News Release
SHARP CORPORATION
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May 30, 2023

World's first*1 report: A potential effectiveness of Plasmacluster Technology that may induce brain activation

Validation of the mechanism of its enhancing effect on human work performance by measuring brain function *2

Sharp Corporation conducted collaborative research on its Plasmacluster technology, with Dr. Goichi Hagiwara, Associate Professor, Faculty of Human Sciences, Kyushu Sangyo University. When the mechanism of its enhancing effectiveness on human work performance is validated by measuring brain function, Sharp confirmed for the first time in the world, the potential to induce brain activation by exposing working people to Plasmacluster ions with positive and negative ions emitted simultaneously.

Through research using brain wave measurements, Sharp has demonstrated that its Plasmacluster technology contribute to the enhancing effectiveness on work performance (the reducing stress and maintaining the concentration of people working indoors or driving a car*3, 4 and the improvement of exercise training efficiency*5,6and esports scores*7 and so on), and this time, Sharp could approach specific mechanism for the first time.

From the results so far, Sharp considered the possibility of Plasmacluster technology effect not only on brain waves but also on blood flow (cerebral blood flow) in the prefrontal cortex, which is closely associated with concentration and cognition. Therefore, in this research, Sharp used a device to measure the changes in cerebral blood flow and then compared the changes under the following conditions: when subjects were not exposed to Plasmacluster ions (air flow only) and exposed to Plasmacluster ions.
As a result, the changes in cerebral blood flow that occurs during brain activation was confirmed when subjects were exposed to Plasmacluster ions, and it is suggested that this brain activation by the Plasmacluster technology contribute to the mechanism of the enhancing effectiveness on human work performance.

Plasmacluster technology is an air purification technology that uses the same positive and negative ions as those present in nature. A high level of safety and various effectiveness have been confirmed by conducting tests at independent third-party testing institutions in and outside Japan for more than 20 years. With the discovery of the potential of Plasmacluster technology to induce brain activation as a turning point, Sharp will continuously conduct the verification of the effectiveness and its mechanism against the human being to enhance its reliability, and will study the additional effectiveness and applicability of Plasmacluster technology to the new field.

Comments from Dr. Goichi Hagiwara, Associate Professor, Kyushu Sangyo University
Research on positive or negative ions only has been conducted till now, but there has been little progress in research emitting both simultaneously. In this research, the potential for brain activation to be induced by Plasmacluster technology with positive and negative ions emitted simultaneously was confirmed for the first time, and this is very significant for advancing research in this field. it is possible that work performance such as sports, learning, daily operations and so on is enhanced by improvement of the ability to think and take action due to this brain activation, so I look forward to further application of Plasmacluster technology in the future.

*1 Research results of ion emission type air purification technology in which positive and negative ions are emitted simultaneously (as of May 30, 2023; based on Sharp findings).

*2 Measuring brain activity by measuring brain wave, and the changes in cerebral blood flow. it is used for not only to basic research but also to simple diagnosis on the brain.

*3 Verification of the suppression of stress and maintenance of concentration while working indoors https://jp.sharp/plasmacluster-tech/closeup/closeup01/

*4 Verification of the suppression of stress and maintenance of concentration while driving a car https://jp.sharp/plasmacluster-tech/closeup/closeup05/

[*5] Verification of improvement of exercise training efficiency with Plasmacluster technology https://jp.sharp/plasmacluster-tech/closeup/closeup06/

[*6] Hagiwara et al. Effectiveness of Positive and Negative Ions for Elite Japanese Swimmers' Physical Training: Subjective and Biological Emotional Evaluations. Applied Sciences. 2020, 10(12), 4198. https://doi.org/10.3390/app10124198

[*7] Hagiwara et al. Effect of positive and negative ions in esports performance and arousal levels. Journal of Digital Life. 2021, 1,2. https://doi.org/10.51015/jdl.2021.1.2

■ Overview of Test to Investigate the Effects of Plasmacluster Ions on Cerebral Blood Flow

- Test conducted by: Dr. Goichi Hagiwara, Associate Professor (Kyushu Sangyo University)
- Test space: Laboratory in Kyushu Sangyo University (W 7.80 × D 3.40 × H 2.90 m)
- Subjects: 24 men and women; 19 to 22 years of age
- Verification test apparatus: Testing devices equipped with Plasmacluster technology、NIRS Brain Measuring Device
- Test conditions: a. Plasmacluster ions OFF (air flow only)
  b. Plasmacluster ions ON (simultaneous exposure to positive and negative ions)

- Plasmacluster Ion density: Approx. 100,000 ions/cm^3 at the positions of subjects
- Test method:
  ① A NIRS Brain Measuring Device was fitted onto each subject.
  ② The subjects colored picture under each test condition, and testing devices were halted after a predetermined period of time.
  ③ The changes in cerebral blood flow were checked and compared for the respective test conditions.

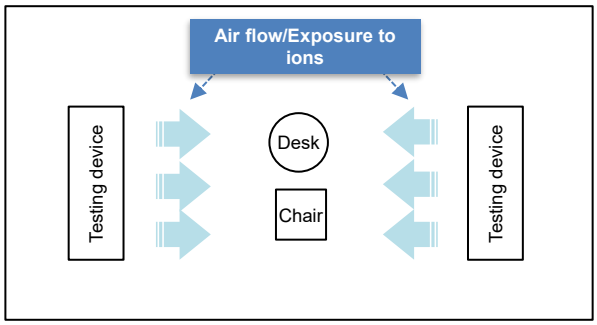

Fig. 1. Testing device layout image

Fig. 2. Image of testing

- Results:
  - Cerebral blood flow which the oxygenated hemoglobin concentration increased and deoxygenated hemoglobin concentration decreased was confirmed under the Plasmacluster ions ON condition. This suggested that brain activation may have occurred since the change is observed when brain activity occurs.
    It is thought that this contributes to the mechanism of the enhancing effectiveness on human work performance by the Plasmacluster technology that has previously been verified.

