Monitoring Human Biomarkers with AO Scan during the First Analog Mission Pilot Study to Build a Biofrequency-based API of Human Body

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Abstract

There is a lack of research, access, and understanding of human frequencies and biomarkers derived from bioresonance software. AO Scan is a voice and body analysis software that remotely monitors the electromagnetic and magnetic scalar wave differences in up to 120,000 human frequencies and biomarkers from short scans over a few minutes. In this ground-based pilot study, 90 non-invasive Vitals and Comprehensive Scans were conducted on a six-person crew during a two week Analog Mission at the LunAres research station in Poland. Complete blood count (CBC) biomarkers from six Vitals scans were recorded for each analog astronaut and compared to two blood tests from February 12 and 26, 2021. With six analog astronauts generating 3,600 biomarkers per Vitals scan each day, the study analysed the accuracy of 0.833% of the 54,000 biomarkers generated from the Vitals Scan. The first data analysis yielded an accuracy of 65% in describing both the in and out of range CBC biomarkers. A high false positive rate of 76.9% was observed, as well as a false negative rate of 30.1%, a true negative rate of 23.1%, and a true positive rate of 69.3%. The second data analysis determined how many CBC biomarkers deviated under 30 or over 70 percent from the maximum healthy CBC biomarker range. The study results are largely inconclusive considering a variety of reasons including instrument sensitivity, time differences, small sample size, diet, and environmental factors. This experiment represents the first peer reviewed study to use the bioresonance non-linear scanner AO Scan to remotely monitor the health of humans and analog astronauts. Further research is required to quantify the accuracy and efficacy of AO Scan by comparing them with established medical diagnostic tools in order to understand the potential significance in monitoring human health.

Keywords: Bioresonance, Human Biomarkers, Voice and Body Analysis Software, Analog Mission, Space Exploration

1 Introduction

This research study attempts to examine the accuracy of complete blood count (CBC) biomarkers remotely generated from the AO Scan voice and body analysis software. This is done by comparing scan results with blood tests from analog astronauts during a February 2021 mission at Lunares Research Station in Poland. The paper collects the science, history, and recent advancements involved in bioresonance software.
A new software is proposed, human factors analysis is conducted, and potential implications for manned space missions are examined. The main contributions of this study include the following:

- Conduct the first ground-based pilot study and quantitative data analysis of AO Scan results,
- Understand, challenge, and interpret accuracy and sensitivity of AO Scan technology,
- Propose a software and API design for improved user experience with this early stage biotechnology.

1.1 Background to Bioresonance

Every cell in the body has their own distinctive vibrational frequency and emits and receives electromagnetic signals [1]. When cellular electromagnetic communication or vibrational oscillations are disrupted by injury, diet, stress, or emotion, diseases can appear [2]. There is a measurable difference between the natural standardized frequency and actual resonating frequency of that biological function that can be calculated to determine the health of cellular mechanisms. Microcurrent electrical therapy (MET) was proposed before 1974 and involves passing low-level current to restore natural current flow of the human body [3]. Microcurrent stimulation affects cellular physiology by reducing the electrical resistance of the injured tissue and restoring its cellular capacitance. A 1982 study found that microcurrent stimulation (< 500mA) can significantly increase the production of ATP in the tissue by as much as 500% and increase amino acid transport and protein synthesis in the treated area by 30-40% [4]. Thus, the health status of an organ, tissue, system or cell structure within the body can be identified and targeted by passing microcurrent frequencies through the body and measuring the current's resistance. Bioresonance measures and attunes the frequencies of energy wavelengths coming from the body. A 2020 allergy study found that 90% of the 311 patients observe no allergy-related symptoms (nasal, eye, respiratory, and gastrointestinal) or show significant improvement of their symptoms after 12 months of bioresonance treatment [5]. MORA bioresonance therapy (classical bioresonance therapy) has been practised for more than 30 years since the 1970s by naturopathic practitioners throughout planet Earth. A 2011 study found that bioresonance therapy had a high practical-therapeutic effectiveness for over 83.3% of all the 935 patients suffering from diseases, allergies, pain, and infections [6]. According to the findings obtained by a pilot study in 2014 with 190 smokers, bioresonance therapy was found to be clinically effective in smoking cessation and does not show any adverse side effects [7].

A disease first begins outside the body, in the human biofield. When it is in the biofield, it is much easier to remove or balance than after it becomes physical matter. With an electrical field 60 times greater and a magnetic field 5,000 times greater than that of the brain, the heart -which is central to the Autonomic Nervous System (ANS)- projects signals into the biofield that can be detected by another human being, brain and heart [7]. While the practice of biofield therapies has existed in Eastern and Western cultures for thousands of years, empirical research on the effectiveness of biofield therapies is still relatively nascent. Biofield therapies may be delivered either in the same room or parts of the body further away from the human heart. As of 2015, more than 15 clinical trials have been conducted with biofield therapies in patients with cancer and 30 published clinical trials have reported the effects of biofield therapies for pain [8]. Several studies have examined human biomarkers such as heart rate variability (HRV), cortisol, and cytotoxicity (quality of toxic cells) as outcomes in clinical research participants. Reported changes in these specific outcomes suggest that biofield therapies have positive effects on physiological processes [8].

Two main components of Earth's pulsed electromagnetic frequencies (PEMFs), the standing waves of electricity or Schumann frequencies, and Geomagnetic frequencies, are important to human health. In the early 2000s, NASA demonstrated that astronauts who are cut off from Earth's magnetic field developed health problems, which can be prevented by providing an artificial magnetic field. A four year NASA study led b Dr. Thomas Goodwin found that the greatest efficacy on PEMF therapy came from rapid time varying square-waves, low 10Hz frequencies, and low intensities 10-200 milligauss. NASA and Roscosmos use electromagnetic field generators on the ISS to maintain human circadian rhythms, energy production, and inflammation reduction [9]. Further research is required to determine the effect, if any, from local PEMFs on the efficacy of low electromagnetic frequencies pulsed from bioresonance software.

