlation with SMI, while the other measures showed no relationship. Motor function was correlated with rise (-.391,  $p<.05$ ), grip strength (.689,  $p<.01$ ), maximum speed walking (.471,  $p<.01$ ), and twisting strength (.578,  $p<.01$ ). Twisting strength correlated with motor function (.578,  $p<.01$ ) and grip strength (.728,  $p<.01$ ). Motor function was correlated with many of the measured events, suggesting that it can be used as a substitute when other events cannot be performed. Twisting strength had a high correlation with grip strength, but had a low correlation with SMI, indicating that grip strength is the most necessary for movements such as opening the lid of a plastic bottle.

**Keywords:** elderly people, physical fitness measurement, skeletal muscle mass index (SMI), standing motor function (kinetic function), wrist twisting force

## Are Genes Under Positive Selection in High Latitudes Associated With Brown Adipose Tissue Activity in East Asians and Contributing to Cold Adaptation?

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**Abstract:** Humans had been encountering cold environments during their migration from Africa to various regions worldwide, and genetic adaptation had been necessary to withstand cold stress. Population genetic analyses have been conducted to find evidence for the adaptation to cold environments and identified promising candidate genes with signatures of positive natural selection in populations at high latitudes. However, it is not clear whether these candidate genes are related to the ability of cold adaptation in humans. To clarify this, the present study focused on the brown adipose tissues (BAT), which are responsible for non-shivering thermogenesis in humans, and investigated whether single nucleotide polymorphisms (SNPs) in the candidate genes of the cold adaptation are associated with the variation in thermogenesis. BAT activity was measured in two independent groups: 399 healthy Japanese adults and 84 healthy East Asian adults under cold exposure using fluorodeoxyglucose-positron emission tomography and computed tomography (FDG-PET/CT) and infrared thermal camera, respectively. Furthermore, we quantified cold-induced thermogenesis (CIT) and lipid oxidation (FO) in a subgroup of 56 male participants of the FDG-PET/CT cohort. Genomic DNA samples were collected from these participants, and SNP genotyping was performed for SNPs of five candidate gene regions, ANGPTL8, PLA2G2A, PLIN1, TBX15- WARS2, and LEPR, all of which had been identified in previous population genetic studies. In the subgroup, individuals with the G-allele carrier of the rs2298080, located between TBX15 and WARS2, exhibited diminished CIT, FO, and BAT activity compared to A-allele homozygous individuals. However, neither of the two groups showed any association between the SNPs of these candidate genes and BAT activity when analyzing all the samples. In summary, there was no robust evidence substantiating the involvement of these candidate genes in cold adaptation through the activity of BAT.

**Keywords:** cold adaptation, metabolism, single nucleotide polymorphism, brown adipose tissues, non-shivering thermogenesis

## Alterations in Oral Microbiota of Differentiated Thyroid Carcinoma Patients With Xerostomia After Radioiodine Therapy

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**Abstract:** Oral xerostomia remains one of the most common complications of differentiated thyroid carcinoma patients (DTC) after radioiodine therapy (RAI). Environmental factors in the etiology of xerostomia are largely unknown. We aimed to characterize the oral microbiota signatures and related biological functions associated with xerostomia and identify environmental factors affecting them. Saliva was collected from 30 DTC patients with xerostomia (XAs), 32 patients without xerostomia (indicated as non-XAs) following RAI after total thyroidectomy, and 40 healthy people (HCs) for 16S rRNA sequencing analysis. The oral microbiota of XAs and non-XAs exhibited significant differences in  $\alpha$  and  $\beta$  diversities and bacterial taxa. The abundance of *Porphyromonas*, *Fusobacterium*, and *Treponema\_2* was significantly higher in XAs, while the abundance of the *Streptococcus* was lower in the microbiota of non-XAs. *Fusobacterium* and *Porphyromonas* were negatively correlated with unstimulated/stimulated whole salivary secretion (USW)/(SWS), while *Fusobacterium*, *Porphyromonas*, and *Treponema\_2* genera levels were positively associated with cumulative radioiodine dose. PICRUSt2 and BugBase suggested a significant difference in the expression of potentially pathogenic, anaerobic, gram negative, the arachidonic acid metabolism, and lipopolysaccharide (LPS) biosynthesis between XAs and non-XAs, possibly interdependent on radioiodine induced inflammation. NetShift analysis revealed that *Porphyromonas* genus might play as a key driver during the process of xerostomia. Five genera effectively distinguished XAs from non-XAs (AUC = 0.87). Our study suggests for the first time that DTC patients with xerostomia after RAI display microbiota profiles and associated functional changes that may promote a pro-inflammatory environment. Dysbiosis of the oral microbiota may contribute to exacerbating the severity of xerostomia. Our results provide a research direction of the interaction mechanism between oral microbiota alteration and the progress of xerostomia.

