

Neurosciences at Universiti Sains Malaysia Represent Malaysia to Support Global Precision Brain Health

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Abstract

The combined effort of the neuroscience and psychology cluster at the Universiti Sains Malaysia (USM)—fundamental, applied and clinical—has moved the institution to the number two position in the country, behind Universiti Malaya. The strategy to join the Global Brain Consortium (GBC) and put Malaysia on the map to address the GBC mission, vision, focus areas and outcomes began recently, in May 2019.

Keywords: *global, precision, brain, health, Malaysia, neurosciences, neurosurgery, psychology*

Introduction

Malaysia was honoured to be invited to attend the World Health Organization (WHO)-supported Global Brain Consortium (GBC) workshop with the motto ‘Towards Global Precision Brain Health’ at the Montreal Neurological Institute’s de Grandpré Communications Centre in Montreal, Canada from 9–10 May 2019. The topics discussed ranged from the future expectations of the WHO in terms of global brain health, international and multilateral research-funding agencies, data-sharing infrastructures, and data governance for Electroencephalography (EEG) to studying

dynamic brain starts with EEG, clinical research opportunities for EEG, clinical care translation using EEG, and the role of funders in advancing global brain collaborations.

USM Moves to the International Level

The GBC is a diverse network of brain researchers, clinicians and institutions committed to achieving improved and more equitable health outcomes worldwide. It is a Canada-based initiative that builds collaborative and dynamic relationships among global-oriented health researchers, domestically and internationally.

The GBC will address the challenges facing multinational collaborative efforts in support of Global Precision Brain Health. It aims to strengthen linkages between like-minded neuroscientists across borders and disciplines to build a fluid and connected global research community that can advance equitable solutions to priority health challenges worldwide, with an orientation towards brain health and research challenges in low- and middle-income countries (LMICs) and guided by the overarching goal of reducing disparities in health outcomes (1).

Malaysia has prepared itself by establishing training programmes via Universiti Sains Malaysia's graduate-level courses that consider the United Nations' Sustainable Development Goals, especially in education. Global brain health requires trained medical and non-medical personnel combining both the arts and the sciences (2–6).

The Master of Surgery (Neurosurgery) programme of the Universiti Sains Malaysia is training future neurosurgeons (Figure 1) and has thus far graduated 78 neurosurgeons (Figure 2) since this 2-plus-4-year postgraduate coursework was initiated in 2001, currently coordinated by Professor Zamzuri Idris, Professor Dato' Dr Jafri Malin Abdullah, Associate Professor Abdul Rahman Izaini Ghani and Dr Regunath Kandasamy. The established Integrated Neuroscience Programme (INP), coordinated by Dr Muzaimi Mustapha, is on its eleventh batch of postgraduate students, producing

both Masters and Doctors of Neurosciences since its establishment five-and-a-half years ago (Figure 3). The Master of Neurosciences by pure research, master coursework in neurology, and Doctorate in Neurosciences currently coordinated by Dr Farizan Ahmad has produced more than 35 graduates (Figure 4).

The newly established Integrated Clinical Psychology USM-UPSI courses coordinated by Associate Professor Dr Azizah Othman and Dr Mohamed Faiz Mohamed Mustafar and the Master of Cognitive Neuroscience courses coordinated by Professor Dato' Dr Jafri Malin Abdullah and Dr Aini Ismafairus Abd Hamid received their first batches of students in September 2018 and the second batch of Cognitive Neuroscience students in February 2019 (Figures 5 and 6). The newly established Brain Behaviour Cluster (Figure 7) has jump-started its activities, focusing on translational, transdisciplinary excellence in clinical neurology, neurosurgery, and psychology, with at least 56 members in various fields. Thus, we hope the ranking of clinical neurosciences and psychology will improve over the next three years in Malaysia, as per Figures 8 and 9. The Global Brain Consortium that Malaysia was invited to join will further focus on collaboration with other under developed and near developed countries to improve their neurological and mental healthcare using neurotechnology like the EEG (Figure 10).



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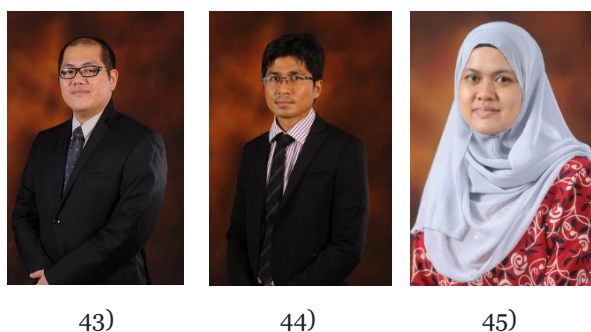


