



AUTO+ MEDICAL

MEDICINE'S HIGH COUNCIL

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KEEPING SAFE AND SOUND

Scientific study examines high noise levels at motor sport events P38

DANIEL DE JONG

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FIRST RESPONSE

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Editorial Board: Dr Kelvin Chew, Dr Jean Duby, Dr Pedro Esteban, Dr Matthew MacPartlin, Prof Jean-Charles Piette, Dr Robert Seal, Dr Paul Trafford

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Welcome to the new issue of AUTO+Medical, which features the latest news and reports from the world of motor sport medicine. As a member of the Editorial Board, I'm pleased to present the seventh issue of this publication as safety is the first and constant concern of the FIA.

Training the medical and safety officials who work throughout motor sport is extremely important and the cover story of this issue explains how these skills are being taught to participants in the World Rally Championship. This training programme has been running for 15 years and is now being expanded further with a potential partnership with the Red Cross.

In the future, the FIA hopes to expand a second phase for different participants in rally events around the world.

Elsewhere in this issue we speak with Dr Amjad Obeid, the CMO of the Bahrain Grand Prix, who will also handle the medical training and services for the inaugural Formula One race in Azerbaijan. We also hear from GP2 racer Daniel de Jong about his recovery from injuries sustained in a major crash last season.

Our scientific study examines one of motor sport's most overlooked medical topics: hearing damage amongst spectators. This is a problem that has been addressed for team members but there is a need to protect fans at the same time.

I hope you enjoy the latest issue.

Dr Jean Duby
FIA Medical Delegate for the World Rally Championship

LETTERS

In this section, we print the best letters and emails received from readers around the world. We welcome comments on articles as well as suggestions for future content or insight into an area of motor sport medicine you feel would be relevant. If you wish to send in a letter or email, please direct it to: medical@fiainstitute.com

Dear Editor,

As a doctor in motor sport, I've been following the AUTO+ Medical publication since it began, it is quite a comprehensive way to keep up to date in this challenging environment.

In Latin America there is not a proper training program for doctors, and all the skills and know-how have been through tutoring from more experienced doctors, from whatever is available from other countries and the FIA publications.

I've found that this specific publication has also been of value to create networking among motorsport doctors from different countries, allowing to share experience and useful information.

I feel very proud to be a part of this community of professionals who share the same passion and the will to lend a hand to each other.

Keep up the good work you're doing, and be sure that with every article, every note or letter, you are making a difference all around the globe to improve safety in our sport.

Best regards,

Jenny Bertin
Chief Medical Officer
Formula E Ciudad de Mexico ePrix

Editor: Thank you for your positive comments. We would be very keen to hear more from the motor sport medical community in Latin America and across the world, whether that is through further letters or articles submitted for publication.

All articles should be relevant to Motor Sport Medicine and follow the accepted guidelines for any medical articles submitted for publication, be they an overview of a topic or original research being presented. They should also include Title, Authors, Images and References.

AUTO+ Medical is helping doctors across the world, according to Dr Jenny Bertin, CMO of the Mexico ePrix (pictured)



GLOBAL NEWS

NÜRBURGRING HOSTS EXTRICATION TRAINING

Extrication teams from around the world received rescue certification after a training event organised by the DMSB Academy took place at the Nürburgring.

The course, which was held on 20-21 February, involved 75 participants from extrication teams stationed at the Hockenheimring and Nürburgring circuits in Germany, Assen in the Netherlands, Zolder in Belgium, as well as applicants from Finland and Canada.

Dr Michael Scholz, the DMSB's association medic, directed the course, which involved extrication training using an Audi LMP1 World Endurance Championship car and a BMW DTM machine.

After the event, which also included lectures on the

special safety requirements at Formula E events from the championship's head of safety John Trigell, every participant was awarded extrication accreditation. The DMSB is a recognised FIA Institute medical regional training provider (RTP). The German teams were given the extra certification that will enable them to work at Formula E events.

Scholz said: "The debut event at the Nürburgring was a total success. The circuit provided perfect conditions for the training and further education of the national and international extrication teams."

"In the end, we presented all the teams with the FIA certificate."



Extrication crews practiced on a DTM car



The study took place at the 2013 FIA WEC round in Austin

EDUCATION NEEDED OVER HEARING LOSS RISKS

The results of a study into the risk of noise-related hearing loss at motor sport events has concluded that more needs to be done to educate fans of the sport about the issue.