Dr. Royal Raymond Rife was an American optics inventor, engineer and scientist who developed the Rife Machine in the 1920's and 1930's that delivers a low energy electromagnetic frequency into the body.[10] By applying a low voltage current, Dr. Rife discovered that viruses, bacteria, parasites and pathogens are sensitive to a specific frequency of sound and can be targeted and killed by intensifying that frequency or signal, similar to how opera singers use their voice to shatter crystal glass.

1.2 Recent Advancements in Voice Analysis and Frequency Resonance

All human cells produce electromagnetic fields from the electrical activity in all the body's 210 different cell types, each with a different measurable frequency. Neurons, endocrine cells, and muscle cells are referred to as "excitable cells." These cells produce current (via electron transfer); magnetic field (via moving charges);

a pulsed frequency; as well as pH, oxygen, carbon dioxide, and light (via biophotons)[11]. As limbs are affected by Parkinson's disease, vocal organs involved in speech production are impacted too. On the bottom trough of human voice waves, vocal tremors, weakness, and rigidity appear. A 2017 study with 20 early Parkinson's disease (PD) patients and 15 controls used a speech analysis technique, called RASTA-PLP, to accurately identify 82% to 87% of patients with Parkinson's [12]. Moreover, a team at NYU School of Medicine developed a novel bioinformatics AI tool that can analyse voices and identify those with Post traumatic stress disorder (PTSD) with a high accuracy rate of 89 percent. By combining AI with audio recordings of the human voice spectrum, researchers partitioned over 40,000 unique biophysical features [13].

In terms of recent advancements in frequency resonance, researchers tested thousands of frequencies and discovered that sympathetic resonance vibration requires two input frequencies, one lower and one higher frequency which must be 11 times higher, which is known as the 11th harmonic that shatters microorganisms like crystal glass. Through eight years of using sympathetic resonance vibrations at a cancer lab in the Division of Surgical Research laboratory at Jefferson, Dr. Anthony Holland and researchers killed an average of 25-52% of leukemia cells in patients, slowed the growth rate of cancers by 65%, and discovered the electronic signals eliminated antibiotic resistance in MRSA bacteria [14].

1.3 Background to AO Scan and Solex, LLC

Since the early 2000's, three Russian scientists who specialize in microwave resonance therapy identified and compiled a database of more than 120,000 different frequencies that are the same in each person [15]. After cataloging the frequencies, the US-based company Solex LLC commercialised AO (Alpha Omega) Scan Digital Body Analyzer, a voice and body analysis software that remotely analyses short fifteen second audio files to monitor the active/inflamed or less active/underused frequencies of 1,400+ human biomarkers. With a similar imaging process to MRI, CT Scan or X-Rays, AO Scan pulses electromagnetic frequencies in each scan which spans a maximum of five to ten minutes in duration, and generates three safe non-invasive scans: (i) INNER-voice, (ii) Vitals Reports, and (iii) Comprehensive Reports. As a type of biofeedback device similar to neurofeedback, AO Scan reported that the device has not been approved by the U.S. Food and Drug Administration (FDA) and that it is not used as a medical or diagnostic instrument [15].

AO Scan was formerly operated only on specific mobile Android devices due to high compute power to run the application. The company uploaded the software to the cloud in early 2021, which is now accessible via the internet for registered scan users who pay $149 per month to use and access the voice and body analysis software. Hundreds of open source user testimonials can be found in various AO Scan Facebook groups. Since the company launch in 2017 and product roll-out in Summer 2020, Solex has accumulated 20,000 AO Scan users, which would generate approximately $2.98M per month if all users are charged at the same monthly rate. After decades of product development, technology miniaturisation, and system improvements from similar technologies to larger rife machines with wired electrodes, the biotechnology has become integrated into cloud-based software and is now commercially available on the market with price reductions orders of magnitude lower than previous costs.

1.4 Challenges in Field

With the largest frequency-based database on human health, AO Scan does not currently allow individuals and organisations access to their database primarily due to privacy concerns, which imposes limitations on human understanding of health, research, and science. Although many registered users have reported that AO Scan results match with bloodwork and other testing procedures, a lack of scientific literature and research limit the potential of frequency resonance biotechnology. One of the largest challenges toward the market diversification of using AO Scan to monitor human health is the minimal peer-reviewed research and understanding of the instrument sensitivity and accuracy of the green and red dots.

After learning about AO Scan and experiencing the challenges and opportunities in the field, 10+ researchers and developers united during the fall and winter 2020 to found Biofrequency Analytics (BA), a Washington, DC-based data analytics firm, research organisation, and cloud-based Software as a service (SaaS) company. BA plans to design, build, and operate one of the first frequency-based data refinery of the human body from

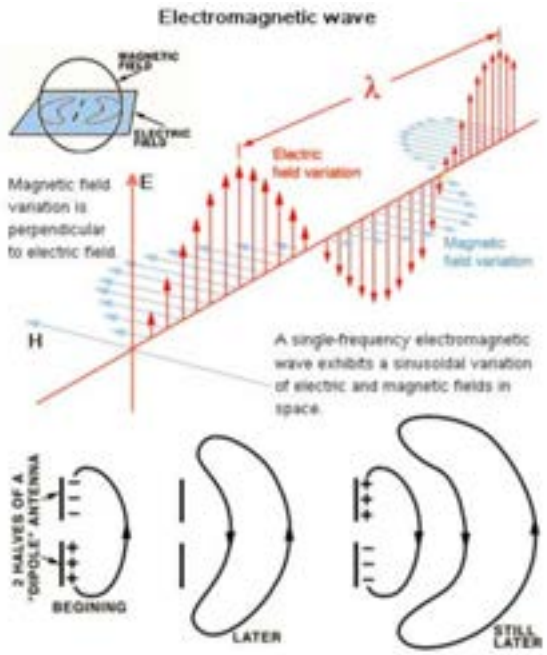

Figure 1: Electromagnetic wave]

tailored data analysis on over 120,000 human frequencies and over 1,400 human biomarkers derived from AO Scan software. Biofrequency Analytics plans to provide the following key services: (i) data aggregation and analytics, (ii) research coordination and management, (iii) remote scans and customised health reports.

