

National Workshop-CME on Autonomic Function Tests Improved Knowledge, Skills and Aptitude for Investigation, Research and Training in Autonomic Functions and Dysfunctions among Physiology Faculty of India

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ABSTRACT

Background and Aim: A one-day National Continuing Medical Education (CME) program and workshop, titled 'Prima Autonomica', focused on Autonomic Function Tests (AFTs), was held on March 8, 2025. Organized by the Department of Physiology at MOSC Medical College, Kolenchery, Kerala, India, the initiative aimed to update participants' knowledge and facilitate their acquisition of techniques for administering and interpreting AFTs, guided by leading physiologists with specialized expertise in AFT clinics. **Methods:** The program comprised six insightful talks delivered in the forenoon by five distinguished speakers, exploring topics ranging from foundational concepts of the Autonomic Nervous System (ANS) to advanced techniques for assessing autonomic functions. Key areas included the significance and clinical relevance of AFTs, underlying physiological control mechanisms, blood pressure variability, baroreceptor sensitivity, and heart rate variability (HRV). The afternoon session was dedicated to hands-on demonstrations and the interpretation of various AFTs, alongside HRV acquisition and analysis. **Results:** A total of 310 participants (144 onsite and 166 online) from approximately 60 medical colleges across India attended. The majority were postgraduate students and physiologists. Feedback analysis showed that 60.3% rated the CME and workshop as excellent, while 36.8% rated them very good. **Conclusion:** All sessions of the immersive one-day program were positively received, and video recordings were distributed to all participants via email. The event received excellent feedback. It effectively raised awareness among undergraduate and postgraduate students, disseminated best practices among faculty, enhanced educational networking between participants and speakers, and helped delineate future strategies for continued skill development.

Keywords: Autonomic Nervous System, Autonomic Function Tests, Heart Rate Variability, Physiologists, Continuing Medical Education, Workshop.

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INTRODUCTION

The Autonomic Nervous System (ANS) is critical for physiological stability and the precise regulation of organ systems; yet, it often remains on the periphery of clinical focus. This relative neglect contributes to a significant, persistent lack of awareness among medical professionals regarding its importance, reflected in the scarcity of both dedicated ANS testing facilities and appropriately trained specialists. This CME and workshop sought to bridge this divide by equipping physiologists with the necessary knowledge and skills, underscoring their potential to significantly advance

autonomic diagnostics and improve healthcare delivery.^[1] Leading physiologists with expertise in autonomic function were invited to update participants' knowledge, share their valuable clinical experience, and demonstrate techniques for administering and interpreting Autonomic Function Tests (AFTs).

Evaluation of the Autonomic Nervous System (ANS) in the physiology laboratory plays a vital role in the diagnosis and management of various clinical disorders such as Diabetes Mellitus (DM), Multiple System Atrophy (MSA), and Parkinson's disease. This evaluation can be performed by analyzing cardiovascular responses to physiological stimuli such as orthostasis, deep breathing, isometric exercise, cold stimulation, and the Valsalva maneuver.^[2] Despite Kerala's population of 35.1 million, the state has fewer than 10 medical centers equipped to perform autonomic function tests. Awareness among the medical



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community regarding its importance in maintaining good health is also grossly lacking. The few centers that perform these tests often do not conduct the full battery of autonomic function tests. Currently, only a few neurologists and cardiologists in the state are trained to perform these tests, with almost no practicing physiologists trained in this area. The situation in the rest of the country is not significantly different. However, physiologists are in an excellent position to perform these tests and establish autonomic function testing laboratories. This highlights the dire need to create awareness among physiologists, both in Kerala and nationwide, regarding the significance, relevance, and scope of performing autonomic function tests. With this objective, we designed a one-day CME to inform the physiology community about the laboratory evaluation of the ANS and to update participants on the interpretation of Autonomic Function Tests. The speakers invited for the talks and workshops were expert physiologists from select, premium institutions in the country, who have been running autonomic function testing laboratories for more than a decade in their respective states. Additionally, a hands-on session was included to help participants learn how to administer the tests, acquire high-quality data, and interpret the results reliably. To the best of our knowledge, this was the first workshop of its kind in the state dedicated solely to autonomic function tests, with sessions led by expert physiologists in the field and presented in both online and offline modes.