The study took place at the 2013 round of the World Endurance Championship and American Le Mans series and was produced by a team of doctors working at the Circuit of the Americas track in Austin, Texas.

Of the 825 spectators surveyed for the study, 91.9 per cent of the total group was aware of the possibility of noise-related hearing injury, but only 49.5 per cent of those who were aware of hearing injury reported it as a concern and just 53.7 per cent of the entire group described their intention to wear hearing protection during the race.

The paper concluded that efforts to educate motor sport fans about the danger of noise-induced hearing loss should be encouraged.

"It is likely that many fans do not understand that hearing loss can occur at lower decibel levels than they realise," the paper reads. "Continued efforts to educate spectators and offer options for hearing protection at venues should be supported."

You can read the full report on p38 of this publication

HINCHCLIFFE REVEALS HOSPITAL SCARE

IndyCar race winner James Hinchcliffe has revealed that he was minutes away from losing his life in the aftermath of his crash in practice for the 2015 Indianapolis 500.

The suspension on Hinchcliffe's Schmidt Peterson Motorsports car failed at 223mph and when it hit the wall, part of a wishbone penetrated the cockpit and the Canadian driver's right thigh, into his left leg, pinning him to the car.

After a difficult extrication period, Hinchcliffe was rushed straight to the Indiana University Health Methodist Hospital where doctors later informed him he arrived close to death.

He said: "There was a time on my way up to the operating room from the shock room in the emergency room where they couldn't find my pulse anymore."

As he was transported to the hospital, Hinchcliffe was given 22 pints of blood, more than twice what the human body can typically hold.

"That's possible because they were putting it in before they plugged the leak. They were putting fresh blood in me and I was spitting it back out," he said.

Hinchcliffe, who returns to racing in 2016 after his recovery, praised everyone involved in saving his life.

He said: "There's no one person that had a bigger role than the other but there were a lot of people that without, I wouldn't be here."





Heidfeld at the Buenos Aires ePrix

HEIDFELD RETURNS TO FORMULA E AFTER SURGERY ON WRIST INJURY

Nick Heidfeld returned from a wrist injury to finish seventh in the Buenos Aires ePrix, his first Formula E race following surgery.

The German driver tore the scapho-lunate ligament on his left wrist during the Putrajaya ePrix and subsequently missed the next round at Punta del Este.

Heidfeld had two pins inserted into his hand and although these were removed prior to the Argentinean event, he only made a last minute decision to take part in the race following a successful test of his movements in an old GP2 car and then the ePrix's shakedown session.

He said: "I thought there might be a chance to drive [in Buenos

Aires] although my therapist said at first it was impossible.

"But the test in an old GP2 car in Valencia showed there was a good chance.

"I didn't have any pain, I did a couple of laps without major problems. I didn't push it to the limit, but it was enough to decide to come [to Argentina]."

Heidfeld also explained that the nature of Formula E's steering system meant he had to wait until after the Buenos Aires shakedown to decide if he could take part in the full event.

He said: "In the Formula E car you can turn the steering wheel a lot [and] it's a lot more bumpy."

VICKERS RETURNS TO NASCAR

NASCAR driver Brian Vickers completed the Daytona 500 after recovering from blood clots that have stopped him from racing four times in the last six years.

The American driver finished 26th in NASCAR's blue-ribbon opening event of the 2016 season after substituting for Stewart-Haas Racing's Tony Stewart, who is recovering from a back injury himself.

Vickers described his joy at being back in a Sprint Cup car after he had previously feared that he would never be able to take part in another race again.

He said: "For me, this is huge. I wasn't sure I would ever race again (after his most recent blood clot issue in March 2015). The last five or six years of my life have been a roller coaster, to say the least."

Vickers also advised other top-line drivers to enjoy their time in motor sport while it lasts.

He said: "I think a lot of these guys get in these cars and they are so caught up in the moment and the future, they don't stop to think that it may be their last time and they should enjoy it."



OBEID APPOINTED AZERBAIJAN GP CMO

Dr Amjad Obeid has been appointed Chief Medical Officer for the inaugural Azerbaijan Grand Prix, which will take place later this year.