2 Science behind AO Scan

2.1 History and Background to Electromagnetism

A single frequency electromagnetic wave propagates as a sinusoidal variation of electric and magnetic fields. As outlined in figure 1, magnetic field variation is perpendicular to the electric field [16]. Living organisms are sensitive to both the Electric (E) field and the Magnetic (B) field. In electromagnetism, the Lorentz force refers to the combination of electric and magnetic forces on a point charge due to electromagnetic fields. Because the Lorentz force results from a magnetic field and produces mechanical motion, phenomena that arise from it are often referred to as "magneto-acoustics", which represents a novel and important application of Lorentz forces in biomedical imaging [17]. James Clerk Maxwell began working on Michael Faraday's lines of force. In his 1861 paper titled, On Physical Lines of Force, Maxwell modelled these magnetic lines of force using a sea of molecular vortices that he considered to be partly made of aether and partly made of ordinary matter [18].

AO Scan claims to use three core techniques: (i) Bioresonance Recognition, (ii) Bioresonance Comparison, and (iii) Sympathetic Vibratory Physics [15]. Customers have the option to conduct five scans: quick scan, INNER-Voice, Vitals, Comprehensive, SEFI, which are all visible at the homepage of the online software after users login. The Vitals and Comprehensive Scans comprise over 90 percent of the human biomarker data. After users upload an individual photo, full name, gender, weight, height, birth date, email address, and voice recording, the scan reports are generated and delivered within several minutes. A majority of scans

were conducted in-person until the late 2010's, when the software was uploaded to the cloud. It is believed that users began conducting more remote scans across planet Earth to pulse low energy electromagnetic frequencies and 180 degree sinusoidal waves to the intended user thousands of miles away. Further research is required to determine the efficacy and difference between in-person and remote scans.

The technology is based on the works of Nikola Tesla, Dr. Royal Rife, and Albert Einstein. When initiating a scan, specific frequencies for the biomarker are remotely introduced to the brain, which then responds with the actual frequency that human subsystem or biomarker is resonating at. After comparing the actual frequencies to the introduced frequencies, signals are converted into algorithms and compared to a large database to determine the numerical value (1-9) [15]. Biomarkers with lower numbers indicate lethargy or under-use, and higher numbers correlate to overuse or inflammation. Whereas traditional bioresonance utilise wired electrodes to identify the wavelengths of human cells and body parts, AO Scan claims to wirelessly initiate the bioresonance recognition and comparison starting in the brain [15]. AO Scan measures the electric and magnetic vector potentials of EM frequencies and remotely pulses low energetic electromagnetic frequencies to the user. The AO Scan Vitals and Comprehensive Scans monitor the frequency deviations in the electromagnetic and magnetic scalar waves.

2.2 Scalar waves

The wireless transfer of energy as longitudinal (or scalar) wave radiation was discovered by Nikola Tesla around 1890 [19], originating from the patent entitled Apparatus for transmission of Electrical Energy [20]. Scalar waves, also known as Tesla Waves, are two of three possible wave types, the electromagnetic wave, the electric scalar wave (SW), and the magnetic SW, which plays a crucial role in biology. Living organisms propagate magnetic scalar (Tesla) waves instead of the electrical Tesla-wave. ATP is the 'energy-currency' of plants, animals and humans and is produced in the mitochondria as a result of a functioning respiratory chain. It is theorised that the mediation of scalar waves occurs from the mitochondria[21].The necessary energy required to power the cellular chemical processes are provided by the magnetic scalar wave itself [22]. Earlier papers proposed that mitochondria, located inside tunneling nano tubes, are able to form a connected structure in order to exchange energy and information signals between cells electrically or electro-magnetically [23].

When there is a disturbance in the frequency of a living organism, there is a magnetic Tesla wave that radiates into the zero point energy field (ZPF). Tesla waves vibrate in line with the direction of travel and propagate throughout planet Earth at rates of 7.8 cycles per second that are permeable through most nonliving and living matter. While the Hertzian waves have a transverse-wave characteristic, the scalar waves are based on a direct trajectory from the sender to the receiver and vice versa. The energy emitted by the transmitter is collected again by the receiver. This applies only in the so-called resonance between transmitter and receiver, which requires the same waveform, the same frequency and the opposite phase [21].

Scalar waves are reported to exhibit multiple trapped modes including the potential well, trapping case, and scattering case. Trapped modes of scalar waves provide clues to frequency resonance mechanisms [24], which are considered to be partly made of aether and partly made of ordinary matter. A plasma physics professor, Dr. Bahman Zohuri provides a greater scientific and mathematical understanding of scalar waves in his 2018 publication entitled Scalar Wave Driven Energy Applications [19].

Moreover, Nikola Tesla discovered the rotating magnetic field which is the basis of the induction motor, alternating current electricity, and Magnetic resonance imaging (MRI) technology. MRI devices also produce a radio frequency current that creates a varying magnetic field [25]. An MRI scanner generates a very strong magnetic field (about 0.2 to 3 teslas, or roughly a thousand times the strength of a typical fridge magnet), which aligns the proton spins to measure how much water is in different tissues. With two hydrogen nuclei or protons, water molecules (H2O) become aligned in a magnetic field as the protons absorb the energy from the magnetic field and flip their spins. Up to 60 percent of the human adult body is water. The brain and heart are composed of 73 percent water [26]. AO Scan employs an imaging process similar to an MRI, CT Scan or X-Ray.