Figure 1. Master of Surgery (Neurosurgery) residents till May 2019

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| <p>Year 1</p> <ol style="list-style-type: none"> 1) Dr Debbie Kong Ching Ching 2) Dr Harvinth Nagalingam Muniandy 3) Dr Looi Mun Choon 4) Dr Mas Syazaneeza Shab 5) Dr Mohd Farhan Mohd Faiz Wilson Yeo 6) Dr Mohd Ghadafi Wahab 7) Dr Mohd Iryan Che Othman 8) Dr Muhamad Ridzuan Alias 9) Dr Nadiah Ahmad Fuad 10) Dr Nishan Rao Subramaniam 11) Dr Rohan Jeevaraj 12) Dr V Jeyaseelan G Vasanthakumaran 13) Dr Vicnesh Thillynathan 14) Dr Zaharul Azran Zahari <p>Year 2</p> <ol style="list-style-type: none"> 15) Dr Is Shahrom 16) Dr Julian Tan Li Kwang 17) Dr Kuha Raj a/l Arumugam 18) Dr Mohd Hezry Abu Hassan 19) Dr Mohd Khairun Mohd Mispan 20) Dr Thavanesan a/l Puvanesavaran <p>Year 3</p> <ol style="list-style-type: none"> 21) Dr Ahmad Zulfadli Mohamed Radzi 22) Dr Alarmelu Nithya Ramanathan | <ol style="list-style-type: none"> 23) Dr Ang Song Yee 24) Dr Jesse Ze Ngai 25) Dr Kumarappan a/l Chokalingam 26) Dr Moventhiran a/l Ramakrishnan 27) Dr Nurshaheda Mohd Salleh 28) Dr Sam Joe Ee 29) Dr Saravanan a/l Sridharan 30) Dr Lim Mei Sin 31) Dr Mohd Najmi Abd Halim 32) Dr Sarah 'Atiqah Mohd Zamri 33) Dr Tan Shze Ee 34) Dr Teo Eu Gene <p>Year 4</p> <ol style="list-style-type: none"> 35) Dr Arulkanesh Devatathan 36) Dr Diana Noma Fitzrol 37) Dr Muhammad Aizzat Othman 38) Dr Razmeender Singh Kelly 39) Dr Tan Zi Han 40) Dr Lee Chun Lin 41) Dr Shukriyah Sulong 42) Dr Lee Shwu Yi 43) Dr Lau Bik Liang 44) Dr Asrarul Fikri Abu Hassan 45) Dr Asmaa Mohamad Afifi |
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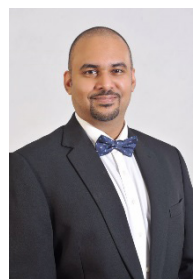
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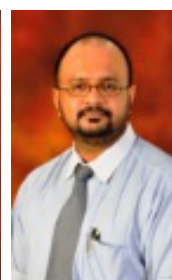
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Figure 2. Neurosurgeons who have graduated from the postgraduate neurosurgical programme since 2001

Remember your neurosurgical academic lineage: My neurosurgical teacher was Professor Luc Calliauw from Hospital University Ghent, Belgium who was taught by Professor Henk Verbiest from University Hospital Utrecht, Holland who was taught by Professor Clovis Vincent from Pitié-Salpêtrière Hospital, Paris, France who was taught by Professor Joseph Jules Francois Felix Babinski from the same hospital in France and the famous Professor Harvey Cushing of Harvard Medical School, USA

- 1) Professor Dr Zamzuri Idris
- 2) Associate Professor Dato' Dr Abdul Rahman Izaini Ghani
- 3) Dr Badrisyah Idris
- 4) Dr Adam Mohd Zakaria
- 5) Dr Kan Choon Hong
- 6) Dr Lee Hock Keong
- 7) Dr Gee Teak Shang
- 8) Dr Mohd Saufi Awang
- 9) Dr Farizal Fadzil
- 10) Dr Rahmat Harun @Haron
- 11) Dr Hafiz Mohd Zain
- 12) Dr Chan Kin Hup
- 13) Dr Sofan Zenian
- 14) Dr Saiful Razman
- 15) Dr Ahmad Zamzuri Remeli
- 16) Dr Mohd Aidil Mohd Noor
- 17) Dr Siti Suriyati Buang
- 18) Dr Sharon Casilda Theophilus
- 19) Dr Premananda Raja a/l Murugesu
- 20) Dr Sani Sayuthi