**Keywords:** oral microbiota, xerostomia, differentiated thyroid carcinoma, radioiodine therapy

## Exploring the Correlation Between Attention-Deficit/Hyperactivity Disorder (ADHD) Traits and EEG Activity During Tasks in Sleep Deprived States

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**Abstract:** The relationship between Attention-Deficit/Hyperactivity Disorder (ADHD) and sleep has garnered significant attention because ADHD patients often experience severe and frequent sleep disruptions. Additionally, ADHD and sleep deprivation have similar brain regions that are less active. Some studies suggest that adults with ADHD are particularly susceptible to the negative impact of sleep deprivation on attentional processes. Therefore, individuals with a high tendency for ADHD may experience a significant aggravation of ADHD-like symptoms during sleep deprivation, adversely affecting mental functioning. This study specifically focused on P300, an event-related potential (ERP) linked with attention and investigated the correlation between EEG and ADHD traits during the Iowa Gambling Task (IGT) under sleep-deprived circumstances. For this study, we recruited 21 healthy male undergraduate and graduate students, classified into high, medium, and low ADHD symptom groups based on results based on the Conners' Adult ADHD Rating Scale (CAARS). Following a sleep control period at home, we conducted two conditions in a crossover design: one involving sleep-sufficiency condition (8 hours of sleep) and the other inducing sleep deprivation. The experiment day included an IGT performed at 13:00, after attaching electrodes for EEG measurement. Calculating the average amplitude of P300 at the Fz, Cz, and Pz electrodes was triggered by the feedback of the acquired reward. Conducting a three-way ANOVA with ADHD symptoms, sleep conditions, and electrodes as factors revealed an interaction between ADHD symptoms and electrodes. The interaction between ADHD symptoms, sleep conditions, and electrodes was a significant trend. The results indicate that a combination of ADHD symptoms, sleep conditions, and electrode factors may influence attentional function during IGT.

**Keywords:** attention-deficit/hyperactivity disorder (ADHD), sleep deprivation, EEG, Iowa gambling task (IGT)

## A Study on Estimating Modalities of Attention Using Machine Learning

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**Abstract:** In recent years, machine learning has been applied to EEG decoding techniques, and research has been conducted to discriminate human mental states and cognitive processing states. However, few studies have focused on differences in the modality of attention (visual or auditory). The aim of this study is to develop a machine learning algorithm that can estimate whether a person's attention is focused on visual or auditory modalities from event-related potentials (ERPs) during a task. The methods used were a visual counting task, an auditory counting task, and a task in which participants were presented with stimuli of both modalities simultaneously and attended to only one of them. A 64-channel electroencephalograph (EEG) was used to measure the EEG. The EEG obtained in each task was divided into epochs of -200 ms to 600 ms based on the stimulus presentation, and ERPs were calculated using tens to hundreds of randomly extracted epochs from all epochs. 100 patterns of ERPs were created. A binary discrimination algorithm was constructed with the modality (visual or auditory) as the objective variable. The data obtained from the simultaneous presentation task were used as the objective variable. The explanatory variable is an index of ERPs calculated from each of the ERPs generated. The data obtained in the visual and auditory tasks were used for the explanatory variables. The variable selection methods Boruta and Random Forest were used to construct the algorithm. The results of the experiment on eight subjects showed that the average percentage of accuracy was  $69.6 \pm 0.142\%$ , which is above the chance level of 50%. By exploring machine learning methods and useful ERP metrics, the establishment of this technique could make a significant contribution to the advancement of brain-computer interface research, which is often the goal of EEG decoding.