MATERIALS AND METHODS

A one-day National CME and Workshop, titled 'Prima Autonomica,' on Autonomic Function Tests was held on March 8, 2025. It was organized by the Department of Physiology at MOSC Medical College, Kolenchery, Ernakulam District, Kerala, India.

Event Details

The event was organized in a hybrid mode and was split into two sessions. The forenoon session comprised didactic lectures by eminent speakers in this domain. The afternoon session consisted of demonstrations of the different tests using a standardized data acquisition system and a hands-on session. The primary goal of the workshop was to raise the level of awareness about autonomic function tests among medical professionals and the secondary goal was to emphasize on the role of physiologists who can greatly contribute to this area with training and minimum essential facilities.

The workshop was structured in the following manner:

The first session was to familiarize the audience with the equipments (tilt table) and software used for analysis (PowerLab).

Following this, the methods of recording the autonomic functions were described.

The actual recording of HRV was demonstrated on a volunteer and data interpretation explained in detail. The data acquisition system used was Power Lab Software provided by AD Instruments.

Forenoon Session

The CME began with an introductory lecture by Dr. Rebecca Tony (MOSC, Kolenchery) titled "Introduction to the Autonomic Nervous System." This session laid the physiological foundations for understanding the ANS. This was followed by a session titled "Cardiovascular Autonomic Function Assessment through Ewing's Reactivity Tests" by Dr. Amudharaj D (AIIMS, Mangalagiri). He emphasized the clinical relevance of ANS evaluation and the foundations of ANS evaluation in the laboratory. He also shared his experience regarding Autonomic Function Testing at his institutional laboratory.

The keynote talk, "Autonomic Function Testing - An Important Diagnostic Test for Medical Practice," was delivered by Prof. Dr. Sucharita S (SJMC, Bengaluru), who discussed the relevance and importance of testing autonomic functions for various clinical disorders. Various challenging clinical situations including neurodegenerative disorders and Multiple System Atrophy (MSA) and Parkinson's disease, were presented and discussed, and the role of autonomic function testing in resolving clinical dilemmas was discussed.

Thereafter, Dr. Taniya Anto (SJMC, Bengaluru), in her talk titled "A Closer Look at Autonomic Testing - Its Mechanisms and Interpretation," delved into the physiological mechanisms underlying the different tests. She detailed the physiological control loops subserving different components of the Ewing battery of tests and explained the standard methodologies for performing them. Common pitfalls and how to avoid them were also addressed.

Prof. Sucharita S discussed advanced testing techniques in her subsequent session titled "Blood Pressure Variability and Baroreflex Sensitivity-Two Key Components of Autonomic Evaluation." She described the physiological mechanisms behind resting perturbations in blood pressure and indices describing this variability. She also explained the evaluation of Baroreflex activity, a key mechanism buffering beat-to-beat perturbations in blood pressure.

Dr. Shival Srivastav (AIIMS, Jodhpur) spoke on "Heart Rate Variability (HRV) Analysis as a Crucial Component of Autonomic Function Tests." He discussed the physiological basis of this variability, and common tools and techniques for HRV evaluation. He also shared his perspective on the test-retest repeatability of this parameter, recent criticisms of HRV indices, and the future roadmap for applying this tool in research and clinical care.

After each session of the CME and workshop, time was allotted for doubt clarification. Case scenarios were presented and

participants were asked to interpret the same which ensured active participation. One Chairperson (who is an expert in the topic being presented) was assigned for each session who would mediate doubt clarification of both the online and offline participants. The offline participants could directly clarify their doubts with the speaker using a circulating mike, while the online participants could post in the chat box on the online platform (Zoom), which was visible on the presentation screen to both the speaker and the chairperson.