- 21) Dr Saiful Azli
- 22) Dr Naseer Abdul Wahab
- 23) Dr Kantha a/l Rasalingam
- 24) Dr Toh Charng Jeng
- 25) Dr Tan Wei Ming
- 26) Dr Nujaimin Udin
- 27) Dr Mohd Azhari Omar
- 28) Dr Liew Boon Seng
- 29) Dr Adrean Husin
- 30) Dr Regunath a/l Kandasamy
- 31) Dr Risdhawati Hasan
- 32) Dr Asraf Sharifudin
- 33) Dr Lim Swee San
- 34) Dr Mohammad Azman Raffiq
- 35) Dr Gerard Arvind Martin
- 36) Dr Priya Sharda Jagdish Mitter
- 37) Dr Faizul Hizal Ghazali
- 38) Dr Puneet Nandrajog
- 39) Dr Kamalanathan a/l Palaniandy
- 40) Dr Thinesh Kumaran
- 41) Dr Cheah Pooi Pooi
- 42) Dr Siti Azleen Mohamad
- 43) Dr Ch'ng Chee How
- 44) Dr Sim Sze Kiat
- 45) Dr Ananda Arumugam
- 46) Dr Mah Jon Kooi
- 47) Dr Tan Yew Chin
- 48) Dr Mohd Raffiz Mohd Ali
- 49) Dr Jason Raj a/l Johnson Kovilpillai
- 50) Dr Fadzlishah Johanabas Rosli
- 51) Dr Adrian Ng Wei Chih
- 52) Dr Jacintha Vikeneswary
- 53) Dr Ailani Ab Ghani
- 54) Dr Senthil Kumar a/l Rajapathy
- 55) Dr Ng Wei Peng
- 56) Dr Ariz Chong Abdullah @ Chong Chee Yong
- 57) Dr Low Siaw Nee
- 58) Dr Low Yong Lee
- 59) Dr Lim Liang Hooi
- 60) Dr Manvinder Singh Mangat
- 61) Dr Lai Chuang Chee
- 62) Dr Kanmani Dewi
- 63) Dr Chan Chee Kong
- 64) Dr Mohd Syahiran bin Mohd Sidek
- 65) Dr Prabu Rau a/l Siram
- 66) Dr Low Peh Hueh
- 67) Dr You Xinli
- 68) Dr Goh Chin Hwee
- 69) Dr Neoh Yee Yik
- 70) Dr Muhammad Ihfaz Ismail
- 71) Dr Davendran Kanesen
- 72) Dr Kho Giat Seng
- 73) Dr Nelson Yap Kok Bing
- 74) Dr Rajendra Rao a/l Ramalu
- 75) Dr Rakesh Rethinasamy
- 76) Dr Ramissh Paramasivam
- 77) Dr Vinodh a/l Vayara Perumall
- 78) Dr Yee Sze Voon



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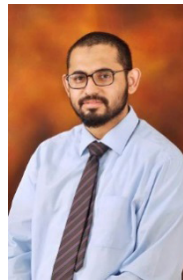
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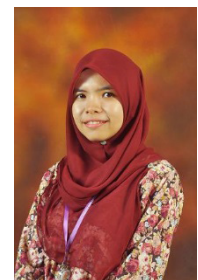
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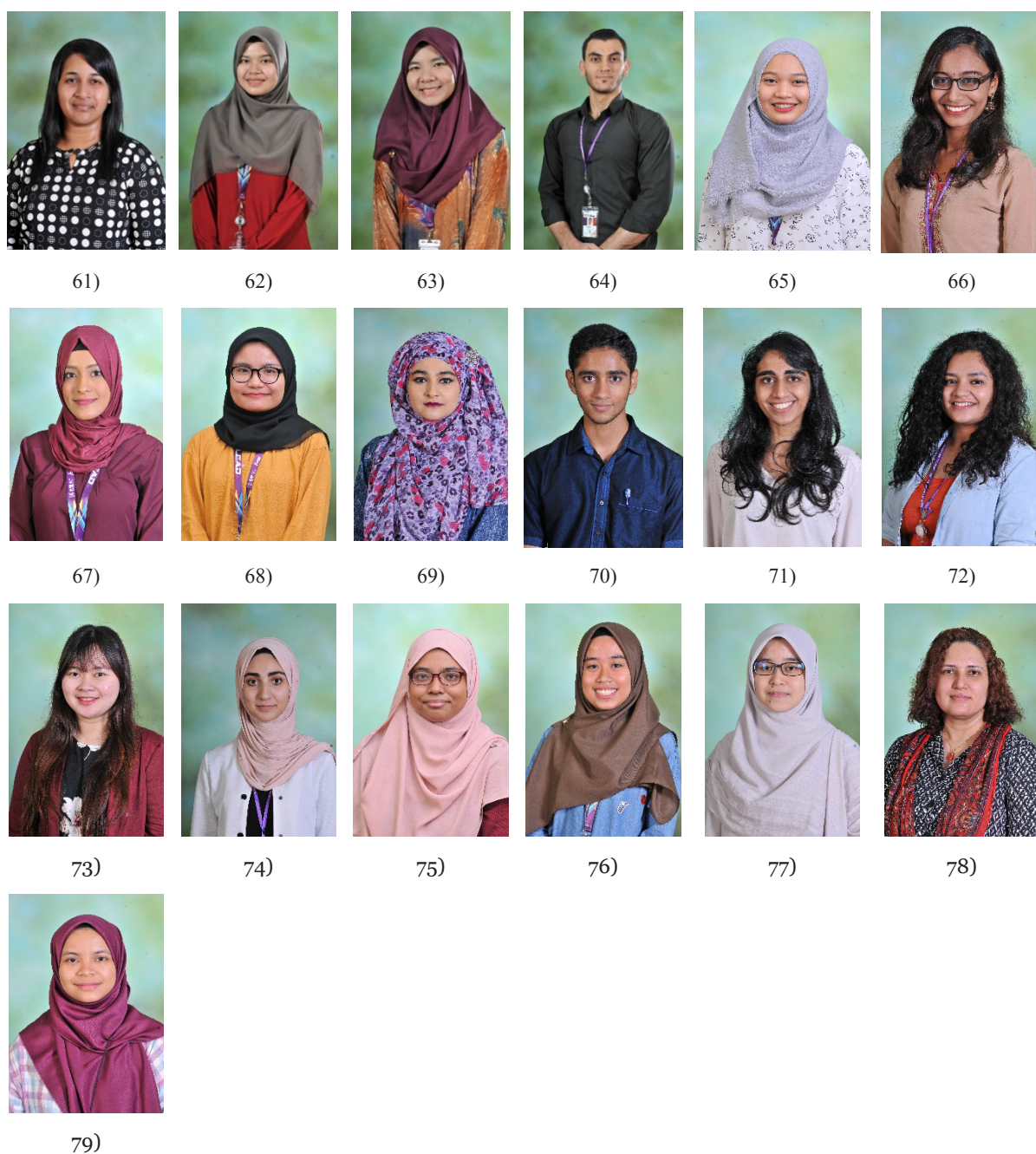