**Keywords:** machine learning, modality, ERP (event-related potential), 64-channel EEG, BCI (brain-computer interface)

## Physiological and Psychological Influence of Wooden Interiors in School Classrooms on Junior High School Students

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**Abstract:** In general, wood is considered to have an affinity for humans. Several studies on adults have demonstrated this possibility including a stress-reducing effect. Thus, incorporating wood into the living environment may contribute to children's mental and physical well-being as well. However, few studies have examined the relationship between children and wood. Therefore, we investigated the relationship between children's psychological and physiological responses and wooden classrooms, as one of the spaces where children spend a long time. The experiment was conducted in two wooden interior and two non-wooden interior classrooms in a junior high school in Japan in December 2022. The participants were 144 students in the second grade using the above-mentioned classrooms. Temperature and humidity were measured at 0.1m, 1m, and 2m above the floor in the classrooms. Subjective evaluations using 7- or 9-grade scales on concentration, fatigue, comfort, drowsiness, warm/cool sensations, etc. were collected after each class. Mood state scores using Profile of Mood State 2<sup>nd</sup> Edition were collected once on the final experimental day. Pulse rate and blood pressure were measured at 8:15, 10:30, 13:00, and just before leaving the school. The amount of physical activity was measured over time while the students were in the school. The pulse rate was high in the morning and lowered during the daytime. Its variation over time was similar in both wooden and non-wooden classrooms. As to the mood states, the students using wooden classrooms showed lower Total Mood Disturbance score than the students using non-wooden classrooms did. In addition, the students using the wooden classrooms tended to show higher T-score on Friendliness. To summarize, wooden interiors in school classrooms may positively affect the students especially in terms of mood states. In this survey, significant differences were observed in the psychological scales, rather than in the physiological indicators.

**Keywords:** children, wooden classroom, mood state, pulse rate, actual environment

## The Effects of Intake of Lo-ca-bo Nuts for a Week on AGEs and Health Outcomes

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**Abstract:** A low carbohydrate diet can reduce the advanced glycation end products (AGEs), and it is assumed to have a positive effect on metabolic syndromes, locomotive syndrome and the appearance of aging. Thus, intake of low carbohydrate nuts (Lo-ca-bo nuts) would reduce AGEs and improve health. This study aimed to examine the effects of intake of Lo-ca-bo nuts on AGEs and health outcomes. One hundred Japanese people were randomly divided into experimental and control groups. The intervention group consumed 30 g of Lo-ca-bo nuts, which is rich in omega-3 fatty acids, vitamin E, and oleic acid, before daily meals for a week. TAS 9 VIEW (YKC, Tokyo, Japan) was used to index of autonomic nervous activity. Total power (TP), low frequency (LF) power, high frequency (HF) power were calculated and these values were expressed in natural logarithm (Ln). Glycation was calculated as auto fluorescence values deposited in approximately 1 mm of the epidermis and dermis layer using a final glycation product measurement scanner (Serista, Inc.). Body composition (body mass, body fat mass, and muscle mass) was measured by Inbody 470 (Inbody, Inc.). A two-way ANOVA (group × time) was conducted with a significance level of less than 5%. AGEs ( $p < .000$ ) and body fat mass ( $p < .000$ ) after interventions were significantly lower than those before interventions. No significant differences were observed for autonomic nervous activity, body mass, and muscle mass. Although the intervention duration was short (i.e., a week), the present study showed that intake of Lo-ca-bo nuts can reduce AGEs and body fat mass. Further studies are needed to investigate the effects of intake Lo-ca-bo nuts for long-term on physical and mental health.