Afternoon Session

A workshop on various aspects of performing Autonomic Function Tests was conducted in the afternoon. The first session, led by Dr. Amudharaj D, covered the “Technical Aspects of Cardiovascular Autonomic Function Assessment.” Here, the equipment and facilities required for conducting autonomic function testing were discussed. Desirable equipment features, methods for gathering

reliable data, and preparation of a comprehensive evaluation report were elaborated. The next session, by Dr. Taniya Anto, titled “Demonstration of Conventional Autonomic Function Tests,” consisted of a live demonstration of performing tests for autonomic function evaluation. The final session consisted of a “Demonstration of HRV Acquisition and Analysis” by Dr. Shival Srivastav, using popular data acquisition systems and software tools. The demonstrations were assisted by Dr. Anne Varghese (MOSC, Kolenchery), Dr. Rebecca Tony (MOSC, Kolenchery), Dr. Jayakrishnan. G (GMC, Thrissur), and Dr. Annie S. Jose (SUT, Thiruvananthapuram).

Student Video-Assisted Projects

In the run-up to the CME, first-year MBBS students of MOSC Medical College were required as per NMC Internal Assessment guidelines(Museum) to prepare 25 video-assisted projects based on concepts and mechanisms in various complex

Topic: Introduction to Autonomic Nervous System

Speaker: Dr.Rebecca Tony

Quality

70 responses

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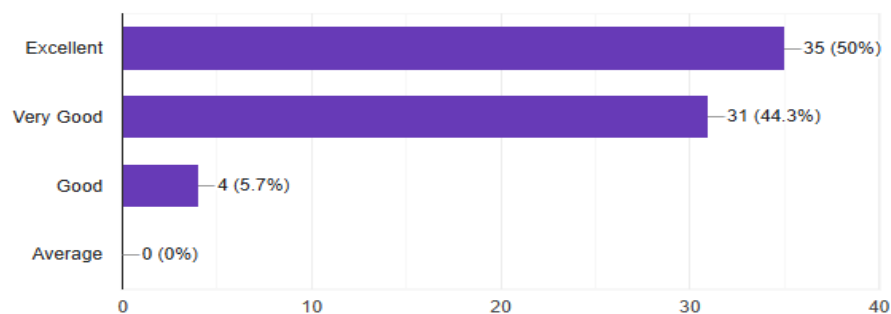


Figure 1: Feedback regarding CME session (Introduction to autonomic nervous system).

Topic: Cardiovascular Autonomic function assessment-Ewing's reactivity tests

Speaker: Dr.Amudharaj D

Quality

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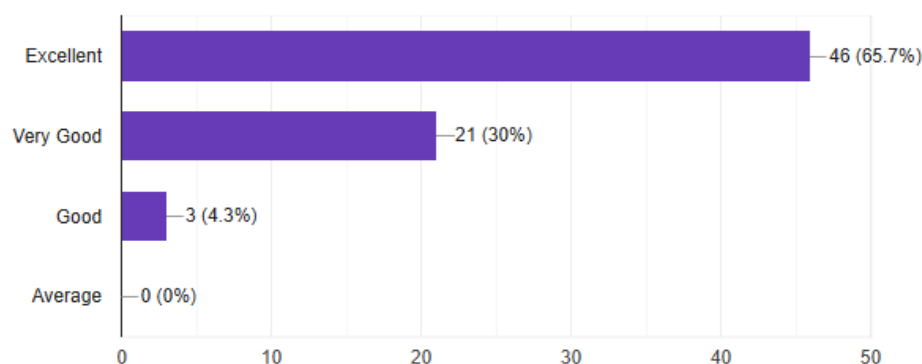


Figure 2: Feedback regarding CME session (Cardiovascular autonomic function assessment - Ewing's reactivity test).

topics in Physiology, with the purpose of developing a deeper understanding through imaginative, innovative, and interactive learning methods. These projects were judged for the top three positions, and a total of five projects were awarded prizes during the CME. Details of the student video project presentation winners are mentioned in Table 1. The purpose of involving first-year students was to foster early awareness regarding Autonomic Function Tests. This approach, aimed at clarifying complex concepts, can be adapted to enhance understanding of the autonomic nervous system, whose extensive functions across various body systems are still being explored.