Figure 3. Integrated neuroscience programme students from 1st batch till 11th batch

1st batch INP students

- 1) Dr.Wan Mohd Daud Wan Omar
- 2) Nazirah Hanim Sharipudin
- 3) Rumaisa Abu Hassan
- 4) Teo Yong Chang

2nd batch INP students

- 5) Al-Zahrani Hussain Saad
- 6) Che Mohd Nasril Che Mohd Nasir
- 7) Koh Junhao
- 8) Mohd Ibrahim Abdullah
- 9) Muhammad Bilal
- 10) Nazeerah Abd Rahman
- 11) Wong Jia Hui

3rd batch INP students

- 12) Saidah Napisah Muhammad
- 13) Priatharsine Seerangan
- 14) Nurul Fatihah Othman
- 15) Nur Aimi Zawami Ahmad
- 16) Fatin Hilyani Mohamad
- 17) Ahmad Adamu Adamu
- 18) Usman Jaffer

4th batch INP students

- 19) Abu Bakar Tijjani Salihu
- 20) Auwal Bello Hassan
- 21) Norlyiana Samsuri
- 22) Rafidah Rosli
- 23) Siti Nur Ain Zakaria

5th batch INP students

- 24) Chuang Huei Gau
- 25) Faraj Almarri
- 26) Mazira Mohamad Ghazali
- 27) Muhammad Afiq Mahayidin
- 28) Nor Aqilah Mohd Yusuf Yeo
- 29) Nurfaizatul Aisyah Ab Aziz
- 30) Nurul Atikah M Nor Nazli
- 31) Shazlan Noor Suhaimi

6th batch INP students

- 32) Amanina Ahmad Safri
- 33) Amy Shafinas Azman
- 34) Chong Pei Nei
- 35) Khaled Sayed Rabia Elsayed
- 36) Mas Syazwanee Shab
- 37) Mohd Khairul Izamil Zolkefley
- 38) Mohd Waqiyuddin Abdullah
- 39) Nadia Izzati Nordin
- 40) Tai Yan Shan
- 41) Ummi Nasrah Talib

7th batch INP students

- 42) Chai Wen Jia
- 43) Ivanna Fernandez
- 44) Nur Adila Ramli

- 45) Nur Naznee Hirni Abd Aziz

- 46) Nurfarhana Abdul Ghani

- 47) Siti Atiyah Ali

- 48) Tan Celina

8th batch INP students

- 49) Cheeh Hui Lee

- 50) Dayang Yasmin Abang Abdul

- 51) Revathy Murali

- 52) Siti Hajar Mohd Zaki

- 53) Siti Nurulhusna Hashim

- 54) Tiara Ramli

- 55) Zakiyyah Munirah Mohd Zaki

9th batch INP students

- 56) Aishah Sakinah Zahid

- 57) Mohammed Abdalla Kannan Ahmed

- 58) Nor Azulaikha Abdullah

- 59) Nurul Nazihah Zaidil

- 60) Sara Fatini Abdul Naser

- 61) Sri Ratha Balakrishnan

10th batch INP students

- 62) Farah Madihah Mustafa Kamal

- 63) Nurul Amirah Mohammad Murad

- 64) Younis MS Firwana

11th batch INP students

- 65) Anis Raihan Dzeidee Schaff

- 66) Devi AP Ananth

- 67) Hadjer Khiati

- 68) Iffah Syafiqah Suhaili

- 69) Iman Imtiyaz Ahmed Juvale

- 70) Joshua Kuruvilla

- 71) Kiirtaara Aravindhan

- 72) Malvika Sharma

- 73) Nornadirah Abdul Rahman

- 74) Nour Mohammed Abdallah Qaddumi

- 75) Nur Nasihken Mawi

- 76) Nurdarina Ausi Zulkifli

- 77) Nurulain Syahirah Razali

- 78) Rabia Nazir

- 79) Wan Shahirah Wan Adnan



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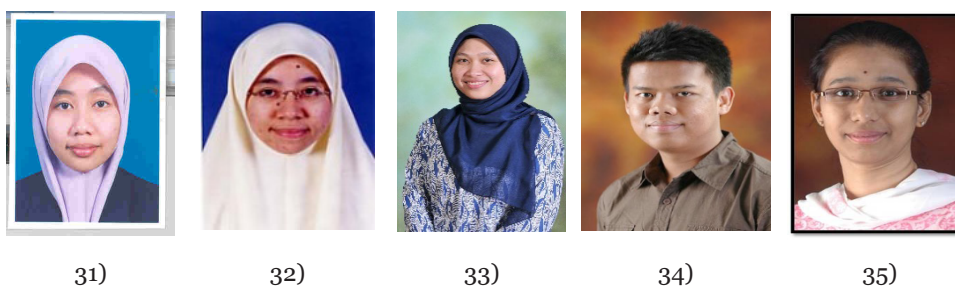


