

ACADEMIC ARTICLE

THE STRANGE CASE OF THE HAVANA 'SONIC ATTACKS'

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Abstract

This article analyses the saga of the alleged 'sonic attacks' directed against US diplomats between 2016 and 2018. It summarises the key developments, and examines the various theories put forward to explain the phenomenon. Analyses by major science- and medicine-based journals are evaluated, and inconsistencies highlighted. The background of troubled US–Cuba relations during the Trump administration is also assessed as a contributing factor to the widespread attention. Finally, some general thoughts on lessons learned from the 'sonic attacks' incidents are offered.

Keywords: Cuba–US relations, Cuba-acoustic attacks, Cuba-fake news

There should be no doubt that these attacks against foreign diplomats on Cuban soil are not simply accidents and the US should look at additional policy options to hold the Cuban regime accountable for the ongoing harm being done to foreign diplomats and their families.

– Marco Rubio, Senator for Florida

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The US has no evidence whatsoever to affirm that there have been attacks against its diplomats in Havana, nor that Cuba may be responsible or have knowledge of third-party actions.

– Josefina Vidal, then-director of US Affairs at the Cuban Foreign Ministry

Lovelorn crickets or a new weapon? 'Concussion without the symptoms of concussion' or mass hysteria? Perhaps mysterious viruses or chemical agents? Rogue sectors of Cuban intelligence or Russian spies keen to disrupt the Obama–Castro fence-mending initiatives? There has certainly been a plethora of symptoms, explanations and theories about events affecting American (and to a lesser extent Canadian) diplomats and family members based in Havana in 2016–18. Despite the best efforts of the FBI (who made at least six visits to examine the alleged crime scenes), the RCMP, as well as scientists and medical experts in several specialised US medical centres who have examined the patients, no sound explanation has yet been provided for the mysterious events of this period.

This article tries to both summarise the events and developments surrounding the mystery, and to offer some thoughts on the principal theories offered to explain this startling phenomenon. It starts from a basis of accepting that the affected diplomats and family members do have valid medical conditions, as yet undetermined. And it also seeks to assess the causes suggested, and to place the events described within a broader political context. Perhaps most important of all, it seeks to offer some general thoughts on lessons learned from the attention paid to these events over the past two years.

The Background

Starting in late 2016, and lasting until the fall of 2017, 26 American diplomats and family members (and later 14 Canadians) complained of a variety of medical symptoms. The most common complaints were dizziness, headaches, cognitive difficulties, difficulties in balance, intense brain pressure and hearing difficulties.

These diverse medical symptoms and growing concerns that 'something' was wrong developed at a time of enormous political significance in relations between the US and Cuba. As with everything else related to this case, this fact is of significance for, after more than five decades of barely concealed hostility, the governments of Barack Obama and Raúl Castro decided to reopen diplomatic relations. Months of negotiation, involving secret meetings in Canada and even the support of the Vatican, resulted in both presidents announcing simultaneously in

December 2014 that they intended to renew bilateral relations (broken by Washington in January 1961), and to move towards a normalisation of diplomatic ties.

While for many Cuba watchers, this was a victory for common sense, others were dismayed. Strident, and powerful, right-wing politicians in Miami condemned the diplomatic initiative. Most Cubans applauded the measure, although a minority of influential conservative Cubans were also opposed. Indeed former president Fidel Castro was not slow in voicing his own concerns about the new policy of rapprochement. Their concern was based upon what they saw as the disingenuous approach of Obama, intended to weaken the Cuban system. In Miami, too, a powerful lobby group continues to see any attempt to improve relations with Cuba as anathema – and it was clear that under Obama significant changes were taking place. In sum, the improvement in bilateral relations was viewed with mixed emotions – on both sides of the Florida Strait.

Despite the reservations of conservative sectors in Miami and Havana, relations steadily improved, culminating in the formal re-establishing of diplomatic relations in July 2015, and the visit to Havana of President Obama in March 2016. (Despite being just 180 km away, this was the first visit of an American president in almost 90 years.) Regulations were relaxed on American tourists visiting the island, and hundreds of thousands of American tourists swept in to experience the formerly forbidden ‘prohibited fruit’.² Intelligence-gathering and drug interdiction policies between both countries developed, and Coast Guard ties were strengthened. US hotel chains initiated proceedings to manage hotels in Havana, and American business people came to explore investment and trade possibilities. Wide-ranging cultural exchanges resulted, including of some American movies and TV programmes in Havana.