Founding heads of the department were honored during the department's maiden CME.

Statistical Analysis of Data

Feedback data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). The data were presented as frequency (percentage).

RESULTS

A total of 144 participants attended the event in person, while 166 joined virtually. Besides undergraduates, most attendees were post graduate students and physiologists from approximately 60 medical colleges across India, with some attendees from other branches of medicine too. Both beginners and trained participants were there. For the beginners it was a platform to build up their foundation about AFT and for the trained personnel it was an add-on to refresh, recollect and update their existing knowledge.

A structured feedback survey was completed by 68 participants. The majority rated both the CME and Workshop sessions as either Excellent or Very Good. Specifically, 60.3% of participants rated both the CME and the Workshop sessions as Excellent, and an additional 36.8% and 35.3% rated them as Very Good, respectively (Table 2). Only a small proportion rated the sessions as Good (1.5% for CME, 5.9% for Workshop), and none rated the Workshop as Average.

Analysis of session-specific feedback (Figures 1-6) revealed particularly strong appreciation for the lectures on Heart Rate Variability (HRV) Analysis, Baroreflex Sensitivity, and Ewing's

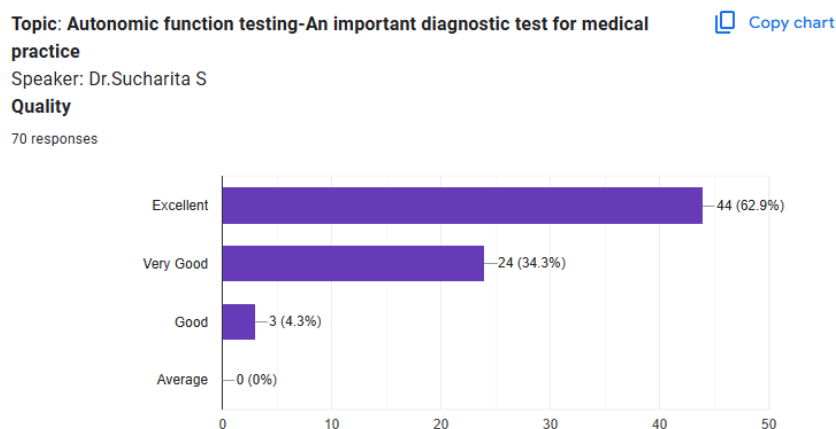


Figure 3: Feedback regarding CME session (Autonomic function testing-An important diagnostic test for medical practice).

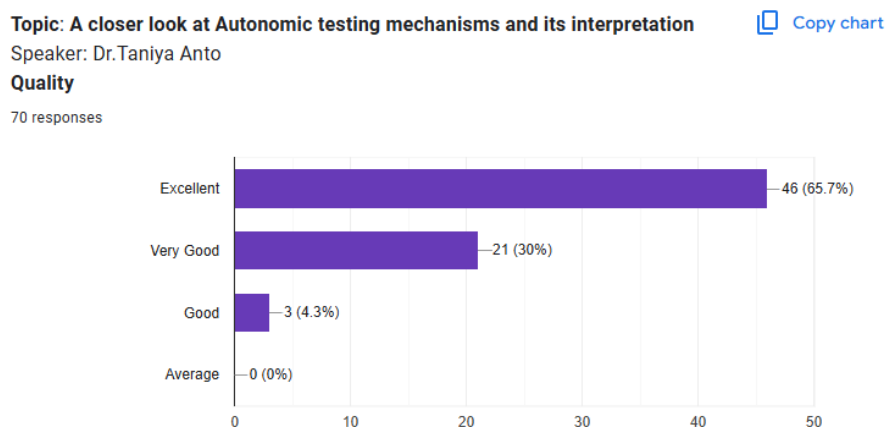


Figure 4: Feedback regarding CME session (A closer look at autonomic testing mechanisms and its interpretation).