Figure 4. Master by Pure Research, Doctorate by Pure Research and Advanced Master of Medicine (Neurology)

Neurosciences

- 1) Siti Norhajah Hashim
- 2) Mohd Azim Patar
- 3) Putri Nur Hidayah Al-Zikri Mohamad Akil
- 4) Dr. Zulkifli Mustafa
- 5) Raisah Abd Hadi
- 6) Mohd Nasir Mat Nor
- 7) Syed Fariq Fathullah Syed Yaacob
- 8) Mohd Harizal Senik @ Nawi
- 9) Mohd 'Ulul 'Ilmie Ahmad Nazri
- 10) Ahmad Tarmizi Che Has
- 11) Muhammad Hanif Che Lah
- 12) Norshazrin Shazira Shafee
- 13) Siti Zawani Mohd Ramli
- 14) Wan Noor Ainun Baharuddin
- 15) Mazira Mohamad Ghazali
- 16) Samhani Ismail
- 17) Nanthini a/p Jayabalan
- 18) Wan Salihah Wan Abdullah

19) Tee Jong Huat

- 20) Khalilah Haris
- 21) Khairol Naaim Mohd Nasir
- 22) Nur Syairah Abd Rani
- 23) Mashytah Abdul Karim
- 24) Nor Entan Supeno
- 25) Nurul Iman Wan Ismail
- 26) Asyraf Abd Rahman
- 27) Emmilia Husni Tan
- 28) Siti Zulaikha Nashwa Mohd Khair
- 29) Abdul Aziz Mohamed Yusoff
- 30) Farizan Ahmad
- 31) Norafiza Zainudin
- 32) Sarina Sulong
- 33) Siti Naziha Hasma Hassan
- 34) Zarif Sofian

Neurology

- 35) Dr Shalini Bhaskar



Figure 5. First batch Master of Clinical Psychology students USM-UPSI

1st batch Master Integrated Psychology Programme-USM

- 1) Ummi Norliana Zainal
- 2) Angela Chen Aun Kei
- 3) Siti Amirah Hanna Jafri Malin

- 4) Audrey Poh Sze Huey
- 5) Sharifah Diana Syed Abdul Halim
- 6) Loh Ken Joey
- 7) Mariah Hanna
- 8) Mohamad Farahan Huszaimi M Pajar

9) Norsuhana Emilinadiah Husin

10) Nurulhidayah Mohd Saat

11) Seeh Ti Whan

1st batch Master Integrated Psychology
Programme-UPSI

12) Muhammad Lutfi Md Nizam

13) Neo Jia Yeh

14) Norasyikin Jane Mustafa Kamal

15) Chao Thung Yin (Joyce)

16) Asmirah Jafarulla Khan

17) Suwarna Sukumaran

18) Abd Raouf Abdul Razak

1st batch Doctorate Integrated Psychology
Programme-USM

19) Tay Kok Wai (Clinical Neuropsychology)

20) Michelle Choong Poh Kin (Clinical
Psychology)

21) Liang Yaw Wen (Clinical Psychology)

1st batch Doctorate Integrated Psychology
Programme-UPSI

22) See Geok Lan (Clinical Neuropsychology)

23) Atiqah Chew Abdullah (Clinical Psychology)



Figure 6. First and second batch of Master of Cognitive Neurosciences USM offered at Postgraduate Institute@Kuala Lumpur

1st batch

- 1) Joice
- 2) Wang Shi-Jie
- 3) Nurul Bayti Sumardi
- 4) June Lew Wan Ling
- 5) Chin Jia Wei
- 6) Norrul Aikma Mohamed
- 7) Khairiah Razali
- 8) Kartina Ismail
- 9) Lim Hui Sean

- 10) Yogendren Murugia

- 11) Nadiah Mohd Sukarno

2nd batch

- 12) Thilageswary a/p Doraisamy
- 13) Ramesh Kumar a/l Ramachandren
- 14) Audrey Antoine a/p Max Antoine
- 15) Eizan Azira Mat Sharif