While the evolving improvement of bilateral relations was not without growing pains, there is no doubt that on many levels the new arrangement was

2 While there are various sources of information on the number of American tourists to Cuba, there is no doubt that measures taken by the Trump administration have had a negative impact on American tourism to the island. In 2015 some 163,000 Americans visited Cuba. This increased to 284,000 in 2016 and, as a parallel to the warming diplomatic ties, 619,000 American tourists came to Cuba in 2017. The Trump administration has reimposed strict regulations on Americans travelling to the island and published travel advisories about potential health dangers to visiting Americans, resulting in a decrease of some 40 per cent of Americans travelling by traditional programmes to Cuba in 2018. Significantly Americans travelling on cruise ships are not faced with the same restrictions, and their numbers have increased steadily. Moreover the number of Cuban Americans (who are also immune from the legislation) visiting the island increased from 407,000 in 2017 to 493,000 in 2018.

generally beneficial to both countries. This came to an end in November 2016 with the election of Donald Trump. Initially he had recognised the value of the Obama initiative (after over 50 years of a failed policy by Washington of regime change), while later (and campaigning in Miami) his approach evolved into a hardline attack on Cuba. Once in power, he concentrated on larger foreign policy challenges (including Russia, China, North Korea, NAFTA, the European Union and Mexico). Meanwhile his former rival in the presidential campaign Senator Marco Rubio, the Republican Senator for Florida and a Cuban American from Miami, continued to push for a hardline approach to Cuba. He, together with Congressman Mario Díaz-Balart and National Security Adviser John Bolton, has led the policy charge against Cuba, and has introduced a variety of bills to overturn Obama initiatives.

In September 2017 Rubio, together with four other Republican senators, sent a letter to Secretary of State Tillerson, urging a stronger reaction from the Trump administration in the face of what had become known as 'sonic attacks': 'We ask that you immediately declare all accredited Cuban diplomats in the United States persona non grata and, if Cuba does not take tangible action, close the U.S. Embassy in Havana' (Zengerle and Frank 2017). Later that month Rubio issued a press release condemning the 'weak, unacceptable and outrageous' actions of the US State Department towards Cuba. He urged the administration to downgrade the US embassy to an interests section, 'and consider relisting Cuba as a state sponsor of terrorism' (Rubio 2017). The following week Senator Rubio amended his approach, however, and praised the State Department for expelling 'Cuban operatives' from the US, adding 'No one should be fooled by the Castro regime's claim it knows nothing about how these harmful attacks are occurring or who perpetrated them' (Derby 2017). Needless to say, tension resulting from this major increase in rhetoric was widely felt in Havana – including by the US diplomats stationed there.

Rubio maintained his criticism of the 'attacks' throughout 2018, by which time he had become the official spokesman for the Trump administration on the Cuba file. In January, for example, he engaged in an angry discussion with his fellow (Republican) senator, Jeff Flake of Arizona. Flake, who had been a supporter of the Obama approach to Cuba, had been briefed by both FBI and Cuban sources on events in the US embassy, and stated that there was a lack of credible evidence of any 'sonic attacks'. His Republican colleague from Florida sent an angry tweet: 'It's a documented FACT that 24 US govt officials & spouses were victims of some sort of sophisticated attack while stationed in Havana' (Ordoñez 2018). He developed the personal nature of the 'attacks' by personalising the impact of the symptoms: 'We are talking about Americans and their relatives who are suffering today with what is typically seen after a traumatic car

accident. Many, more than six or seven, will never be able to work’ (Gómez Torres 2018b).

Rubio criticised both the way in which the State Department had failed to protect its diplomats and also the Cuban government for either being responsible for the ‘attacks’ (or at the very least allowing others to cause them). Mainstream US media also took up the issue, and often offered superficial coverage and limited analysis, described in the case of NBC as ‘reckless, dangerous and journalistically unethical’ (Greenwald 2019). As a result of the increasing rhetoric and highly charged atmosphere, the position of the Trump administration hardened. Restrictions on trade and investment in Cuba, and on the free movement of Americans to the island, were introduced, all designed to punish Cuba. Many of the initiatives introduced by the Obama administration soon withered. Key members of the Trump team left, or were fired, and were replaced by hardliners – including incoming Secretary of State (and former director of the CIA) Mike Pompeo and National Security Adviser John Bolton, who in November of 2018 termed Cuba, Venezuela and Nicaragua a ‘troika of tyranny’.

To signal its displeasure at the health risks faced by diplomats, Washington demanded in May 2017 that two members of staff at the Cuban embassy in Washington leave their post and return to Havana. This, it was hoped, would signal clearly Washington’s concern, and end any potential injury to American diplomats. However, as the number of people at the US embassy in Havana complaining of related medical symptoms increased, Washington took extreme measures. The number of American diplomats working there was reduced from 54 to 18. In addition, all family members of American diplomats were instructed to return to the US in order to protect their health.