Reactivity Tests, which were identified as the most informative and clinically relevant topics. The overall arrangement and organization of the CME received uniformly positive feedback (Figure 7), reflecting the smooth conduct and time management of the hybrid event.

Similarly, feedback on individual workshop sessions (Figures 8-10) demonstrated high satisfaction with the hands-on demonstrations, especially for HRV acquisition and analysis and technical aspects of cardiovascular autonomic testing. The overall workshop arrangements (Figure 11) were also rated as excellent by most participants.

DISCUSSION

The meeting successfully generated awareness among undergraduate and postgraduate student participants, updated best practices in the field among faculty, fostered enhanced educational networking between participants and speakers, and helped delineate future courses of action and development for emerging and interested faculty members wishing to study

autonomic function tests further. Participants received updates on: the Ewing battery of tests, blood pressure variability and baroreflex sensitivity as key components of autonomic evaluation;^[3] Heart Rate Variability (HRV) analysis;^[4] the demonstration of conventional Autonomic Function Tests; and the demonstration of HRV acquisition and analysis. This CME serves as an important milestone for physiologists wishing to apply their knowledge of the ANS and forge new paths in improving societal health.^[5,6] Positive feedback indicated that the CME and Workshop sessions were excellent (Table 2). Structured feedback was gathered on both individual sessions and the overall program (Figures 1-11). Pre and Post-Test were planned but could not be implemented well due to time constraints. Videos and Power point presentations of each session were shared in the WhatsApp group for participants, and also individually sent to each participant to their email address provided. The video recordings of the sessions were not published on YouTube since the CME - Workshop carried a participation fee. CME and Workshop Participation certificates were provided to both

Topic: Blood pressure variability and Baroreflex sensitivity- Two key components of autonomic evaluation

Speaker: Dr. Sucharita S

Quality

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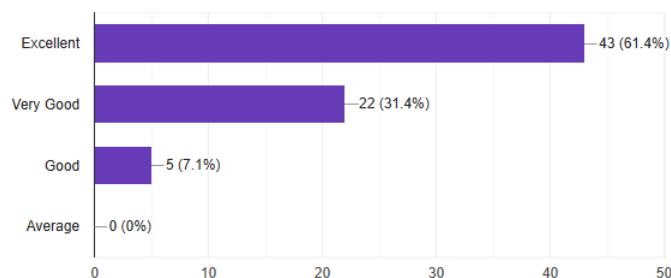


Figure 5: Feedback regarding CME session (Blood pressure variability and baroreflex sensitivity-Two key components of autonomic evaluation).

Topic: Heart rate variability analysis- Crucial component of autonomic function tests

Speaker: Dr. Shival Srivastav

Quality

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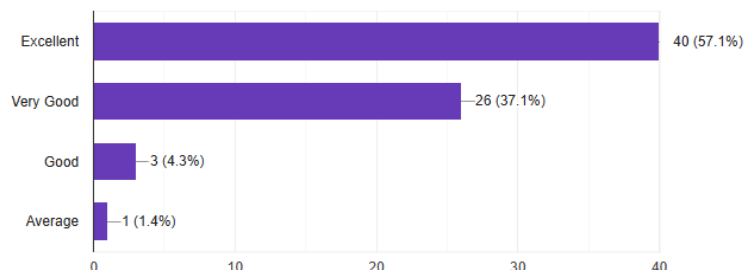


Figure 6: Feedback regarding CME session (Heart rate variability analysis-crucial component of autonomic function tests).