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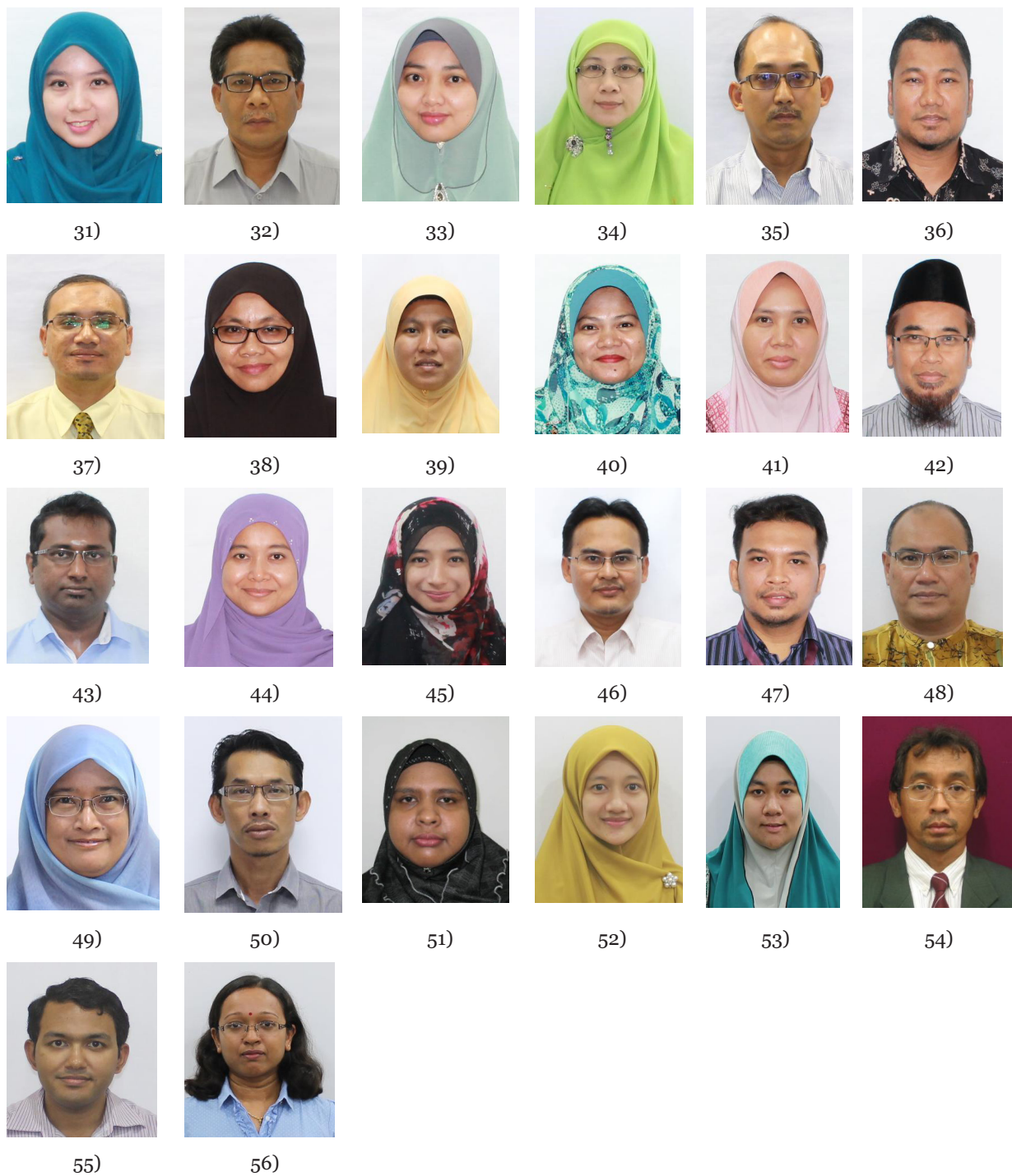


Figure 7. Members of Brain and Behaviour Cluster, [previously known as P3Neuro (Pusat Perkhidmatan dan Penyelidikan Neurosains)], School of Medical Sciences, Universiti Sains Malaysia

