



# The Physiological Society of Sri Lanka

## NEWSLETTER

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### PSSL Council 2013/2014

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### Presidents Message

It is with great pleasure that I extend my warm greetings to you via this PSSL Newsletter.

Each New Year brings a time of reflection on the past and planning for the future. This year I have the opportunity to continue the work of the PSSL and doing so, further the objectives of the PSSL while being true to our core values.

We have to strive to improve our multiple roles as teachers, researchers and service providers as Physiologists in Sri Lanka. The PSSL has a function to bring together Physiologists and other interested colleagues in Sri Lanka and abroad to work with and learn from each other to achieve excellence in our multiple roles. We all are teachers of Physiology in a rapidly evolving field of medical education, researchers in a country with limited research funds and service providers often juggling to offer excellence with limited financial and other support. Learning from each other by communicating our successes and getting help to trouble shoot our problems is always needed and this newsletter is one such method available to physiologists in Sri Lanka.

I hope that we can all continue to support this newsletter by contributing articles as well as using it as a sounding board for ideas that can be discussed by the membership of the PSSL. I also hope that you recommend this to all your colleagues to make this newsletter a vibrant 'must read' for all scientists interested in Physiology.

Dr. Deepthi de Silva

President, PSSL

## Editorial

### **Broadening the horizon of Physiology through PSSL**

The Physiological Society of Sri Lanka (PSSL) which was started in 1987 as a small society with a membership of less than 50 is growing in all dimensions.

In the initial years, the major events in the annual calendar of the society were its annual sessions and the two prestigious orations to commemorate the two great physiologists, Professors K N Seneviratne and A C E Koch.

The 3<sup>rd</sup> conference of the South Asian Association of Physiologists (SAAP 3) held in Sri Lanka in November 2012 was a landmark event of the PSSL. Although the members of the society had been in continuous contact with the International Physiological Societies, SAAP 3 opened the opportunity to almost all local physiologists to interact and share scientific knowledge with their overseas colleges, especially those in the SAARC region.

Presently, the 'Physiology family' is kept diligent by the addition of many interesting annual events to its calendar. Regional meetings not only advance knowledge, but inculcate fellowship and stimulate strong bonds between physiologists of different universities. Interuniversity Physiology Quiz which was started in the year 2013 is targeted at the young brains of medical undergraduates to enhance the interest in the field of Physiology.

The future of the PSSL looks bright. The registration of SAAP secretariat in Sri Lanka will facilitate regional collaboration while holding PSSL in the center. Attracting new members through an active membership drive, involving non-medical physiologists to the regular activities of PSSL, strengthening the collaborations on physiology teaching and research between physiologists in different local and international institutions, and making use of the knowledge of PSSL members for the betterment of society are some of the other potential avenues that cross my mind to broaden the horizon of this great field of physiology.

Dr. Sudharshani Wasalathanthri

Editor, PSSSL

### **Upcoming Event**

## **2<sup>nd</sup> Inter – medical Faculty Physiology Quiz – 2014**

Date : 7<sup>th</sup> June 2014

Time : 9.30 a.m.

Venue : Faculty of Medicine, University of Kelaniya, Ragama

**Join us to witness the excitement!**

## Regional Meeting of the Physiology Society of Sri Lanka

Faculty of Medicine, University of Ruhuna, Karapitiya, Galle.

The regional meeting of the Physiological Society of Sri Lanka was held on the 5<sup>th</sup> April 2014. More than 25 participants were in attendance which included academics from the Faculties of Medicine in Colombo, Kelaniya, Jayewardenepura, and Jaffna in addition to the host institution.

Dr. Deepthi de Silva, President of the PSSL gave the welcome address.



The welcome address was followed by the Introduction to the Department of Physiology, Faculty of Medicine, Karapitiya. Dr. R.J Lenora, Head, Department of Physiology gave a brief overview of

the activities of the Physiology Department while highlighting the organizational structure of the Department, details of the members of the academic and non academic staff, research activities and the services offered to the public that includes performing diagnostics tests such as EMG's.



The next item was a symposium on "Physiology teaching" with two resource persons viz. Dr. K D Mahinda, Senior Lecturer at the host institution and Dr. Madawa Chandrathilake, Senior Lecturer in Medical Education at the Faculty of Medicine, Kelaniya.

Dr. Mahinda in his presentation raised some issues inherent to traditional teaching methods and



outlined the reasons for transition into contemporary teaching/learning strategies in Medical education. He also mentioned some trends in Medical Education such as Holistic education, active learning, collaborative learning, cooperative learning, learning in small groups, reflective practices and learning through clinical scenarios.

Dr. Madawa Chandrathilake emphasized the importance of standardizing Physiology teaching in the Medical Faculties in Sri Lanka while stating that the academics have a moral obligation of ensuring equality of knowledge in the medical graduates who spend their formative years of their medical careers in the pre clinical setting. Dr. Chandrathilake mentioned several techniques for subject benchmarking such as Delphi method, nominal group method and consensus conference.