Figure 2: AO Scan Vitals Reports

2.3 AO Scan Reports

2.3.1 Vitals Report

AO Scan provides the option to conduct five scans: a quick scan, INNER-Voice, Vitals, Comprehensive, SEFI, which are all visible at the homepage of the online software after users login. The Vitals and Comprehensive Scans comprise over 90 percent of the human biomarker data of interest. The only digital information entered to conduct remote scans and extract the human biomarker data include a headshot photo, first name, last name, gender, weight, height, birth date, and email address. The Vitals Scan monitors the frequency deviations in magnetic scalar waves and require around 30-60 seconds on average per person, depending on the compute processing power of the AO Scan software that was increased by 50 percent in early 2021. Vitals Report includes over 600 human biomarkers per scan, representing the status of each biomarker in the present day. As highlighted in figure 2, the grey column on the right indicates the status of that biomarker after inputting specific frequencies. The white column on the left is the biomarker status after the most recent scan or after bringing the human frequencies closer to natural resonance. Green dots indicate that the biomarker is in balance and functional and red dots represent a biomarker out of balance or deficient. Multiple repeated red dots indicate that biomarker is out of the healthy operational range. Each Vitals Report generates biomarkers across the following 26 categories: blood-lipids, CBC, amino acids, fatty acids (Omega-3's and Omega-6s), parasites, fungus, bacterial diseases, inflammation, insulin resistance, digestive enzymes, microminerals, heavy metal toxicity levels, vitamins, bone mineral density/disease/growth, brain nerves, cardiovascular/cerebrovascular, collagen indexes, hormones, immune system, organ function, molds, allergens, intolerances to food, human toxins, and viruses.

2.3.2 Comprehensive Report

The Comprehensive Scan also monitors the frequency deviations in magnetic scalar waves but require greater compute power spanning around three to five minutes on average per person. Comprehensive Reports provides over 747 ratings of human anatomy, physiology, and subcomponents including the following: arteries, arms, head, legs, lower and upper body, chromosomes and corresponding telomeres, centromeres,

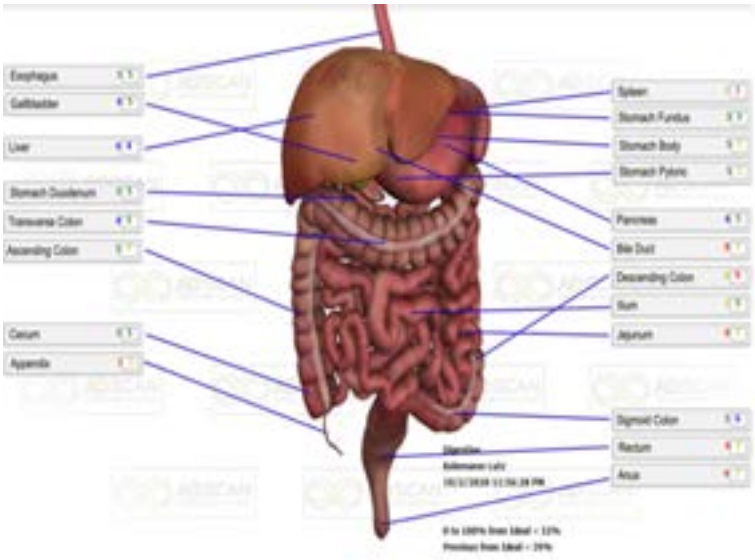

Figure 3: AO Scan Comprehensive Report: Digestive Organ

chromatids, DNA markers, connective tissue, heart, muscles, nerves, organs (adrenals, basal ganglia, blood cells, brain, breast, cerebral cortex, digestive, human cell, kidney cross section, large intestine, liver,lungs, mitochondria, neck, pancreas, rectum, reproductive, respiratory, skin, stomach, teeth, thyroid) urinary system, skeleton, and veins. In early 2021, the software provider and operator Solex, LLC changed the delivery of Comprehensive Reports from delivering 34 PDF's via email, averaging around 20.4 MB in total, to cloud-based web pages that occupy around 6.3 MB on average, similar to the AO Scan Vitals reports. The numerical values on the left of each white box highlighted in figure 3 represents the biological status after the first Comprehensive Scan. The values inside the grey box represent biological status of the second to last scan. Numerical values closer to one indicate lethargy, under use, and inactivity and values closer to nine represent overuse, inflammation, or over-activity. Closer to five indicates that the biological component is performing well and in balance. Each section includes quantitative measurements ranging from 0 to 100 percent from ideal and previous from ideal.

3 Materials and Methods

3.1 LunAres Analog Mission Orpheus 11

Six analog astronauts participated in this study in isolation on a lunar manned mission simulation at LunAres Analog Space research station, based in Poland. The habitat is located in a post-military airport, where the old nuclear bunker was converted in an Extra Vehicular Activity (EVA) area, simulating the surface of the moon. For the duration of the mission, astronauts had a strict diet that consisted exclusively of freeze-dried food. Caffeine was prohibited, and they did not have access to natural light. The crew was gender balanced, and consisted of scientists from four countries.