※Oxy-Hb：Hemoglobin with bound oxygen、give oxygen to brain tissue
※Deoxy-Hb：Hemoglobin after delivering oxygen、back to lungs and receive oxygen

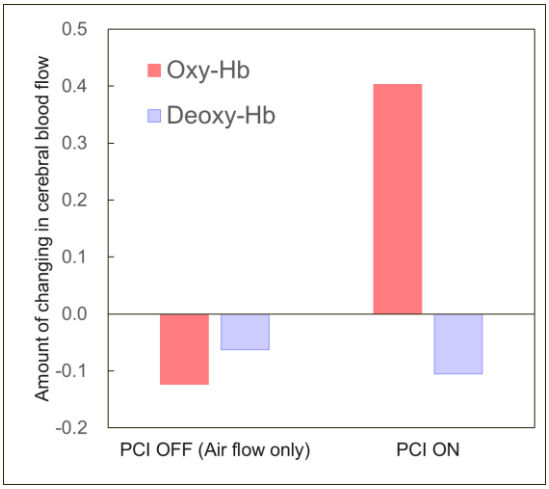

Fig. 3. Changes in cerebral blood flow under each test condition (n=22)

Reference example

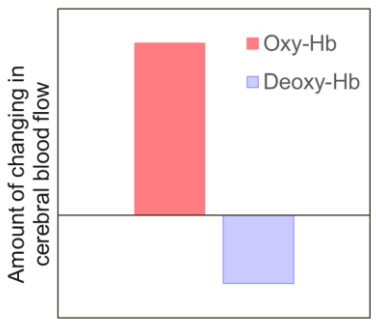

Fig.4. Image of changing in cerebral blood flow when brain activity occurs

・oxygenated hemoglobin concentration increase
・deoxygenated hemoglobin concentration decrease

Research Institutes That Provided Data for Sharp's Academic Marketing

Target	Testing and Verification Organization
Working mechanism of its enhancing effect on work performance	Kyushu Sangyo University, Department of Sport Science and Health, Faculty of Human Sciences
Working mechanism of inhibitory effects on viruses, fungi, and bacteria	Professor Gerhard Artmann, Aachen University of Applied Sciences, Germany
Working mechanism of inhibitory effects on allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University
Working mechanism of skin moisturizing (water molecule coating) effect	Research Institute of Electrical Communication, Tohoku University
Efficacy proven in clinical trials	Kyushu Sangyo University, Department of Sport Science and Health, Faculty of Human Sciences
	National Institute of Fitness and Sports in Kanoya
	Shibaura Institute of Technology, College of Systems Engineering and Science, Department of Machinery and Control Systems
	Littlesoftware Inc.
	Dentsu ScienceJam Inc.
	Graduate School of Medicine, University of Tokyo / Public Health Research Foundation
	Faculty of Science and Engineering, Chuo University / Clinical Research Support Center, University Hospital, University of Tokyo
	National Center of Tuberculosis and Lung Diseases, Georgia
	Animal Clinical Research Foundation
	Soiken Inc.
	School of Bioscience and Biotechnology, Tokyo University of Technology
	National Trust Co., Ltd. / HARG Treatment Center
Evaluation of effects on cells	Columbia University, Department of Medicine
Viruses	Kitasato Research Center of Environmental Sciences
	Seoul National University
	Shanghai Municipal Center for Disease Control and Prevention, China
	Kitasato Institute Medical Center Hospital
	Retroscreen Virology, Ltd., UK
	Shokukanken Inc.
	University of Indonesia
	Hanoi College of Technology, Vietnam National University, Vietnam
	Institut Pasteur, Ho Chi Minh City, Vietnam
	National Research Center for the Control and Prevention of Infectious Diseases, Institute of Tropical Medicine, Nagasaki University
	Department of Microbiology, Shimane University, Faculty of Medicine
	Columbia University, Department of Medicine
Fungi	Ishikawa Health Service Association
	University of Lübeck, Germany
	Professor Gerhard Artmann, Aachen University of Applied Sciences, Germany

	Japan Food Research Laboratories
	Shokukanken Inc.
	Shanghai Municipal Center for Disease Control and Prevention, China
	Biostir Inc.
	Medical Mycology Research Center, Chiba University
Bacteria	Ishikawa Health Service Association
	Shanghai Municipal Center for Disease Control and Prevention, China
	Kitasato Research Center of Environmental Sciences
	Kitasato Institute Medical Center Hospital
	Dr. Melvin W. First, Professor Emeritus, Harvard School of Public Health, US
	Animal Clinical Research Foundation
	University of Lübeck, Germany
	Professor Gerhard Artmann, Aachen University of Applied Sciences, Germany
	Japan Food Research Laboratories
	Shokukanken Inc.
	Chest Disease Institute, Thailand
	Biostir Inc.
Allergens	Graduate School of Advanced Sciences of Matter, Hiroshima University
	Department of Biochemistry and Molecular Pathology, Graduate School of Medicine, Osaka City University
Safety	LSI Medience Corporation
Odors, pet smells	Boken Quality Evaluation Institute
	Animal Clinical Research Foundation
Skin beautifying effects	School of Bioscience and Biotechnology, Tokyo University of Technology
Hair beautifying effects	Saticine Medical Co., Ltd.
	C.T.C Japan Ltd.
Plant	Facility of Agriculture, Shizuoka University
Hazardous chemical substances	Sumika Chemical Analysis Service Ltd.
	Indian Institutes of Technology Delhi