Dr Obeid, who is also the CMO for the Bahrain Grand Prix, will lead the medical team at the Baku street circuit during its first Formula One event on 17-19 June 2016.

In an interview with AUTO+Medical (which you can read in full on page 18), Dr Obeid described the initial training sessions and track deployment plans that he had already initiated for the medical team in Azerbaijan.

He said: "I have already started my training for the medical team. In January, we trained with the extrication team in Baku and with Dr. Jean-Jacques Issermann and Professor Jean-Charles

Piette, the FIA medical delegate.

"Professor Piette and I inspected the track and discussed the deployment of the medical team."

Dr Obeid explained that the training for the Baku safety and medical teams would continue after the Bahrain Grand Prix, which will take place on 3 April.

He said: "We will have another medical seminar for them after the Bahrain Grand Prix and then move on to the full team training on medicine for the Formula One race."



CONCUSSION DEBATE PLANNED

The FIA's Medicine in Motor Sport Summit will discuss the sport's treatment of concussion at its next meeting in December.

A panel of experts recently met in Geneva to examine the results of a survey on concussion in a previous edition of this publication.

Discussions regarding rotation, the mechanisms responsible for concussion and how they could be measured also took place, and ideas on how to use motor sport's close relationship with engineering to further study and treat the

condition were proposed.

Speaking about the meeting Dr Paul Trafford said: "An agreement was reached to make concussion a subject for the conference with a view to issuing guidelines on diagnosis, treatment and when to allow concussed participants return to motor sport."

Future research projects including measuring angular rotation, high-speed cameras and new imaging methods for examining concussion were also agreed.

ARC PUBLISHES RESPONSE TO 2015 ILCOR GUIDELINES

The Australian Resuscitation Council (ARC) is the latest major regional body to present its response to the 2015 International Liaison Committee On Resuscitation guidelines

The ARC, in co-operation with the New Zealand Resuscitation Council, makes recommendations for how resuscitation should be conducted based on the evidence and guidelines issued by the central body, ILCOR.

Dr Matthew MacPartlin, deputy CMO at Rally Australia and assistant CMO at the Australian Grand Prix explained how the ARC's response could potentially influence the work of medical motor sport personnel.

He said: "It would seem that the next time you respond to a race incident with the suspicion of a neck injury, at least by mechanism, the application of a semi-rigid c-spine collar is no longer mandatory.

"Instead we can exercise discretionary judgement as to whether to let the person self-extricate, self-extricate with a collar in place or be assisted out with careful manual in-line c-spine control.

"The rigid spine board takes a hit too. While it still has a role in assisting extrication or moving a person, leaving them strapped to the board for prolonged periods is no longer acceptable."

The issue of resuscitation will be covered in a future issue of AUTO+Medical.



FIA PRESIDENT DELIVERS 2016 WATKINS LECTURE ON SAFETY

FIA President Jean Todt delivered the annual Watkins Lecture for the Motorsport Safety Fund at the Autosport International Show.

Todt addressed a range of issues that motor sport faces. He identified Ari Vatanen's high-speed accident during the 1985 Rally Argentina as a pivotal moment in his drive to improve safety as he followed the aftermath of the Finnish driver's crash.

"For many days we thought he would not survive. So that becomes the priority, and you follow your people in the crucial hours after the accident. [Vatanen's accident] was probably the turning point of my interest in safety. Then you reach some success in your life and you think it is time to give something back."

The President explained that he continued his quest to improve

safety standards during his time as boss of the Ferrari Formula One team and it then became a top priority when he took charge of the FIA.

He said: "When I was team principal at Ferrari I always encouraged Michael [Schumacher] to promote global safety, and when I was elected president of the FIA it was only natural that I would put road safety on the top of my list.

"We have made progress in safety in racing, in certain countries on the road, [and] on circuits. [But] every weekend it reminds you that there is more to do, to protect the drivers, the marshals, and the spectators. We have created specific safety commissions - like the closed road commission headed by Vatanen - so for me [safety] really is the biggest priority."



MSA ADOPTS CONCUSSION RULES

Britain's Motor Sport Association has implemented new rules regarding concussion among motor sport competitors ahead of the 2016 season.

Under the new rules, concussion will be diagnosed by the Chief Medical Officer following an accident if there is any momentary loss of consciousness, confusion, disorientation, amnesia, headache, dizziness or nausea displayed by a participant involved in a crash.