Each analog astronaut had different roles and responsibilities:

- Commander Benjamin Pothier, French anthropologist and human factors expert
- Vice Commander Aleksandra Kozawska, Polish service and strategy designer
- Mission Engineer Eduardo Salazar-Perez, Mexican mechatronics engineer
- Software Engineer Alicja Musial, Polish satellite software developer
- Media Officer Marcin Baraniecki, Polish software developer

- Medical Officer Sara Sabry, Egyptian mechatronics/biomedical engineer and researcher

Every morning, astronauts check their daily habitat tasks and routines scheduled by Mission Control (MC). A typical day in the habitat starts with a wakeup call at 7:30 am, a morning group yoga session, a hearty bowl of freeze-dried porridge, and a cup of herbal tea. This is followed by several medical checks that look at heart rate, oxygen level, temperature, weight, and blood pressure. The medical officer responsible for biomedical research spent time with every astronaut in the morning, measuring changes in grip strength (dynamometer) as well as posture (stabilography). The aim of this research study is to "assess the influence of prolonged isolation in a small space on selected motor strength and posture". After those daily morning medical checks and habitat tasks, astronauts met with mission control at 10:30 am to discuss any possible issues with the habitat, or to have a briefing about EVAs.

Every other day, astronauts participated in EVAs that required the help of the entire crew. Throughout the EVA, habcom communicated the EVA team through walkie-talkies as well as being connected on Zoom with MC and occasionally, with the remote crew and flight surgeon. Upon completion of the EVA, getting undressed, having another med-check and cleaning the Atrium, the crew had a debriefing which helped in better understanding how to improve the tools and prototypes for future EVAs. Finally, the crew met in the kitchen for dinner. They used this time to talk and bond, which helped immensely with keeping the mission morals high, and built a higher sense of belonging to a team. After dinner, the crew met in the Operations room where they had a daily psychological test, and finally, the medical officer conducted a final medical checkup for the entire crew. The working day would come to an end at around 9:00 pm, and the crew would usually either sit and talk, or have a movie night in the atrium before going to bed at 11:30 pm.

On non-EVA days, the morning routines were the same but after lunch, each astronaut worked on their independent research and projects. Mission engineers usually worked on the geological sampling tools (Eduardo, Alicja and Marcin). The medical officer and the commander (Sara and Benjamin) collaborated on a Neurofeedback project using an EEG headset, while the vice commander (Aleksandra) worked on her independent research. Habitat tasks included taking out the garbage in the morning, vacuuming all the modules, preparing food for the crew (breakfast, lunch and dinner), cleaning up after meals, cleaning the sanitary modules, and general cleaning.

3.2 Scan Methods and Process

Each day crew members recorded their voice by saying the ABC's or talking into a microphone of cell phone. With the AO Scan cloud-based software, Vitals and Comprehensive scans were conducted remotely on each crew member every day at varying times mostly from 2-7 PM GMT +1. Most crew members received daily emails in the late afternoon or early evening with URL's to access their Vitals and Comprehensive Reports. The analog astronauts mentioned that there was initial interest and engagement in viewing their scans, however, the interest waned after the first few days. Almost all of the crew did not view AO Scan results each day. This could be attributed to several factors including the current design of the API that demands a few minutes to read biomarkers, time of day, and analog astronauts are typically quite busy each day.

4 Results

4.1 Blood Tests and Analysis on Analog Astronauts

On February 12, the first blood tests were conducted on the six analog astronauts. Blood test kits, analysis, and results were provided by DIAGNOSTYKA, a polish-based organisation established in Kraków in 1998 that employs over 7,000 specialists throughout 170 laboratories in Poland. The second round of blood tests were conducted the morning of February 26 a few hours before breakfast. For data analysis, validation, and interpretation, it is important to consider that single blood tests often demand follow up tests to better gauge the actual value of each complete blood count (CBC) biomarker.

	AO Scans (GMT+1)		Blood Tests (GMT+1)		Time Difference	
Astronaut code	Feb 13	Feb 26	Feb 12	Feb 26	Feb 12	Feb 26
A1	2:24AM	2:28PM	N/A	N/A	N/A	N/A
A2	2:41AM	2:42PM	7:44AM	6:08AM	17hrs, 3min	15hrs, 26min
A3	2:51AM	8:50PM	7:36AM	6:10AM	16hrs, 45min	14hrs, 40min
A4	3:03AM	8:52PM	7:31AM	6:09AM	16hrs, 28min	14hrs, 43min
A5	1:32PM	8:51PM	7:17AM	6:12AM	29hrs, 43min	14hrs, 39min
A6	1:23PM	7:14PM	7:40AM	6:11PM	30hrs, 16min	13hr, 3min

Table 1: Time Differences between Scans and Blood Tests

Blood tests were taken during preflight and postflight, ie. before and after the 2-week isolation mission. Blood samples were analysed and graphed for five of the six analog crew members on February 12 and 26. Analog astronaut A1 was excluded from the data analysis due to failure to deliver blood tests on time. Five biomarkers: Eosinophils, Monocytes, Neutrophils, Mean platelet volume (MPV), and White Blood Cells (WBC) deviated around 75% or higher from the maximum healthy range for the CBC biomarkers.

Blood tests were then compared with scan results from CBC biomarkers monitored with AO Scan from February 12 to 14 and February 24 to 26. There were similarities and differences between the biomarkers out of balance from blood tests and AO Scan. Both methods registered imbalances for Lymphocytes, Blood Platelets, WBC, Basophils, Neutrophils, and Monocytes. Although AO Scan registered less biomarkers out of balance for Neutrophil and Eosinophils with higher imbalances for Hematocrit and Hemoglobin across crew members even though these biomarkers were not outside of the healthy range in blood tests.

The 15 CBC biomarkers analysed in the study comprise around 2.5 percent of biomarkers in each Vitals scan, which contains 600 biomarkers per report. 450 CBC vitals biomarkers were manually analysed from 30 scans over two three-day time periods. CBC biomarkers included in the pilot study comprise .833 percent of the 54,000 biomarkers generated from the Vitals Scan and excludes all of the 67,000+ biomarkers generated from the Comprehensive scans during the 16-day study time period.With six analog astronauts, 3,600 biomarkers were generated from Vitals each day and around 4,500 biomarkers were generated from each Comprehensive scan per day for a total of 8,100 biomarkers generated per day for the six-man crew.