The US government also ordered the Cuban embassy in Havana to reduce its staff by the same proportion. This resulted in extremely limited diplomatic and consular abilities in both countries.³ It is worth noting that many of the diplomats stationed in Havana asked to stay in Havana, and Barbara Stephenson, president of the American Foreign Service Association, supported their request: ‘Our view is that American diplomats need to remain on the field and in the game . . . We have a mission to do and we’re used to operating around the globe

3 ‘The few American diplomats who still work in Havana now live together in group houses, set back at a cautious distance from the street . . . “Our Embassy is operating on life support”’, [Senator Patrick] Leahy said. ‘It cannot process visas. It cannot conduct effective diplomacy. It cannot engage on human rights. In a time of political and economic transition in Cuba, our Embassy has been sidelined’. See Entous and Anderson (2018).

with serious health risks' (Labott and Oppmann 2017). The Trump administration rejected this request.

As can be seen, regardless of the medical symptoms experienced by the embassy staff, a harsh political drama was rapidly unfolding. The Cuban government, baffled by the rapid increase in tensions – which went directly against their commercial interests – sought rapidly to investigate all possible causes, and to cooperate with foreign security agencies investigating the complaints. The die was cast, however, and soon the word 'attack' was being used both in official US government communications and in the popular media. Travel advisories, based upon the health difficulties of American diplomats, were issued by Washington, warning Americans of health dangers if they ventured to Cuba. American tourism to the island fell sharply. Bilateral relations deteriorated significantly, with Washington continuing to exert pressure upon the Cuban government – referring constantly to the 'sonic' or 'acoustic' attacks.

The Theories about Those Involved and the Methods Used

There is no shortage of suspects when it comes to those responsible for the 'sonic' or 'acoustic' attacks. Dissident members of the Cuban security service, disillusioned with the pragmatic approach being undertaken by Raúl Castro as bilateral relations improved, and loyal to the harder line of former President Fidel Castro, were indicated in US media as early suspects. As tensions between Washington and Moscow grew, and as international criticism was directed at Vladimir Putin after the poisoning of a former KGB agent in England, focus also shifted to the potential role of Russian operatives (*NBC News* 2018). After an American diplomat in Guangzhou, China suffered similar symptoms, there was also speculation about a possible Chinese involvement in the Havana incidents.

In terms of potential methods used to inflict damage upon the diplomats and family members there was also no scarcity of theories. Infrared and ultrasound weapons were suggested at the outset, and the vague but ominous term 'directed energy' was bandied around in the media. At one point the official US position was that 'sophisticated microwaves or another type of electromagnetic weapons were likely used' (Gámez Torres 2018a). Doctors in a team put together by the State Department developed a theory about a 'neuro weapon' (Gámez Torres 2018a). Previously some sort of space-age sonic weapon had been considered likely, but this was later discarded as a prime cause, since it was believed that sound waves alone were not sufficient to produce the medical symptoms noted by the diplomats. One explanation suggested by several was that malfunctioning eavesdropping equipment, with microphones and receivers being set too closely

together, was responsible for the noise which had affected the diplomats. Dozens of articles were written in scientific journals as various theories were postulated (and criticised) – with little agreement.

The situation reached fever pitch in September 2018, when frustration at the lack of explanation resulted in the State Department officially deeming the events in Havana as ‘attacks’ on diplomats. A State Department official confirmed this strategy, stating that there was ‘no reason to believe this was anything but an intentional act’ (Lederman et al. 2018).

In an effort to allay these fears, the Cuban government initiated a series of measures to evaluate the claims of the American diplomats. President Raúl Castro met with US envoy Jeffrey DeLaurentis in an attempt to convince the American diplomat that Cuba was determined to comply with its Vienna Convention responsibilities, and ensure protection for the diplomats. Broad Cuban cooperation in supporting foreign investigators was provided. Cuba offered to help in any way that would help both governments discover the cause of the health challenges faced by diplomats. In addition Cuban specialists from a variety of backgrounds – medicine, engineering, science and security – undertook their own wide-ranging tests to discover what the cause was, and to determine a solution. For its part the Trump administration flew security, engineering and medical specialists to Cuba to see if they could find an explanation. None was found. The Canadian government belatedly followed suit, again without success.

A key argument of the proponents of the ‘acoustic’ or ‘sonic’ attack argument was the release in October 2017 by Associated Press of a recording allegedly reflecting the pulsating sound that had been identified by American diplomats (YouTube 2017). Recordings had reportedly been made of this noise by some of the diplomats affected, who had been given recording devices for this purpose. Reporters Josh Lederman and Michael Weissenstein released the recording, ‘part of the series of unnerving incidents later deemed to be deliberate attacks’ that ‘led investigators to suspect a sonic weapon’ (Lederman and Weissenstein 2017). The recordings were sent to US intelligence agencies and to the US Navy for analysis. American diplomats confirmed that the sounds recorded were consistent with what they had heard, and in January 2018, Senator Marco Rubio summarised them as ‘high-pitched beam of sound, incapacitating sound, baffling sensation akin to driving windows partially open in a car, or just intense pressure in one ear’ (Rubio 2018).