The two presentations were followed by a lively discussion with contributions from academics that were present. Prof. Susirith Mendis cautioned against over enthusiastic transition to modern learning/ teaching methods in medical education and stated that some important aspects of traditional teaching should be retained. Prof. Sivapalan noted difficulties faced by the Physiologists in promoting active learning among the

students as they are just after their A/L's who are yet to get over the "tuition" system.

After refreshments, Prof. K G Somasiri delivered a guest lecture titled "Do we fool our special senses and compromise health?" where he mentioned that manufacturers intentionally add various additives and preservatives to commonly consumed food items that tempt us to buy them because these artificial substances are tailor-made to fool our special senses. Prof. Somasiri noted that ultimately artificial chemicals could have numerous detrimental effects on our health ranging from food allergies to cancers.

The guest lecture was followed by a symposium of ethics with Prof. Susirith Mendis and Dr. Arosha Dissanayake as presenters.

Prof. Susirith Mendis gave a thought provoking talk on "Qualities of virtue in medicine" where he outlined the importance of role models for medical students to emulate.

He suggested that medical teachers should attempt to imbibe "humanistic skills" in medical students who would retain these skills once they become medical professionals.

Dr. Arosha Dissanayake, Senior Lecturer in Medicine at the host institution did a presentation titled "Ethics in the life of a Physiology teacher" where he summarized the application of ethical principles in the three domains of the PSSL motto "teach, "Search and serve".

The regional meeting was concluded with a "Vote of Thanks" by Dr. Lakmali Amarasiri, Secretary, PSSL. After lunch a social program was organized which included a guided tour of the Galle fort and the maritime museum.

Write-up:

Dr. Nalinda Silva  
Member, Executive Committee, PSSL

## ANNOUNCEMENT

4<sup>th</sup> Biennial Conference of South Asian Association of Physiologists (SAAP)  
&  
3<sup>rd</sup> National Convention of Bangladesh Society of Physiologists (BSP)

**Will be held on 5 – 7 December 2014**

at Bangabandhu Sheikh Mujib Medical University (BSMMU),  
Dhaka – 1000, Bangladesh

**Theme : Advancement of Physiology from Research to  
Clinical Practice**

## 'The Mind against Time'

### Age-Related Changes of Brain and Cognition

**Dr. Tharaka Dassanayake**

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Cognitive functions include perception, attention, learning and memory, and executive functions such as planning, decision making, task-switching and inhibitory control. Age-related changes of these faculties closely follow the neural and neurophysiological changes of the brain (Riddle, 2007).

#### Neural changes of normal ageing

Neural changes of ageing include decline in grey matter and white matter volume and degenerative changes in neuroglia. Decline in grey matter volume in normal ageing seems to be primarily due to reduction in synaptic densities rather than loss of brain cells. This reduction is not uniform. The most prominent decline is seen in pre-frontal areas. According to cross-sectional estimates this occurs at a rate of ~ 5% per decade throughout the adult life-span. Age-related decline pre-frontal cortex (PFC) volume is associated with poor cognitive performance, particularly in executive functions and working memory. Striatum, which has close connections with the PFC through fronto-striatal networks, also shows a decline of about 3% per decade. Smaller, but significant changes are observed in medial temporal lobe structures such as hippocampus, especially after the 6-7th decade. Compared to pre-frontal and striatal regions, other areas such as primary visual cortex show minimal age-related shrinkage.

White matter volume also declines with advancing age. Diffusion tensor imaging studies show a predominant decline in white matter in PFC and anterior corpus callosum. White matter changes are histologically marked by axonal degeneration and degenerative changes of the myelin sheaths. Studies in monkeys show that these microscopic changes in

prefrontal and callosal regions correlate with their cognitive performance.

Numerous degenerative changes have been observed in the neuroglia in the ageing brain. Electron micrography demonstrates different intracellular inclusions in astrocytes (bundles of filaments), microglia (electron-dense debris) and oligodendrocytes (dense inclusions). Changes in oligodendrocytes are followed by degenerative changes in myelin. Resulting reduction in the conduction velocities contributes to a generalised slowing of cognitive processes.

#### Age-related changes of brain activity: neurophysiological evidence

Age-related changes in neurophysiology have been studied extensively in hippocampal neurons. With ageing, changes occur in both *synaptic transmission* and *neuronal activation*. Glutamate, acting through the NMDA and AMPA receptors, plays a major role in hippocampal memory consolidation and thus learning. The number of glutamate receptors and the amount of pre-synaptic neurotransmitters remain largely unchanged in old age, yet the responsiveness of postsynaptic neurons to the neurotransmitters and neuromodulators is reduced. Rodent studies show that in old animals, the after-hyperpolarisation (AHP) phase of the CA1 neurons of the hippocampus is prolonged and of larger amplitude. Larger, prolonged AHP reduces the chances of the neuron reaching the firing threshold level thus restraining the firing frequency of the cell. These membrane potential changes, combined with decreased responsiveness of post-synaptic cells to neurotransmitters could thus impair long-term synaptic potentiation (LTP) and memory consolidation in the ageing brain.