4.2 Data Analysis

The objective of the data analysis was to quantify the significance and accuracy of the red and green dots in the CBC Vitals section. Data analysis on the CBC section of the Vitals Report included the following 14 CBC biomarkers from the blood tests: Basophils, Eosinophils, Hematocrit, Hemoglobin, Lymphocytes, MCH, MCHC, MCV, Monocytes, Neutrophil, Platelets, RBC (Red Blood Cells), RDW (red cell distribution width), and WBC (White blood cells). As outlined in Table 1, Blood tests were sampled on the morning GMT +1 of February 12 and February 26 and scans occurred approximately 16-30 hours after blood was sampled.

4.2.1 Data Analysis 1

The CBC biomarkers from the AO scans were compared to those in the blood. For every biomarker in the CBC, a match or mismatch was noted. A total of 14 biomarkers were compared for each astronaut, on both February 12 and 26, for a dataset composed of 140 datums. To calculate the accuracy, the true positives and true negatives were added and then divided by the total. True positives (TP) are when AO scan indicates that the biomarker in question is within the normal range (healthy - green dot), and the blood test shows that the later is actually true. True negatives (TN) mean that AO scan indicates a red dot (biomarker out of range), and that being in reality true as seen in the blood test. On the other hand, false negatives (FN) occur when

the scan shows a biomarker is out of range (red dot) while the blood test deems it healthy. Incidentally, false positives (FP) mean that the AO scan mistakenly indicates the biomarker is within the healthy range when was actually not.

4.2.2 Data Analysis 2

In applying a similar approach, the aim for Data Analysis II was to better determine the sensitivity and accuracy of AO Scan. The second data analysis determined how many red and green dots in CBC biomarkers of AO Scan deviated under 30 or over 70 percent from the maximum healthy CBC biomarker range registered in the blood tests. First, we determined the percentage of how far each of the 14 biomarkers deviated from the maximum or minimum healthy blood test range. The sum of standard deviations for the healthy range of CBC biomarker was used to determine how far the actual CBC biomarker value from blood tests deviated from the maximum or minimum health range. Results indicating less than 0% were above the maximum healthy range and the values greater than 100% indicate below the minimum healthy range for the CBC biomarker. Each CBC biomarker was replaced and analysed with the red dots (1s) and green dots (0s) from AO Scan. The percent from maximum or minimum approach holds the potential to enable greater understanding into the sensitivity, accuracy, and significance of the single red dots, and repeated red dots, or biomarkers out of balance for longer periods of time.

5 Discussion

5.1 Data Accuracy and Validation

Data Analysis 1. The accuracy of the AO scan was found to be 65% in correctly describing both healthy and unhealthy biomarkers (green and red) with a misclassification or error rate of 35%. The sensitivity or recall (true positive rate) was calculated and is of 69.3%. This gives information on how often the AO scan correctly detects healthy biomarkers. The false positive rate, meaning how often the AO scan indicates the biomarker to be healthy when in reality it is not is of 76.9%. The AO scan specificity (true negative rate) is 23.07%, which gives information on how often it is able to correctly indicate a biomarker that is out of range. Finally, we found that the AO scan precision in correctly predicting healthy biomarkers is 89.8%, with a prevalence of 90.7% (majority of biomarkers are healthy).

Data Analysis 2. If a red dot was closer to the minimum or maximum healthy range, it is theorised there is a greater likelihood that biomarker would register a single red dot and be vibrating at frequencies farther away from the natural resonance. With the deviation from the maximum healthy CBC biomarker range, 51% of the green and red dots were found to correctly determine if each CBC biomarker was in the diminished healthy range between 30 to 70% from the maximum. The second data analysis observed 136 total datum's with a true positive rate of 22%, true negative rate of 29%, false positive rate of 38%, and false negative rate of 10%. The discrepancy and reduced accuracy could be attributed to a 60% reduced healthy range of the blood tests.

5.2 Data Interpretation and Justification

A science and evidence-based approach with a critical non-bias perspective is imperative in evaluating the efficacy, accuracy, and validity of emerging biotechnology and bioresonance software. The results from the LunAres February 2021 pilot study were largely inconclusive and require further studies and testing to determine the significance and accuracy of AO Scan Vitals. The accuracy and misclassification rate is a function of how many green and red dots are considered in the data analysis. The data analysis in this pilot study assumes a relatively low instrument sensitivity even though it has been reported the instrument has a high sensitivity.

Another justification for the discrepancy between AO Scan results and CBC blood biomarkers could be attributed to blood test samples taken on an empty stomach in the morning as well as the time differences between the blood test sampling and scans. For example, scans on February 13 occurred in the middle of the

night GMT +1 around 17 to 30 hours after blood test sampling. Environmental factors affecting blood test results and CBC biomarkers include stress from traveling, radiation exposure on airplane, sleep circadian rhythm, and an empty stomach. Scans on February 26 were conducted one to four hours after blood test sampling. Other potential correlations and reasoning contributing to the high false positives and negative rates include frequency optimization on February 26, food consumption, time of day, environmental factors and stressors. The resonant frequencies of the human body, or the inflamed or underused status of AO Scan biomarkers (green and red dots), consistently fluctuate over time. Additionally, it should be expected that single red dots in the Vitals section fall within the healthy range of blood tests and other instruments. The double red dots, or red dots that persist over extended periods of time, were not studied in data analysis and are of greater concern than the biomarkers that quickly shift closer to healthy range. In summary, AO Scan is a sensitive instrument and conclusive results necessitate proper analysis tracking hundreds and thousands of out of balance biomarkers over larger data samples and extended time windows.