In January 2019 the claim about this particular noise lay in shreds, however, when two scientists offered convincing evidence that the noise – which had featured prominently in US explanations of the ‘sonic’ or ‘acoustic’ attacks – was in fact shown to be the mating call of the Indies short-tailed cricket (*Anurogryllas celerinictus*). The AP recording matched the cricket sound in ‘duration, pulse repetition rate, power spectrum, pulse rate stability, and oscillations per pulse’

(Stubbs and Montealegre-Zapata 2019). Another media frenzy resulted, with dozens of articles written about the newly discovered 'explanation'. One more theory about sonic 'attacks' bandied about by the media, and presented by Washington as evidence of the attacks, was summarily dismissed by many.

The Medical Symptoms and the US Government Response

As has been reported with insight in a November 2018 issue of *The New Yorker*, the first patients complaining of headaches and dizziness were CIA operatives – the first in late December 2016, and two others in February of 2017. By the end of summer 2017, this had affected nine, and at first it was thought that it was just the CIA team that was targeted. Soon, however, other diplomats and family members complained of similar symptoms. Employees of the embassy were sent to Miami for medical tests, and in May 2017 an otolaryngology specialist from the University of Miami flew to Havana to examine American diplomats and their families.

Given that the initial symptoms were related to a loss of hearing, balance difficulties and pressure in the ear, the US Embassy focused their attention on seeking medical support from ENT (ear, nose and throat) specialists. In April 2017 the situation was complicated when an American doctor, employed by the CIA's Office of Medical Services, visited Havana for consultation with patients – only to complain of the same symptoms. This in turn led to a strengthening of the belief that this was a deliberate campaign, undertaken by person or persons unknown, both against the intelligence-gathering operation of the CIA in Cuba and the diplomatic objectives of Washington.

At the University of Miami some 80 embassy community members were evaluated between February and April 2017, after which 16 'were identified with similar exposure history and a constellation of neurological signs and symptoms commonly seen following mild traumatic brain injury, also referred to as concussion' (Swanson et al. 2018). Significantly the symptoms were now seen as having become more serious, and diagnosis passed from dizziness, nausea and headaches to more serious concussion-like conditions. Later, eight more individuals were identified as having similar symptoms. Following further discussion it was suggested that the patients be sent for further, more specialised, testing at the prestigious Center for Brain Injury and Repair at the University of Pennsylvania, headed by Douglas Smith.

Confusing matters more were the experiences faced by Canadian diplomats in Havana, and some 14 Canadian diplomats and family members complained of similar symptoms. The Canadians had reported no medical concerns until they were apprised of their American colleagues' symptoms, after which they too complained to their government officials in Ottawa. Eventually the Canadian government reduced the size of its embassy staff by 50 per cent, while taking

pains to emphasise that Canadian tourists faced no dangers on the island. Moreover in China there was the case of an American diplomat working at the consulate in Guangzhou, who suffered similar symptoms to those reported by the diplomats in Havana (noises, headaches, nausea and difficulties concentrating) and was sent back to the University of Pennsylvania for testing.

In late October 2018, a detailed NBC report analysed the case to date. Its conclusions supported the official position of Washington about the severity of the ‘attacks’ and the increasingly negative tone of mainstream media coverage:

Cuba and China deny any role. While the US has not named a culprit, it says the ‘health attacks’ caused brain injury and other physical harm. Physicians enlisted by the State Department have identified what they call a ‘Brain Network Disorder’ acquired by US personnel serving abroad, say US officials, that includes structural changes to the brain not found in any previously known disorder.

(Lederman 2018)

In summary, for Washington there had indeed been ‘health attacks’, while the rhetoric had heightened following the ominous mention of ‘brain injury’ to the diplomats. Despite this mounting evidence, the popular media emphasised, Cuba and China continued to deny responsibility, a position viewed with concern by the Trump administration. It is worth emphasising that the basis for the principal arguments held by the official US position was the results of medical tests given to all affected at the prestigious University of Pennsylvania, and later published in the *Journal of the American Medical Association*.

Cuba’s Response to the Claims about Attacks

The Cuban government realised that the question of the ‘sonic attacks’ had become far more serious than they had originally envisaged. Attempts to provide extensive cooperation with foreign specialists to determine the cause, as well as their own extensive research, had provided no answers. As a result the Cuban government was convinced that there was no solid, logical explanation for the phenomenon. At the same time Havana could see the potential damage that could ensue, particularly to the Cuban economy, and consternation grew.