The activity of neurotransmitters of the fronto-striatal networks, particularly dopamine, is also found to be impaired with ageing. Dopamine concentration, D2 receptor density and dopamine transporter availability decrease with increasing age. PET studies implicate striatal D2 receptor binding as a correlate of episodic memory performance. Frontal

serotonergic (5-HT<sub>2</sub>) receptors also decline with advancing age. This depletion of neurotransmitter activity, along with structural changes seems to be the main reason for generalised reduction in processing speed.

Cognitive event-related potentials (ERP) have been used to study age-related changes of psychophysiology. A general rule in ERP interpretation is that an ERP component represents a particular cognitive process. The ERP component latency indicates the time taken for a cognitive process and the component amplitude indicates the amount of neuronal resources allocated for the process. Ageing is consistently associated with delayed peak latencies and/or reduced peak amplitudes of ERP components related to sensory memory, attention, working memory and executive functions. These findings are consistent with behavioural changes of the ageing mind and neuroanatomical changes of the ageing brain.

There is an individual variability in age-related cognitive changes. Some high-functioning elderly perform as good as the young in certain cognitive tasks. Functional neuroimaging shows that more brain areas are activated in these elderly during the task. This extra activation seems to represent compensatory recruitment of additional resources in the high-functioning elderly, enabling them keep up with their younger counterparts.

### **Cognitive ageing and its implications**

Not all cognitive faculties follow the same trajectory from early adulthood to the old age. Some (e.g. autobiographical memory, semantic memory, recognition memory and language) remain stable lifelong or decline only in the very old age where as the others decline throughout the adult lifespan (Hedden and Gabrieli, 2004).

Decline in the *processing speed* is a hallmark feature of ageing. Slowed information processing affects the efficiency (but not necessarily the accuracy) of other cognitive operations, thus giving rise to generalised cognitive slowing observed in the old age. Cognitive slowing becomes critical in time constrained

activities such as driving. With age-related impairment of frontal lobe executive functions such as *divided attention* and *attentional switching*, the elderly particularly find difficult to attend to complex traffic environments such as crowded roads and busy intersections. In contrast to the processing speed, sustained attention (vigilance) remains intact until late-life, so that the old individuals can engage in a given activity for a long period of time.

Impaired hippocampal function affects encoding of *episodic memories*. Therefore, the elderly find it difficult to remember the context in which they obtained certain information, for example, where and when they witnessed a particular event. Sometimes a deficient individual might not even remember whether a particular event actually happened or he just heard or thought about the event. This latter conflict between their thoughts and deeds may affect their everyday living.

Automated, over-learned procedures (i.e. *procedural memory*) remain relatively intact with ageing. Therefore, the elderly do not find it difficult to navigate in their neighbourhood or carryout the household tasks in their own homes. However, when one visits new places, meets new people and learns new routines, working memory and executive control mechanisms could be burdened to a degree that cannot be compensated even by the extra neural resources of an elderly individual. Perhaps, many old parents who refuse to come and live with their children in the city may do so not only because they are emotionally attached to their old house, but also because their fronto-striatal networks cannot keep up with the cognitive challenges of the novel environment in the city!

### **References**

Hedden T, Gabrieli JD. Insights into the ageing mind: a view from cognitive neuroscience. *Nat Rev Neurosci.* 2004;5:87-96.

Riddle DR. *Brain Aging: Models, Methods, and Mechanisms.* Boca Raton FL: Taylor & Francis Group, LLC; 2007.



## Achievements and awards



Several members of the Physiological Society of Sri Lanka (PSSL) received Presidential Awards for Scientific Publications in 2014 organized by the National Research Council (NRC).

This photo shows PSSL members who received the awards with the Director NRC.

Left to right: Dr. Tharaka Dassanayake, Dr. Niranga Devanarayana, Prof. Vajira Weerasinghe, Prof. Janaka De Silva (Director, NRC), Dr. Deepthi De Silva (President, PSSL), Dr. Lakmali Amarasiri, Dr. Manori Amarasekera and Dr. Himansu Waidyasekera

Dear Member,

We invite you to submit articles to be published in the next issue of the PSSL newsletter. Please send in your article to the Editor, Physiological Society Dr. Sudharshani Wasalathanthri ([sudharshaniw@gmail.com](mailto:sudharshaniw@gmail.com)) on or before 31<sup>st</sup> August 2014.

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