Overall arrangement of CME

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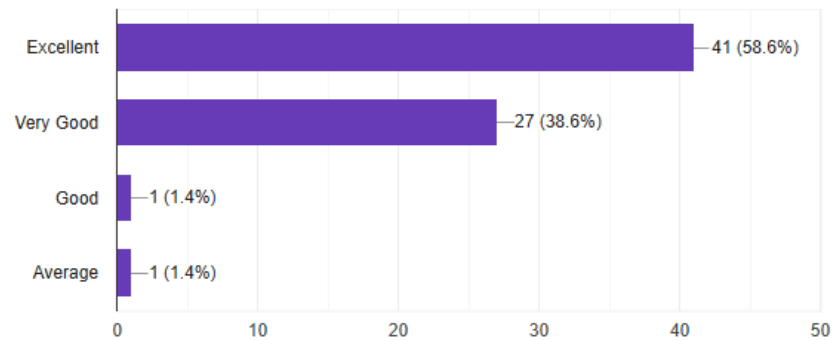


Figure 7: Feedback regarding the overall arrangement of the CME.

WORKSHOP:

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Technical aspects of cardiovascular autonomic function assessment-Dr. Amudharaj D

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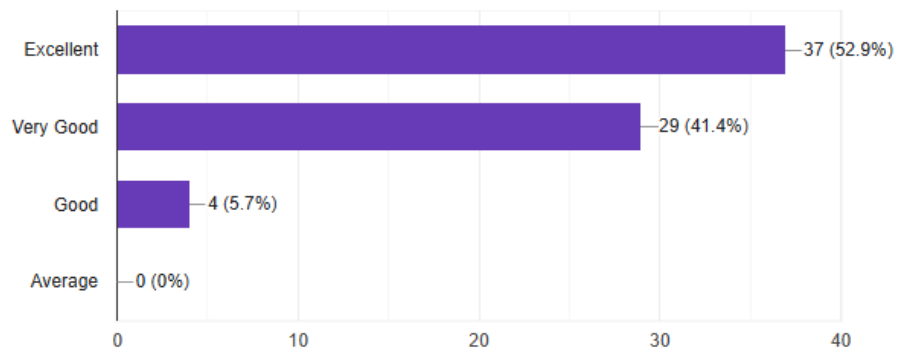


Figure 8: Feedback regarding Workshop session (Technical aspects of cardiovascular autonomic function assessment).

Demonstration of conventional autonomic function tests- Dr. Taniya Anto

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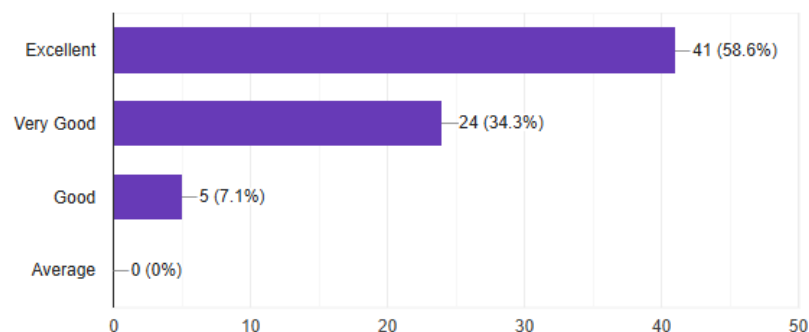
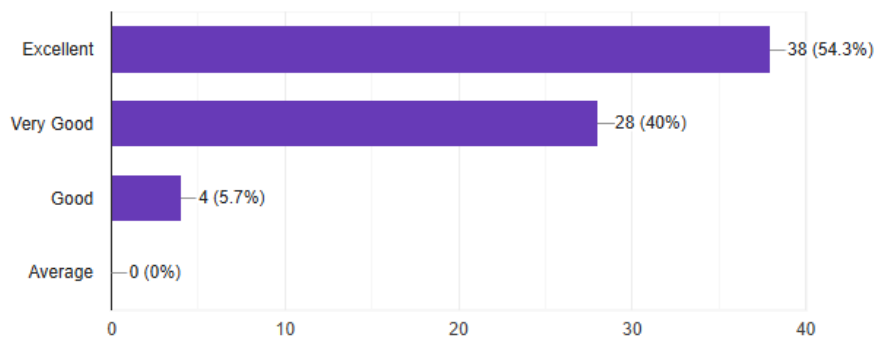


Figure 9: Feedback regarding Workshop session (Demonstration of conventional autonomic function tests).