The Cuban government was baffled. Despite wide-ranging investigation no apparent cause for this array of symptoms was discovered. Specialists from other countries also came to seek the cause – from the RCMP and the FBI. All came with the support of Cuban authorities, increasingly worried by the alarmist tone that the episode was taking, particularly by the Trump administration. Significantly, however, while Cuban officials supported Washington’s requests and the battery of

researchers who came to Havana to investigate what was soon called the 'Havana Syndrome', they were disturbed at the lack of collaboration on the part of American specialists. Indeed, despite many requests Cuban researchers have never received any medical results from colleagues at either the University of Miami or the University of Pennsylvania. The patients' interests had been subordinated to the political objectives of Washington.

Of increasing concern was the way in which the health issue was being treated in the US media, and was being exploited by conservatives in the US as a means of pressuring the Trump administration to cut back on ties with Havana. Given the dire economic situation in Cuba, this represented a major challenge – since American tourists represented the greatest potential market for the rapidly growing tourist industry. New legislation introduced by Trump then resulted in restrictions on American tourists seeking to travel to Cuba. During the Obama administration American hotel companies had signed contracts to manage three hotels in Cuba, but the Trump administration now stopped any future investments.

The essence of the Cuban response can be found in an extensive interview with Mitchell Valdés, Director of the Cuban Neuroscience Center, and a specialist in the auditory system's sensory physiology. He notes how, as soon as it became clear that a health problem had been discovered, a multidisciplinary team was formed in order to discover its cause. Cuban authorities, fully aware of the potential political challenges that could arise from conservative forces eager to disrupt the initiatives undertaken by Presidents Obama and Castro, were keen to resolve the issue as soon as possible.

The first step, given the fact that the initial symptoms were of an auditory nature, was to form a team of ENT specialists. As complaints of different symptoms subsequently emerged, a multidisciplinary task force of specialists was formed, involving scientists skilled in environmental health, epidemiologists, neurologists, physicists, neurophysiologists, acoustics specialists and internists – in all some 30 people. This team then investigated the surrounding conditions in the neighbourhoods where the patients lived, interviewing several hundred people who lived close by. The premise was that, whatever the condition was, it would probably have affected neighbours, and also their pets. Despite exhaustive efforts, no proof was found of anything that could explain the reported symptoms.

The argument developed by Mitchell Valdés about the 'sonic attacks' reflects that of Havana, and consists of three fundamental points. First, he criticises the *JAMA* report, noting the lack of evidence to sustain the argument about brain damage or injury, or indeed about significant hearing loss. Indeed he claims that the idea of 'acoustic attacks' causing brain damage is not sustained by current medical literature. He then notes that many of the symptoms reported by the patients could be affected by stress – and for American diplomats living in Cuba

(where they would be under frequent surveillance), there would indeed be significant stress. Finally he notes the ‘confirmation bias’ held by many of the American physicians involved in the case, who

have a hypothesis and when you look at all the facts, you’re not completely objective. And, the first things that fit with your conceived theory are the ones you use more and the rest you sort of brush under the rug . . . And in this case, there was a theory from the start: that there were attacks. And then everything that we’ve seen published and the leaks to the media, all are based on this unconfirmed idea.⁴

In September 2018 Mitchell Valdés was part of a nine-member Cuban delegation of medical and scientific specialists invited to Washington by the US State Department to discuss the situation of the affected diplomats. The Cubans met with members of the State Department and the National Academy of Sciences. In many ways this was a successful diplomatic initiative, but in other ways was a disappointment. Discussions centred on the findings of medical specialists in Miami and Pennsylvania, but apart from a discussion of the Pennsylvania findings published in a key article in the *JAMA* (analysed below), no new data were provided, and none of the specialists from either place were there to discuss their findings. The Cubans left, disappointed that they had not met with physicians from either of the two medical centres which had examined patients, or had even seen case notes of their patients.

The *JAMA* Report and the International Medical Response

The most thorough medical analysis presented to date about the symptoms experienced by American diplomats and their family members was provided by a team of medical specialists at the University of Pennsylvania. It has been cited by both US government officials (who commissioned the study) and media pundits more than any other research report on this subject. In early 2018 the findings were published in *JAMA*. In all, the article was based upon 21 individuals from the US embassy in Havana (11 women and 10 men, with an average age of 43 years) who were subjected to a series of medical tests in Pennsylvania.

⁴ See Gail Reed (2018). He concludes,

So, when you look at all the potential alleged weapons that could have been employed, none of them are possible according to the laws of physics and principles of engineering. And on the other hand, you have no evidence for brain injury and for hearing loss in a large group of subjects; so, the whole case collapses. It’s simply a construction that I think has spiralled out of control, based on theories that have been accepted as facts and then these pseudo facts are used to construct other theories . . . none of which are scientifically sustainable or acceptable.