No concussed competitor will be allowed to return to action. They will have their licence withdrawn by the MSA, who will then outline the requirements for its return.

In professional championships where a driver wants to return sooner there will be the possibility of competitors being directly referred to specialists who will be able to use a range of tests to deem if a competitor may be allowed to return sooner.

Any competitors who experience a second concussion within three months will be required to see an expert before they are allowed to return again.

Speaking about the new rules, Dr Paul Trafford said: "This is a major step for motor sport to regulate concussion and other ASNs are considering how to implement concussion regulations."



INDYCAR INTRODUCES ZYLON TETHERS TO REDUCE AIRBORNE DEBRIS

IndyCar has introduced Zylon tethers to major aerodynamic components for the 2016 season in a bid to prevent them detaching and causing injuries to drivers.

The sport was rocked last August when Justin Wilson was killed in an accident at Pocono Raceway where a piece of bodywork flew off Sage Karam's crashed car and struck the British driver on his helmet.

Since the start of the new season, IndyCar rear beam wings and rear wheel guards are tethered for all races, while the cars' noses will be secured on superspeedways that are one-and-a-half miles or longer.

Will Phillips, IndyCar's vice president of technology, explained how the series would use the tethers to improve its safety standards and reduce flying debris without affecting the racing.

He said: "It is a continual goal to improve safety for all the participants, fans and drivers alike. We also need to do this in a fashion that does not create more yellow-flag racing and try to prevent as much debris as possible.

"We have great support from our partners to improve safety and wish to thank Chevrolet, Honda and Dallara for their participation and efforts in working together to implement change."

IndyCar machines have featured tethered wheel restraints for the last 17 years and also secure the rear wing to the transmission in a bid to reduce airborne debris.

Another safety change included for 2016 is the use of a domed skid plate on the underside of the chassis to help yaw and spin characteristics, which is designed to work with rear wing flaps to reduce the chances of a car taking off.

RALLY STUDY AIMS TO REDUCE SPINAL INJURIES

A scientific study to assess the threat of spinal injuries among cross-country rally participants took place at the recent Abu Dhabi Desert Challenge.

The rally's organisers, the Automobile and Touring Club of the UAE (ATCUAE), conducted the research in conjunction with the FIA and the FIA Institute's research partner, the Global Institute for Motor Sport Safety.

The study assessed what causes spinal injuries among cross-country rally competitors using accident data recorders fitted into each car to assess G-force loadings. That information will now be correlated with reconstructions made using the latest virtual crash simulator technology.

"The aim is to lessen the threat of spinal injuries in cross-country rallies by creating a driver cockpit safety package using crash simulations with virtual reproduction of injury mechanisms," said ATCUAE President Mohammed Ben Sulayem.

"We want to know exactly what amount of G-force can result in a competitor's spine being broken," added Dr. Sean Petherbridge, the ATCUAE's Chief Medical Officer.

The final outcome of the study aims to produce a new seat that can further protect drivers from spinal injuries.

"The objective is to design cross country rally seats which do not break under normal operation but which compress to absorb the energy in high impact situations in order to protect the spine," said Petherbridge.





FEATURES

FIRST RESPONSE

The FIA is expanding its medical training programme for competitors in the World Rally Championship and beyond



At one point during Rallye Monte Carlo, three-time world rally champion Sébastien Ogier had his hands around co-driver Julien Ingrassia's throat. But this wasn't a dispute between teammates over a costly mistake on the road; the pair were practicing a technique that could save the life of a rally competitor who is trapped in the wreckage of a car following a major crash.

The 'Rautek' manoeuvre for safely removing a trapped person is just one of the practical first aid skills that were taught to the WRC P1 class drivers as part of an introductory workshop between the FIA and the International Federation of Red Cross and Red Crescent Societies (IFRC) at the opening round of the 2016 WRC season. The potential partnership could lead to all drivers receiving regular training sessions throughout the year that will enable them to provide first-on-scene assistance if they come across a serious accident during a competitive rally stage or when they are driving on public roads.

It could then be rolled out across other championships around the world with support from local IFRC offices.

STRONG FOUNDATIONS

If approved, this IFRC partnership would build on the regular first-aid training the drivers have been receiving from WRC Medical Delegate Dr Jean Duby since 2001.