**Keywords:** nuts, AGEs, body fat mass

## Can the NEO HEALER Improve the Blood Status and Autonomic Nervous Activity in Older Adults?

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**Abstract:** Improvements in the blood status and autonomic nervous activity are important to prevent lifestyle diseases such as hypertension and cerebrovascular disease in older adults. Neo Healer is a compact 70 mm square, 330 g massage device that generates magnetism and weak electric currents to heal the body by placing it on the body and moving it on the skin. Neo Healer treatment can provide health benefits such as muscle relaxation in athletes and improvements in the lifestyle and blood status in young adults. Therefore, the purpose of this study was to examine the effects of Neo Healer treatment on the blood flow and autonomic nervous activity in older adults. Thirty-two elderly people ( $74.4 \pm 10.2$  year) were randomly divided into experimental and control groups. The intervention group performed self-massage with the Neo Healer (Intention, Inc.) for 40 minutes once a week for a month. Blood cell components were measured using a dark-field microscope (Ubiqe Microscopetm, Wismerll Inc.) immediately after blood collection, and evaluated by a 6-point scale ranged from 0 (worst) to 5 (best). A laser blood flow meter (ATBFII-LN1; Unique Medical, Inc.) was used to measure blood flow. A TAS 9 VIEW (YKC, Tokyo, Japan) was used to index of autonomic nervous activity. Total power (TP), low frequency (LF) power, high frequency (HF) power were calculated and these values were expressed in natural logarithm (Ln). Blood cell components ( $p=.000$ ), blood flow ( $p=.000$ ), LnTP ( $p=.000$ ), Ln LF ( $p=.000$ ), and Ln HF ( $p=.000$ ) after interventions were significantly higher than these before interventions. Neo Healer can significantly improve the blood condition. It would be interesting to determine whether long-term Neo Healer treatment can improve various lifestyle diseases.

**Keywords:** NEO HEALER, blood flow, blood cell, autonomic nervous activity, older adults

## The Effect of the Bone Strengthen Exercise on Posture and Physical Function in Older Adults

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**Abstract:** Osteoporosis affects 200 million people worldwide and 14 million people in Japan. It is a serious problem for older adults because weakened bones cause various physical problems. Bone weakening has been reported to cause not only frequent fractures but also skeletal distortions such as rounded shoulders. Therefore, the purpose of this study was to examine the effects of bone strengthen exercise on physical function and posture in older adults. Fifty Japanese females (age:  $73.9 \pm 8.4$  years) were randomly divided into experimental and control groups. The Bone strengthen exercise was implemented during the "Hiroshima GENKI Gymnastics Class" organized by Co-op Hiroshima. The experimental group underwent the Bone strengthen exercise for 40 min once a week over the course of 3-month. The Bone strengthen exercise was designed to apply mechanical loads and vibration to the bones of the whole body. This training was performed through supervised sessions (group training). The inclination of 24 major joints of the body related to rounded shoulders, walking speed during a 6-m walk, stride length, two-step test, and speed of sound (SOS) as a quantitative ultrasound parameter of bone were measured before and after the 3-month intervention. After the exercise, the experimental group significantly increased the four joint angles (anterior-posterior tilt of upper body, head, and pelvis and knee;  $p < .05$ ), two step test ( $p < .01$ ), and SOS ( $p < .05$ ). The bone strengthen exercise improved posture, walking ability, and SOS, which were consistent with the previous results that this exercise improved SOS and gait speed in persons requiring nursing care. Postural improvement was not measured in persons requiring nursing care, and, thus, future studies are needed to verify the effectiveness of the bone strengthen exercise in persons requiring nursing care.

**Keywords:** posture, SOS, gait speed, older adults

## The Effects of Focused on Swimming Skill on Swimming Records and Mental Health in a University Swimming Class

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**Abstract:** The purpose of this study was to examine the effects of a university swimming class focused on swimming skill on swimming records and mental health. Thirty university students participated in a 180-min swimming class once a week for two months. The first 30 minutes were preparatory exercises with attention to increasing joint range of motion, 120 minutes were spent on technical training for the crawl, breaststroke, backstroke, and butterfly stroke, and 30 minutes were spent watching videos on on-demand swimming techniques. Crawl and breast style times were measured 50m distance, and back style and butterfly times were measured 25m distance. Mental health was measured by “Sensibility technology ST Emotion” (AGI Japan Inc.) which was evaluated on 10-point scales of calmness, anger, joy, sorrow, and excitement. Crawl ( $p=.000$ ), breaststroke ( $p=.000$ ), backstroke ( $p=.000$ ), and butterfly stroke ( $p=.000$ ), calmness ( $p=.006$ ), joy ( $p=.001$ ), sorrow ( $p=.007$ ), after swimming classes were significantly improved compared to before swimming classes. No significant differences were observed for anger and excitement before and after the swimming classes. The results of this study indicate that a university swimming class focused on swimming skill for 180 min is effective in improving swimming performance. In addition, the increase in pleasant feelings in mental health can be attributed to the reduction in time due to improved techniques. Thus, the swimming class can be very useful in improving mental health feelings and student motivation.