It is important to note that not all patients went through the same tests, but of those who undertook several distant tests provided by a variety of specialists, it was discovered that 'a constellation of acute and persistent signs and symptoms were identified, in the absence of an associated history of blunt head trauma . . . Patients experienced cognitive, vestibular, and oculomotor dysfunction, along with auditory symptoms, sleep abnormalities and headache' (Swanson et al. 2018). Among the 'Key Points' of the article, was a concern 'for a novel mechanism of possible acquired brain injury from a directional exposure of undetermined etiology'.

This report has been presented as the most comprehensive analysis of the different symptoms reported by the patients, and has been cited as proof of an 'attack' on diplomats. The symptoms noted in the University of Pennsylvania study are clear: 18 of the 21 patients reported hearing a 'novel, localized sound . . . intensely loud and with pure and sustained tonality'. Most noted it as being high-pitched, while a minority considered it low-pitched. About 20 of the patients noted a variety of 'neurological symptoms associated with directional phenomena'. These included difficulties in remembering, mental fog, difficulties in concentrating, irritability, dizziness, nausea, balance problems, eye strain, light sensitivity, hearing reduction, drowsiness and fatigue, trouble falling asleep, balance impairment and headaches, among others. Two of the 21 'met criteria for post-traumatic stress disorder and . . . severe levels of anger . . . 1 of whom also endorsed moderate to severe levels of depression and anxiety'.

The analysis in the report noted three common areas of difficulties faced by the 21 patients examined: vision, hearing and sleep. Visual problems were reported by 16, including light sensitivity (13), difficulty in reading (12) and eye strain (11). A variety of hearing challenges were reported, including ear pain (7) and tinnitus (6), and 18 noted that they had heard 'a loud sound'. Moderate to severe hearing loss was noted in three patients. Most (18) reported difficulties in sleeping – including reduced sleep (15), and difficulty falling asleep (16). Headaches were reported by most patients. Initially eight noted 'immediate onset of headache', although five mentioned 'intense head pressure'. As the concerns persisted, and the concerns grew, 17 patients reported headaches, with 16 noting 'persistent headaches'. The symptoms were generally improved for 12 of the patients following medication.

The use of MRI neuroimaging is generally provided in such cases, and all 21 patients were subjected to this procedure. The results were quite clear: 'Most patients had conventional imaging findings, which were within normal limits, at most showing a few small nonspecific T2-bright foci in the white matter . . . There were 3 patients with multiple T2-bright white matter foci, which were more than expected for age'.

The most interesting section of the *JAMA* report is the 'Discussion' section. The authors end their paper with a list of limitations on their research, but prior

to that outlined the general conditions reported by the patients. Hearing and sensory challenges were common, ‘followed by the development of a consistent cluster of neurological signs and symptoms’. Also reported by most were difficulties in remembering, and feeling ‘cognitively slowed’ – as well as symptoms of mood dysfunction, depression and anxiety.

Discounted by the specialists were ‘mass psychogenic illnesses’, since the University of Pennsylvania staff found no evidence of ‘malingering’. Likewise viral or chemical aetiologies were not regarded as likely. The most likely cause, it concluded, was some sort of mild traumatic brain injury – not exactly concussion, but something similar. As a result, a novel condition of ‘concussion without concussion’ has increasingly been mentioned. There was an absence of blunt head trauma encountered in any of the patients, but there were detected symptoms akin to those of concussion – and that soon became the focal point of attention, with ‘brain injuries’ often referred to by the media. The US government employed the results from the *JAMA* study to ramp up the rhetoric against Cuba, and the word ‘attack’ was increasingly employed in all references to the medical condition of the diplomats.

It was not long, though, before many scientists and physicians challenged the validity of the *JAMA* findings. One study by authors in Scotland and Italy criticised the article as being a ‘case of poor neuropsychology, clinically inappropriate and methodologically improper’ (Della Sala and Cubelli 2018). There were two main complaints about the study made by the authors. First were the limited and inconsistent sets of tests to which the patients were subjected. For example only six of the 21 completed all 37 tests – resulting in a lack of consistency or solid research data. The second concerned the ‘arbitrarily high threshold’ used by the University of Pennsylvania medical staff.

The authors were particularly concerned at the decision by the *JAMA* authors to conclude that any of the patients whose performance fell below the 40th percentile were therefore ‘impaired’. They noted how the ‘use of an arbitrarily high threshold gives rise to numerous false positives’. Assessing patients with an unnaturally high threshold was poor science, and resulted in both misleading and inaccurate data, as well as false conclusions. For instance, in using the threshold of the 40th percentile, misleading results were inevitable: ‘Assessing any group of normal, healthy people with a random battery of tests using such a high threshold would result in several of them performing below the chosen cut-off score in one or more test’. Conversely, if a lower threshold had been used (as is normally the case), then fully 50 per cent of the six patients who participated in all of the tests would have shown normal test results.