5.3 Human Factors Analysis and Implications

It was reported that each crew member lost approximately 4 kg (8.8 lbs) on a freeze dried diet. Lower recorded levels of lymphocytes such as B-cells, T-cells, and Cytokine Natural Killer (NK) Cells were observed and can become apparent from zinc deficiencies while higher levels can be due to viral infections and other autoimmune diseases. Low blood platelets, or thrombocytopenia, are a common side effect of nutritional deficiencies such as iron, B12 vitamin, and folate, autoimmune diseases, pregnancy, heavy alcohol consumption or certain medications [27]. Common causes of Low levels of white blood cells (WBCs) in the immune system include autoimmune disease, infection such as hepatitis and HIV, nutritional deficiencies (folic acid and B12), medicine, antibiotics, alcohol, and spleen problems. AO Scan and blood tests observed low levels of Basophils, which are known to contribute to the development of allergies, inflammation, food intolerances, asthma, allergic drug reactions, and more [28].

The Word Cloud highlighted in Figure 4 includes the most prevalent biomarkers out of balance, or double red dots, for all six crew members detected from AO Vitals Scan.These biomarkers were manually extracted from 52 Vitals Scans over every three days for a total of eight days. Notable biomarkers deviating farthest from the healthy range or resonant frequency include: detoxification phase ii, cerebrovascular blood oxygen, omega 3s and 6s, age of ligaments, candida fungus, herpes simplex virus (HSV), protein metabolism in liver and gallbladder, cholesterol crystal, and B6 Pyridoxine. A word cloud approach provides a novel visualisation method to facilitate quicker data interpretation and understanding of biomarkers closer to outside of healthy range.

6 Future Scope

6.1 Need for New Application Program Interface and Software

Tens of thousands of registered users of AO Scan understand a fraction of the data output and human biomarkers. AO Scan's current Application Program Interface (API) is not designed for tracking purposes and only displays numerical (1-9) and green and red dot biomarker data in the present day. As aggregating biomarkers out of balance requires 5-10 minutes per Vitals and Comprehensive scan after each 5-minute scan, manual data entry is often tedious and insufficient to track the progression of biomarkers for health monitoring, research, and commercialisation.

Complex data analytics and aggregation are required to enable each person and researcher to better understand the significance of large datasets of biomarkers. Manual data entry is also more prone to human error. As over 90% of the data generated from each scan user is currently not analysed and most likely forgotten after a few days or weeks, a new software and API holds the potential to recover significant amounts of time, research, and human health understanding. With over 200+ individuals who have expressed interest in a new API and tracking purposes, Biofrequency Analytics plans to develop an improved API initially tailored to the interests of registered users, potential research collaborators, and partners to democratize individual tracking purposes for all mankind.

If further research demonstrates greater accuracy and validation, bioresonance technology such as AO

Figure 4: Biomarkers Cloud

Scan would hold the potential to increase the amount of human health data as well as for astronauts by more than an order of magnitude. A big data approach with complex data-processing application software becomes essential to understand the constantly fluctuating biomarkers from human frequencies.

6.2 Design of New Software and Application Program Interface

The current application program interface (API) of AO Scan Vitals with red and green dots questions the prevailing paradigm of displaying numerical values from blood tests and other medical instruments. Most humans observing and attempting to bring meaning to final health reports will likely be the person that is being studied or most affected by the results. As the average human without a medical background is likely not knowledgeable about the healthy numerical range for every biomarker, an emerging trend in biometrics, biotechnology, software as a service (SaaS), and the delivery of health reports could be shifting toward the green and red dot approach to bring improved data interpretation for the end user. A more simple User Interface (UI) that aggregates the biomarkers resonating out of balance for the longest time and the most critical health anomalies at the beginning holds the potential to maximize data interpretation and minimize clicks to access human health data. Furthermore, understanding the numerical healthy operating range of biomarkers requires greater brain processing power, considering the average human being in 2021 now has an average attention span of eight seconds[29].

A core team of developers and researchers at Biofrequency Analytics plan to design, build, and operate the first frequency-based software and data refinery on the human body to visualize tailored correlations between biomarkers of interest. While finalising the preliminary design review (PDR) of the new online platform, developers can concurrently build the API and software beta version to be released to interested users, researchers, and organisations in fall 2021. A combination of scrubbing, feature extraction algorithms, and custom optimal character recognition (OCR) scripts can be performed on each webpage of the AO Scan Vitals and Comprehensive URLs that will be linked by a user to their account on the platform. Verified users and researchers will have free access to the software beta version for a limited time period where they will test the software, report any inconsistencies or errors, and suggest improvements for features to enable fast iteration and software updates for the final release. A public feedback system and online community forum would provide enhanced user experience and reduce redundant user input and feature suggestions.

Biofrequency Analytics (BA) plans to employ a Software as a Service (SaaS) model, or on-demand software, to license access to the platform and user database on an affordable subscription basis. The API will be hosted on Amazon API Gateway, which provides secure and reliable hosting. The BA user will securely log in through the BA portal where they will be taken to their personal main page. The home page will present the user with various options, including uploading new scans or deleting older scans, an area displaying the top five to ten biomarkers that have remained out of balance, and graphical analysis of their current uploaded data. The data will be visualized with graphs and tables that are easy to understand for users, while allowing interaction to grab a glimpse of more detailed data. If a user chooses to interact with the data, more information will be presented that will explain the meaning of the analysis and possible correlations with other input and output data.

All users will have the option to opt in or out of their data being used for research purposes. A separate subscription tier for the BA data refinery will be designed and tailored to the interested of prospective and registered researchers, data scientists, and developers. Researchers will have special access to various health data that correspond to different user segments and research objectives. This may require various levels of authentication and authorization for users reinforced with data privacy and policy agreements. Each user may have access to specific commands and data. A regular user will have limited access and commands, while a researcher will have slightly more access allowing them to read and interpret data of various users. To allow the software to function between endpoints and allow collaboration outside of Biofrequency Analytics, the API will accommodate these needs via a RESTful approach. A REST API is simple and allows better portability specifically for developers who are interested in working with Biofrequency Analytic's API. Biofrequency Analytics will keep all user data safe and secure, protecting users and their privacy.