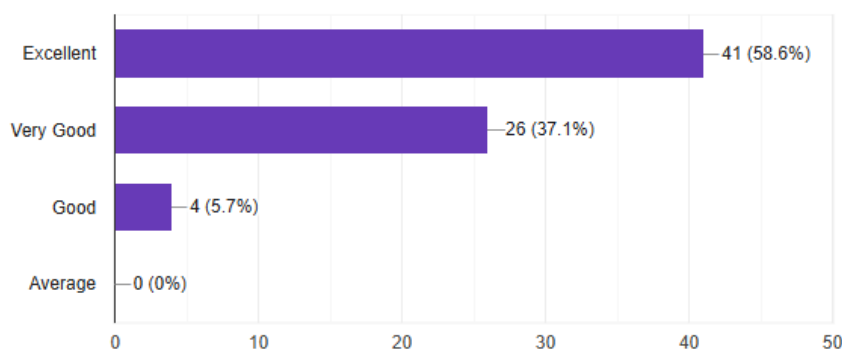
Demonstration of heart rate variability analysis-

Dr. Shival Srivastav

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 Copy chart**Figure 10:** Feedback regarding Workshop session (Demonstration of heart rate variability analysis).**Overall workshop arrangement**

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 Copy chart**Figure 11:** Feedback regarding overall workshop arrangements.**Table 1:** Details regarding the projects awarded in the video competition.

Position	Project title
First	Nobel prize in physiology and medicine-work demonstration
Second (jointly awarded to)	Hyperpolarisation stimulating bipolar cell
	Fern pattern in ovulation
Third (jointly awarded to)	Synaptic transmission
	Phagocytosis

Table 2: Participant feedback regarding CME.

	Feedback regarding the CME (n=68)	Feedback regarding the Workshop (n=68)
Excellent	41 (60.3%)	41 (60.3%)
Very Good	25 (36.8%)	24 (35.3%)
Good	1 (1.5%)	4 (5.9%)
Average	1 (1.5%)	0 (0%)

online and offline participants. Specialized repetitive training and regularly updating knowledge, skills and interpretation while performing autonomic function tests guided by experienced experts is mandated for gaining expertise in the field.^[7-9] All the resource faculties, speakers of the talks, workshop faculties and workshop moderators have undergone certified courses on AFTs. All the speakers and workshop faculties are well experienced in the field and run certification courses and/or observer courses on

AFT in their institution and have been running the institutional AFT labs since more than a decade.

CONCLUSION

The CME sessions were conducted by experienced physiologists who have expertise in performing autonomic function tests regularly. The workshop was also handled by physiologists who run autonomic function testing labs in their institution. These

aspects gave a unique opportunity for budding physiologists to explore the scope of gaining expertise in the field, and for trained faculties to refresh and update their knowledge and skills in the field. Making the workshop accessible on the online mode with good participant interaction gave a broader audience, across the country, the opportunity to visualise and gain familiarity with the intricacies of performing AFT and interpreting the reports. Conducting AFT workshop on the online mode was a unique and novel feature of this CME-workshop. Those who had attended offline could perform the procedures hands-on and interact better with the workshop facilitators.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

AFT: Autonomic Function Test; **ANS:** Autonomic Nervous System; **BRS:** Baroreflex Sensitivity; **CAFT:** Cardiovascular Autonomic Function Test; **HRV:** Heart Rate Variability.

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