The authors criticise the lack of demographic data, as well as the lack of material concerning their clinical history and raw scores (since only percentiles are given). They conclude, ‘there is no evidence that the people assessed present with any

cognitive deficit (to be linked or not with their stay in Cuba). Subjective cognitive symptoms cannot be supported by the reported data. There is no “new syndrome” to contemplate. Hence the search for its cause is moot’. Two of the most critical observers of the original *JAMA* study, McIntosh and Della Sala, were particularly scathing of the conclusions reached by the University of Pennsylvania study: ‘Considering that each participant was given 37 tests, without any statistical correction for the number of tests administered, it seems unlikely that anyone would escape with a clean bill of cognitive health’ (McIntosh and Della Sala 2018).

Other criticisms that have been made about the University of Pennsylvania study concern the lack of chronology provided for the various patients’ symptoms, and it is worth noting that the evaluations took place at a mean of 203 days of onset of symptoms. This meant that patients were obliged to reply on distant memories of the initial symptoms. Significantly, there was no standardised approach to the various tests to which some, but not all, of the patients were subjected. The examiners were not blinded, an important variable because much of the evidence was based on patient self-reporting. There was a lack of both baseline evaluations and a comparative control group, which further complicated the clinical value of the tests. In all, criticism of the *JAMA* study came from many medical specialists around the world, and the original article has been widely discredited.

A rebuttal from the *JAMA* authors resulted, followed in turn by further stinging criticism from many others in the field. The various authors criticising the report noted that in the rebuttal the *JAMA* authors ‘did not defend their idiosyncratic choice of a 40th percentile threshold’ but instead presented other, poorly developed arguments. These, too, were rejected: ‘Hampton and colleagues have tried to patch over an unjustifiable threshold for impairment reported in the original paper with an even less cogent statement of their actual criterion in the rebuttal’. The most pertinent conclusion was blunt, and is worth emphasising: ‘the neuropsychological data do not support the conclusion that whatever happened in Cuba resulted in persistent cognitive decline’ (Della Sala et al. 2018). In late August 2018, *JAMA* also published a series of letters from clinicians criticising the findings of the University of Pennsylvania group. The methodology of the original study was criticised, and potential causes (discounted without sufficient analysis in the original *JAMA* study) were also suggested, including mass psychogenic illness, peripheral labyrinthine cause and functional neurological disorders (Shura et al. 2018).

Concluding Remarks

So what can we make of this complex, troubling episode that has affected the health of some three dozen American and Canadian diplomats and family members in Cuba, has severely curtailed US–Cuba relations, and has (at least partially)

reintroduced a Cold War climate into international politics? This perfect storm of the confrontational populism of the Trump administration, the expectation of Cuba's first post-Castro government that the initiatives of the Obama administration would continue, and a cohort of understandably concerned diplomats, has made for a complex, multifaceted challenge to untangle. Will we ever find the definitive explanation of the events of 2016 and 2017 analysed here?

Nevertheless there are some conclusions that can be drawn – although there are still more questions than answers that need to be considered.

While there is still no clear explanation of the cause of the symptoms experienced by diplomats and their family members, several observations can be drawn. The first concerns the enormous differences held by diverse medical specialists to explain the symptoms faced by patients. As late as the end of December 2018 specialists at the University of Miami maintained that the major health problem faced by the American patients was damage to the otolithic organs (located in the inner ear, and which help people to perceive gravity). Meanwhile their colleagues in Pennsylvania continue to claim that concussion-like symptoms (albeit without any clear evidence of blunt trauma) are the prime medical concern. Since the medical tests conducted in both Miami and Pennsylvania should provide clear evidence concerning the nature of the patients' symptoms, could academic rivalries and medical reputations have interfered with the search for an explanation? Why are there such disparate explanations? Why is there no central repository of all of the medical data of the patients? Why have medical specialists from Miami and Pennsylvania not collaborated to find a solid explanation of the conditions reported by their patients?

Adding to the mix of possible explanations is the plethora of articles published in early 2019 indicating that the high-pitched noise heard by several of the diplomats was in fact the call of the Indies short-tailed cricket. This, together with the many other studies (some sounding like the script for a science fiction movie) has added to the media frenzy surrounding the situation of the diplomats and their family members. There have been scores of television and print media sources that have examined the phenomenon of the 'sonic attacks', as well as dozens of journals – both serious scientific journals and current affairs magazines. The vast majority of the media coverage has been poor and superficial, with some sources clearly guilty of shallow yellow journalism. Whether intentional or not, media coverage has done little to defuse the rather sensationalist nature of its coverage, and has largely supported the extremist (and largely unfounded) claims of the Trump administration.