- 1) Professor Dato' Dr Jafri Malin Abdullah-Chairman
- 2) Professor Dr Zamzuri Idris–Deputy Chairman
- 3) Associate Professor Madya Dr Asrene Ab. Razak–Deputy Chairman
- 4) Associate Professor Dr Azizah Othman–Deputy Chairman
- 5) Associate Professor Dato' Dr Ab Rahman Izaini Ghani @ Ab. Ghani
- 6) Associate Professor Dr Abdul Aziz Mohamed Yusoff
- 7) Associate Professor Dr Muzaimi Mustapha
- 8) Dr Regunath a/l Kandasamy
- 9) Dr Mohammed Faruque Reza
- 10) Dr Tahamina Begum
- 11) Dr Farizan Ahmad
- 12) Dr Muhammad Hafiz Hanafi
- 13) Dr Mohd Nasir Che Mohd Yusoff
- 14) Dr Mohamed Faiz Mohamed Mustafar
- 15) Dr Aini Ismafairus Abd Hamid
- 16) Dr Mohd Zulkifli Mustafa
- 17) Dr Sangu Muthuraju
- 18) Dr Mohd Nor Azim Ab Patar
- 19) Dr Sabarisah Hashim
- 20) Ms Nurul Aini M Nashir
- 21) Ms Nur Amalina Hashim
- 22) Mr Hazim Omar
- 23) Mdm Mazira Mohamad Ghazali
- 24) Mdm Alwani Liyana Ahmad
- 25) Mdm Wan Nor Azlen Wan Mohamad
- 26) Ms Kee Sui Mei
- 27) Mdm Nuraza Othman
- 28) Ms Nur Azza Husna Ahmad Satar
- 29) Mdm Nur Faten Hamzah
- 30) Mdm Sharifah Aida Shekh Ibrahim (Research Officer))
- 31) Mdm Athirah Raihanah Abdul Wahab (Science Officer)
- 32) Mr Mohd Eilham Yusof
- 33) Dr Sanisah Abdul Halim
- 34) Associate Professor Dr Salmi Ab Razak
- 35) Associate Professor Dr Zahiruddin Othman
- 36) Dr Mohd Azhar Mohd Yasin
- 37) Dr Maruzairi Husain
- 38) Dr Norzila Zakaria
- 39) Dr Sharifah Zubaidiah Syed Jaapar
- 40) Dr Nor Asyikin Fadzil
- 41) Dr Raishan Shafini Bakar
- 42) Associate Professor Dr Mohd Shafie Abdullah
- 43) Dr Chandran a/l Nadarajan
- 44) Dr Nik Fariza Husna Nik Hassan
- 45) Cik Aimi Syahidah Zulkipli
- 46) Dr W Mohd Nazaruddin W Hassan
- 47) Dr Mohamad Hasyizan Hassan
- 48) Professor Dr Wan Hazabbah Wan Hitam
- 49) Professor Dr Rosni Abdullah @ Mustafa
- 50) Associate Professor Dr Putra Sumari
- 51) Dr Nurul Hashimah Ahamed Hassain Malim
- 52) Dr Nur Intan Raihana Ruhaiyem
- 53) Dr Nur Syibrah Muhammad Naim
- 54) Professor Dr Mohd Zaid Abdullah
- 55) Associate Professor Dr Haidi Ibrahim
- 56) Dr Anusha a/p Achuthan

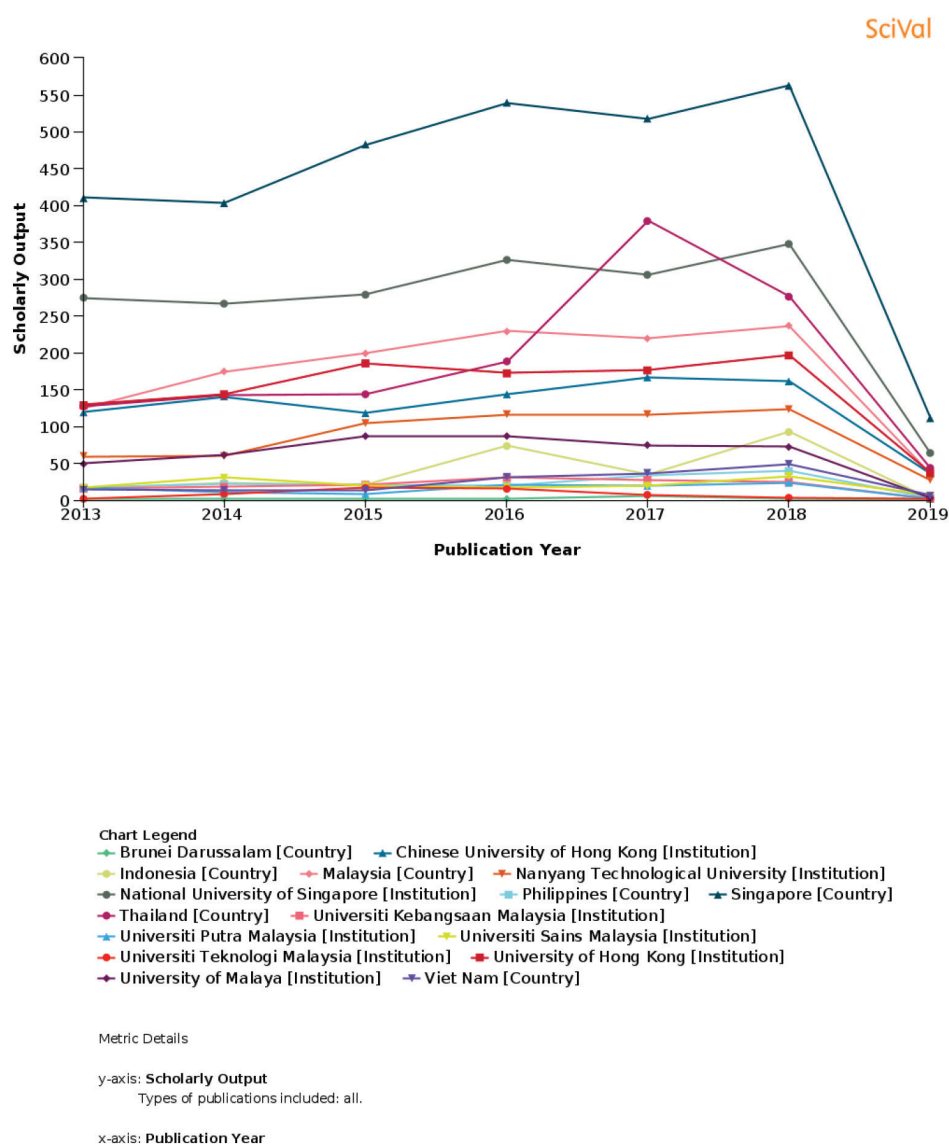


Figure 8. USM ranking in neuroscience according to SciVal, Elsevier
 First ranking: Universiti Malaya
 Second ranking: Universiti Sains Malaysia
 Third ranking: Universiti Kebangsaan Malaysia
 Fourth ranking: Universiti Putra Malaysia
 Fifth ranking: Universiti Teknologi Malaysia