6.3 Applications and Significance of New API and Software

A research-driven approach is intrinsically related to the data interpretation and capability of the software. Improved understanding on the accuracy and sensitivity of AO Scan holds the potential to guide the display and API design of human biomarkers. Understanding the deviations in magnetic scalar waves from cells would enable researchers to propose higher quality questions, theories, and correlations governing inflamed or lethargic responses of human subsystems and numerical frequency-based biomarker data. Considering each Vitals and Comprehensive scan provides a permanent URL, data from previous scans and studies can be scrubbed by algorithms to be included in future research studies after approval of scanned users. A new API with tracking purposes holds the potential to expedite and automate both internal and external research, to improve the research quality, quantity, and impact. Biofrequency Analytic's new API and dual purpose software will bring faster data retrieval, analysis, and interpretation. As the data continuously increases, the model will learn how to interpret the data. With a combined community of users, researchers and developers, Biofrequency Analytic's platform will grow and increase the knowledge base of biomarkers and human health.

6.4 International 2021 Pilot Study

In conducting research and science in understudied fields of telemedicine and bioinformatics, it is essential to determine the efficacy, accuracy, and significance of emerging biotechnologies and corresponding data. The aims of the International 2021 Pilot Study are to remotely conduct non-invasive scans to identify the accuracy of human frequency-derived biomarkers by comparing scan results of 50+ adult participants with blood tests, MRIs, CT Scans, X-Rays, etc. BA is offering free remote scans during pilot study and the opportunity for independent researchers to coauthor and/or lead research studies as a passive method of collaboration and minimal time commitment for external researchers. The International 2021 Pilot Study will help provide a technology demonstrator and science to facilitate the first peer reviewed research experiments on bioresonance NLS systems in partnership and collaboration with interested space organisations and agencies.

6.5 Significance for Human Spaceflight and Exploration

"The technology behind the Bio-Analyzer is the result of research performed by three Russian scientists working with the Russian Space Agency. They developed the technology to maintain the health of the astronauts who work for months aboard the international space station. The complete system, which consists

of three scanners and a homeopathic imprinter, is being used in the U.S. as biofeedback education equipment," says Loran Swensen, CEO of Innergy Development, the parent company of AO Scan. Over 20,000 registered users of AO Scan within two years demonstrates the potential to monitor human health biomarkers and necessitates further research studies.

Human health is essential to understand crew psychology and mission performance. If AO Scan can be employed to remotely monitor human biomarkers with higher accuracy, the software could be passively employed to monitor the physical and mental health from astronauts in the present to autonomously monitor thousands of biomarkers impacted in alternative gravity and the space environment around the clock in real-time. Each astronaut and corresponding crew would benefit from bioresonance recognition and comparison to better understand how they are physiologically adapting to the local environment. The AO Scan software could be used to isolate biomarkers affected from the local environment such as alternative gravity, dust accumulation, isolation, EVAs, high oxygen atmospheres, radiation, lack of sunlight, and the local environment. By remotely monitoring human frequencies, cloud-based bioresonance software holds the potential to observe the progression of human biomarkers associated with resource consumption such as diet, freeze dried food, allergies, intolerance, vitamin, and nutrient deficiencies, heavy metals, gene editing, and much more before undesirable symptoms develop into more serious health challenges. Trend detection and machine learning algorithms could quantify health anomalies and biomarker similarities throughout astronaut crew members to reveal health hazards in local resources and environment. Recent advancements in digital voice analysis suggest that past vocal communication data could become digital windows into the mental and physical health of humans from the past. Further research is required to understand if AO Scan can be employed to accurately monitor the health of humans from data archives of human and astronaut data.

6.6 Recommendations for Future Studies

The aims of future studies will be to determine the accuracy of human biomarkers and how often each biomarker fluctuates between green and red dots. More thorough research experiments and studies are required to evaluate and understand the accuracy of AO Scan data. Validating the results with greater accuracy and less error is essential to determine the significance of biomarkers registering multiple, repeated red dots. In collaborating with space, medical, and health organisations, Biofrequency Analytics plans to lead the research and education effort behind AO Scan by analysing and comparing biomarkers in the Vitals and Comprehensive Reports with a variety of established medical instruments such as blood samples, X-Rays, Ultrasounds, MRI's, Osteoprobes, and other biotechnologies. Future data analysis and interpretation should take into consideration age, gender, weight, resource consumption, environmental factors with second blood tests and more specific tests to determine whether the results are accurate and meaningful. Follow up experiments should account for placebo-controlled studies, reduced time differences, and larger data sampling with multiple blood tests, AO Scans, and human participants. Additional studies comparing CBC biomarkers between scans and blood samples should monitor the nine numerical-based biomarkers (1-9) in the Blood cell section of Comprehensive Scans, which were excluded from data analysis in this study. With automated data entry and analysis of human biomarkers, Biofrequency Analytics would be capable of producing significantly more higher-quality research studies, participants, data sets, human participants to better understand the efficacy of voice and body analysis software to monitor human health.

7 Conclusion

This research study attempts to examine the accuracy of over 450 complete blood count (CBC) biomarkers remotely generated from the AO Scan voice and body analysis software by comparing scan results with two blood tests from the six people during February 2021. The results from the LunAres February 2021 pilot study were largely inconclusive in determining the accuracy of AO Scan Vitals considering a variety of reasons including instrument sensitivity, time differences, small sample size, diet, and environmental factors. The accuracy and misclassification rate is a function of how many green and red dots are considered in the data analysis. This early stage biotechnology is believed to hold the potential to improve human understanding of physical and mental health. This pilot study establishes the first peer-reviewed experiment to use bioresonance software AO Scan and outlines a path forward for continued research studies.

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