A lack of balance has permeated the majority of media reports, with extremely limited coverage of the Cuban perspective. Several bizarre theories to 'explain' the attacks have been presented unquestioningly. Strident conservative voices, such as

that of Cuban-American senator Marco Rubio have been quoted uncritically. And veiled, ominous criticisms of the Cuban position are common such as the claim that 'some in the US government believe that Cuba is not sharing all it knows about what the State department has deemed deliberate *health attacks on its diplomatic personnel* at their homes and at two Havana hotels where they were staying' (Whitefield 2018). By contrast, little information is provided about Cuban support for the international investigation, or its own extensive research into the potential cause.

At present the CIA, the State Department, the National Institutes of Health, the Centers for Disease Control and Prevention, the Defense Department, and the Office of Naval Research are also carrying out research in an attempt to solve the mystery. The FBI, the RCMP and Scotland Yard have also had teams of investigators in Havana to carry out their own research. Meanwhile the Canadian government has contracted the services of a team of neurologists and brain specialists at Dalhousie University to see if an explanation can be found for the symptoms experienced by Canadian diplomats and their family members, all of whom have been given the opportunity to be examined by Canadian specialists.

Without doubt the diplomats and family members experienced physical symptoms that incapacitated them to differing degrees. It is impossible to conceive that the battery of tests to which they have been subjected in Miami, Havana, Pennsylvania, Ottawa and Halifax do not reveal that there were several medical conditions identified in the patients. It could also be argued that subjecting any three dozen people to these tests could well reveal similar results consistent with ageing and living in stressful conditions.

The complexity of the issue revolves around the nature of the symptoms expressed by the subjects – the variety and potential causes of these. Is there any scientific weapon which could explain the array of symptoms? Can the unusual living conditions of the diplomats (working in a country which had experienced diplomatic hostility for over 50 years, and where they would inevitably be closely monitored with some frequency) help to explain any of the symptoms? The theory of psychological factors and stresses (which can result in significant physical conditions) is perhaps an area that has not been fully explored.

The use of Science, writ large, to explain both potential causes of the 'attacks' and the medical conditions resulting, is confusing and troubling. How can there be such a variety of possible explanations for these? On a similar note, how can the most prestigious medical journal in the US, and the faculty at one of the country's best medical centres, produce research findings that have been criticised around the world? Was there any pressure put upon clinicians to draw conclusions suggested by the government in either country? To the non-medical observer it appears as if there has been an unhealthy competition between rival medical research centres, each championing their own theory about the symptoms and

medical conditions. Lost in the middle of these vocal competing interests are the patients, left increasingly uncertain about the cause and severity of their medical condition.

Something which cannot be divorced from any analysis of this matter is the political manipulation by conservatives in the US government. In particular Cuban-American senator Marco Rubio has added to the controversy by condemning the Cuban government for the ‘attacks’ on numerous occasions. It is worth noting that his anti-Cuban government stance is consistent. In recent months he has attacked a tentative agreement to allow Cuban baseball players to join American teams, and has introduced a motion to encourage Cuban medical personnel working abroad to defect. (This policy had been introduced by the George W. Bush administration, but struck down under Obama.) In January 2019 he supported the Trump administration’s apparent intent to implement Title III of the Helms–Burton Act, which sought to limit foreign investment in Cuba. He is also lobbying to have Cuba reinserted in the list of countries alleged to support acts of terrorism. His stance on the ‘sonic attacks’ is thus in keeping with his ideological position.

Hopefully with the passage of time an answer will be found to these disturbing questions. In the meantime, given the various explanations provided by the medical centres where extensive examination of the patients has taken place, a pragmatic approach would appear necessary – provided that the primary objective is to find a definitive explanation of the symptoms and condition of the patients. A joint study, involving specialists from American, Canadian and Cuban research centres working collaboratively, and pooling their resources, would appear a common-sense solution. This might not be in the best interests of politicians seeking to take advantage of this distressing situation – but it would certainly give medical explanations to those affected, and would also help in both countries keen to return to a policy of solid diplomatic relations.⁵

5 Former US Ambassador Vicki Huddleston (2018) has summarised the price being paid by the Cuban population by the deterioration in bilateral relations and the impact of measures taken by the Trump administration:

As has been the case in the past, the Cuban people will suffer most from these new measures. The travel warning has already reduced the number of American visitors, harming the small family businesses that sprung up as a result of Castro’s privatisation reforms and the influx of American visitors. The closure of the consular section of the American embassy means that Cubans can no longer obtain visas for travel to the United States, whether to visit friends, for medical care, for business, or for cultural, religious, and sports exchanges.

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