**Keywords:** swimming, mental health, health, physical education

## Mirror System Activity During the Observation of Dependency-Related Behavior: A Study on Smartphone Addiction

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**Abstract:** Dependence on specific substances or behaviors that becomes difficult to quit has been associated with the degeneration of cortical and neural networks. Previous research has indicated differences in the activity of the mirror system between dependents and non-dependents. The mirror system is neural network that is active in both executing and observing actions, and it is associated with the neural representation of observed behaviors and the understanding of others' actions. It is measured by the desynchronization of the central alpha-band rhythm known as mu suppression. This study focused on smartphone addiction, a behavioral addiction that does not involve substance intake, to investigate how dependency itself affects the mirror system. Twenty-one university students were divided into dependent and non-dependent groups using the Smartphone Addiction Scale-Short Version (SAS-SV). Participants were then tasked with observing addiction-related stimuli (holding a smartphone) and neutral stimuli (holding a remote control) under two different conditions: one with no specific instructions and another with a situational explanation that they were searching for a remote control. The brainwaves were measured during the observation tasks, and mu suppression was examined. The results showed that under the condition with no instructions, there were no significant differences between the two groups. However, under the condition with instructions, the dependent group exhibited stronger mu suppression in response to addiction-related stimuli. The differences in mu suppression between the groups under conditions that directed attention to neutral stimuli suggest the potential influence of dependency tendencies on mirror system activity, regardless of substance intake. In summary, this study highlights the influence of addictive tendencies on neurological responses by focusing on the repercussions of smartphone addiction, a type of behavioral addiction, on the mirror system. Additionally, it suggests the potential use of mu suppression as an indicator of neurological alterations related to addiction.

**Keywords:** brain activity, mirror system, mu suppression, EEG, behavioral addiction

## Spatiotemporal Analysis and Mortality Risk Factors of Melioidosis Cases in Sabah

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**Abstract:** Melioidosis is an opportunistic disease that affects humans and animals caused by *Burkholderia pseudomallei*. The disease is presented with various clinical vignettes and is highly associated with a high mortality rate. The microorganism can withstand extreme conditions to survive. The study aims to analyse the sociodemographic characteristics of melioidosis cases and risk factors associated with the mortality cases in Sabah from 2016-2020. In addition, this study aims to topographically plot melioidosis cases in Sabah to observe the distribution and its environmental association, including temperature, rainfall and soil type. This study was a two-part study. The first part was a cross-sectional study to identify the risk factors of mortality by using logistic regression, whereas the second part used a Geographic information system (GIS) to plot the case using longitude and latitude. The disease data from Sabah State Health Department (JKNS) was integrated with the open-source meteorological and soil-type data to observe the relationship of disease distribution and environmental elements. The study found immunocompromised, gout and bacteremia as risk factors for melioidosis mortality. Autocorrelation Cluster analysis recognised the presence of clusters of melioidosis cases in Sabah. There was a moderate correlation between melioidosis cases with rainfall distribution in the state. Melioidosis is a complex eco-sociological associated disease that is unique and warrants more understanding through future research and development.

**Keywords:** melioidosis, mortality, risk factors, GIS, environmental factors, Sabah

## ***Mycobacterium tuberculosis* Complex and the Environmental Factors: A Geospatial Risk Assessment in Sabah Malaysia**