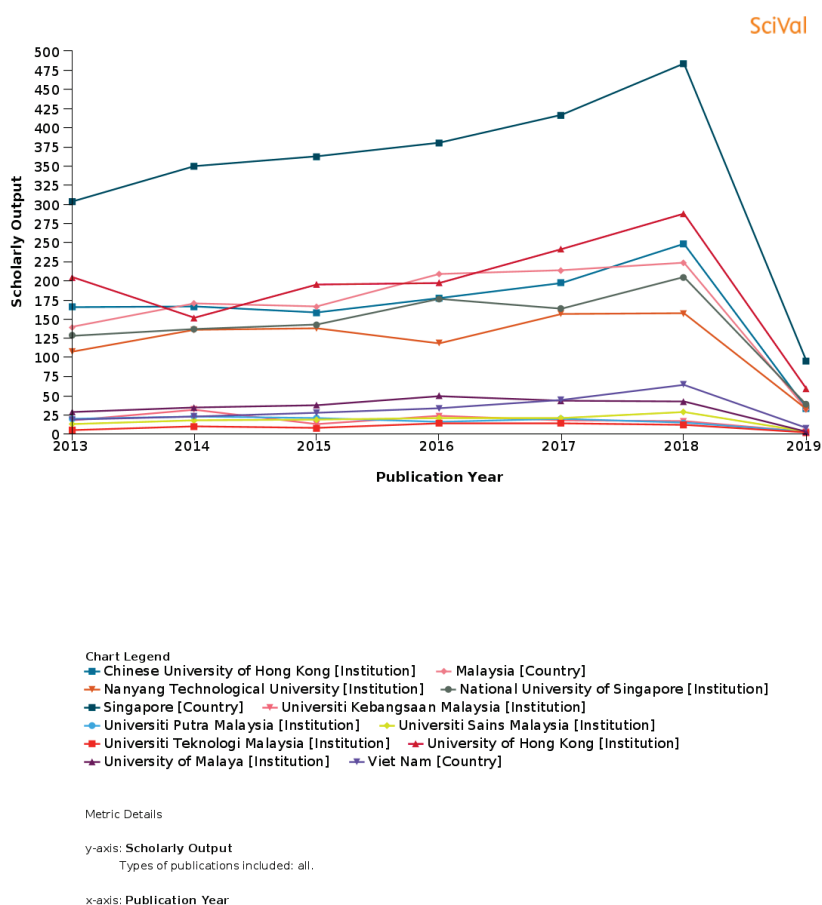


Figure 9. USM ranking in psychology according to SciVal, Elsevier

First ranking: Universiti Malaysia
Second ranking: Universiti Sains Malaysia
Third ranking: Universiti Kebangsaan Malaysia
Fourth ranking: Universiti Putra Malaysia
Fifth ranking: Universiti Teknologi Malaysia



(a)



(b)

Figure 10. Pictures show Professor Alan Evan (a) front row, stood third from left, (b) at the back, stood second from left] and Professor Pedro Valdes Sosa (a) front row, stood fifth from left, (b) forth row, stood fifth from right], and the founders involved in the consortium

What We Strive For

Mental and neurological disorders account for an increasing proportion of the global burden of disease. Additionally, the accessibility and affordability of appropriate treatment remains low, especially in countries classified as LMIC by the World Bank, where approximately 85% of the world's population resides. To improve mental health services, LMICs must increase their workforces, particularly the number of trained professionals who can provide mental health services. Although primary health care professionals can provide the bulk of care, mental health professionals—namely psychiatrists, nurses and psychosocial health experts—are needed to manage patients who are referred for specialised care and to deliver training, support and supervision to non-specialists. Without these mental health professionals, LMICs will be unable to meet their populations' mental health treatment requirements. Advanced technicians would also be involved in the development of EEG policies, procedures, provision of EEG-related supervision, and training of less-experienced EEG technicians and staff (2–6).

Conclusion

The neuroscience group, in collaboration with psychiatry and psychology, hopes to further the global WHO agenda and envisions its implementation in the next three years. We hope for support from the Academy of Sciences Malaysia, universities, the Malaysian Ministry of Health and the public to make this endeavour a success.

The teacher who is indeed wise does not bid you to enter the house of his wisdom but rather leads you to the threshold of your mind—Khalil Gibran.

Correspondence

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Universiti Sains Malaysia,
16150 Kubang Kerian Kelantan, Malaysia.
Tel: +609 767 6300
Fax: +609 767 3833
E-mail: brainsciences@gmail.com

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