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**Abstract:** One-third of the world's population is infected with the *Mycobacterium tuberculosis* complex (MTBC), a leading cause of death in humans and animals. Environmental transmission indirectly affects their well-being, impacting their overall health. Sabah has recorded high TB cases in Malaysia and established several geographical hotspots. Geographical information systems (GIS) and spatial analysis were utilised to identify the distribution pattern and possible factors of TB in the state. The TB cases in 2013 were ethically collected from Ministry of Health Malaysia, while the base map was obtained from ArcGIS platform. These datasets were analysed and map using spatial statistics toolset in the platform. The distribution of TB cases was focused on the districts of Kota Kinabalu (719 people), Sandakan (526 people) and Tawau (457 people). Kota Kinabalu held for the hotspot areas of TB in Sabah, which was 16% higher compared to the other 22 districts in the state. The pattern distribution of the cases was clustered, which was also a similar pattern that occurred in the Kota Kinabalu, with a Z score of the test statistics -39.55, and the critical value of z distribution for significance level was  $\alpha = 0.01$  and -2.58. The epidemic scenarios in Sabah were influenced by spatial characteristics, with Kota Kinabalu being the highest population district with 462,963 people and a strong correlation of 0.94. Sandakan and Tawau also had the highest population and TB cases. Correlation analysis showed a strong positive relationship between age, risk factor, and number of cases for children, adults, and elders. The disease was identified as an epidemic, especially among more individuals in the population and high-density housing urban areas. The geospatial approach could be empirically used for describing the spatial pattern and risk factors of TB cases and hotspots.

**Keywords:** *Mycobacterium tuberculosis* complex (MTBC), environment, spatial pattern, risk factor assessment, GIS analysis

## Mapping of HTLV-1 exposure in the Sabah state of Malaysia

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**Abstract:** HTLV-1 is endemic in Japan and has been identified in neighboring countries. However, it is not well documented in the Southeast Asian countries where the travel and trade with Japan are known for long period of time. As a result, the distribution of HTLV-1 is ill-defined. Therefore, to explore further we produced maps to identify hotspots of HTLV-1 exposure in two areas of Sabah state of Malaysia. Serum samples were collected from rural areas of Kudat district between October 2014 and January 2015. Serological evaluation of HTLV-1 infection was performed with particle agglutination method (Fujirebio, Tokyo, Japan) and the diagnosis was confirmed with line-blot (Fujirebio, Tokyo, Japan). Geographical distribution of prevalence was visualized using open-source GIS software. Similar prevalence [3.6% (39/1036) and 3.0% (23/749)] of HTLV-1 positivity was detected in samples from Kudat area and Banggi island. In total 3.3% (62/1,868) of the samples were positive for HTLV-1. No obvious spatial clustering was detected in Kudat, however there was a possible cluster on South coastal area Palau Banggi. Most households had zero prevalence, some moderate prevalence, and occasionally high household prevalence. We hereby report the distribution of HTLV-1 prevalence in two areas of Sabah, Malaysia. More studies are needed to reveal the detail picture of geographical distribution of HTLV-1 antibody positivity.

**Keywords:** HTLV-1, prevalence, mapping, Sabah, Malaysia

## **Molecular Characteristics and Spatial Distribution of Rotavirus Among Children Under 5 Years Old in Papar, Sabah**

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**Abstract:** Rotavirus is often described as a 'democratic' virus because of the ability to cause infections in every child under 5 years of age and about 70 combinations of human G and P genotype have been reported worldwide. The main objective of this study was to determine the burden of human rotavirus genotypes circulating in Papar and establish a mapping of reliable data on these different rotavirus genotypes. The research design was cross sectional, and 90 stool samples were collected from the study participants who were identified by clinicians in outpatient departments. Stool samples were tested for Rotavirus group A (RVA) antigen using available rapid test kit, G and P genotypes were determined by RT-PCR using specific primers, the nucleotide sequence of the amplicons was determined by Sanger sequencing and phylogenetic analysis was performed by neighbor-joining method. Rotavirus was identified in four (4.4%) children with watery diarrhea. The male:female ratio (1.7:1) clearly showed that it affected mostly male, and children 24-35 months of age (n=31) were more likely to be affected with rotavirus infection. The genotypes identified were G6P[9] (4.4% n=4). The spatial analysis showed that the diarrhea cases distribution in Kinarut was higher compared to KKIA Papar and Bongawan. The G6P[9] genotype distribution was Kinarut (3.3% n=3) and KKIA Papar (1.1% n=1). The study revealed that unique RVA genotypes detected in human because serotype G6 and P[9] have a wide distribution in animal species and it is uncommon in human. Geographical space and human behaviors pattern explained the outcomes in Papar population. Continuous surveillance of rotavirus strains is important because such strains may become important human pathogen once they have adapted to replication in humans.

**Keywords:** rotavirus, burden, genotype, uncommon, strains

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