"Some 15 years ago it occurred to me that it was necessary for rally drivers and co-drivers to have first aid training," says Duby. "Why might that be? Drivers and co-drivers in these types of competitions can play an essential role as they are often the first to arrive on the scene of an accident. Furthermore, there is no experienced extrication team at rally

events, in contrast with circuits, where an extrication team is obligatory."

Often, in the case of a serious accident, one person in the vehicle is more injured than the other, giving the second person a chance to act. In addition, within the space of ten minutes, three or four other competitors would have arrived on the scene, all in a position to provide medical assistance.

"In this scenario, we are moving from 'First aid' to 'First-on-scene training, based on the principle that if you know what to do and what not to do you are able to improve the situation and maybe save a life,'" explains Duby.

The first training session of this type took place at the Acropolis Rally in Greece in 2001. It was given to all drivers taking part in the event together and was entirely theory-based.

"It proved far from ideal," admits Duby. "It was inefficient due to the absence of a practical element and also because the group size was too large."

It became clear to him that the training sessions needed to be organised in small groups and include practical workshops in addition to the theory. It was also evident that the training needed to take place in the days preceding an event and then repeated during the season to ensure that all drivers entered into the championship received the training.

"I developed a PowerPoint training module, which was significantly improved and regularly updated in collaboration with two Turkish associates, Professor Cem Boneval, a surgeon in Antalya, and Dr Erdem Yilmaz, founding director of an established company in Istanbul specialising in first aid training."

As such, over the past ten years, all drivers



WRC Medical Delegate Dr Jean Duby in conversation with WRC champion Sébastien Ogier

“ IF THE DRIVERS KNOW WHAT TO DO AND ALSO WHAT NOT TO DO THEY MAY BE ABLE TO SAVE A LIFE IN AN ACCIDENT ”

and co-drivers entered in the World Rally Championship have been trained throughout the year and been given regular refresher courses, working closely with the relevant Chief Medical Officer in the host country of each event where they take place.

The training evolved over the course of the years and was taught to groups of 10 to 16 drivers using the latest medical and safety theories, as well as practical demonstrations.

PARTNERSHIP PLAN

Now the FIA is planning to take this training to the next level through a global partnership with the IFRC.

"Pooling the expertise and, above all, the resources of the FIA and the IFRC is indispensable and vital for the development of the current training sessions, not only for the benefit of WRC competitors, but for all drivers and co-drivers taking part in rallies worldwide," says Duby.

This training would not be limited to drivers but also available to those present at events who could find themselves on the scene of an accident: the stewards, officials, and even the spectators.

"If fans were interested in receiving the

training, on a voluntary basis of course, they would act as ambassadors for such training which, if tailored to motor sports, would also apply in any type of road accident," says Duby.

The potential importance of this type of training was underlined by the experience of WRC driver Kris Meeke. He recently found himself on the site of a traffic accident in which the driver had died, but he had been able to extricate an unconscious elderly person from the accident vehicle and place them in the recovery position, using methods he had learnt in Duby's training sessions. The driver was congratulated by firefighters arriving later on the scene, who confirmed that he had saved that person's life.

This FIA-IFRC partnership began last year, from a practical standpoint, with the creation of a Survival Kit, which will be developed by the FIA and then placed in race cars. The partnership was further cemented at the beginning of this year with a joint training before the 2016 Monte Carlo Rally.

RED CROSS TRAINING

On the Thursday of the Monte Carlo Rally, the P1 drivers, and their co-drivers and team representatives gathered together to receive training from members of the Red Cross, FIA, and FIA Institute.

"At first, we reinforced the fact that whatever they do, the main priority is their own safety," says Dr Paul Trafford, the FIA's medical advisor who led the session. "So if somebody is injured and another driver stops at an accident, they must not put themselves in a position where they are going to end up as a casualty."

The drivers were then taught the correct procedure for alerting rally organisers that

“ THE FIRST-ON-SCENE TRAINING SKILLS WOULD ALSO APPLY IN ANY TYPE OF ACCIDENT OUT ON THE PUBLIC ROADS”

there had been a serious crash. This involves activating the FIA emergency dashboard transmitter in each car and trying to raise the alarm via radios, mobile phones and speaking to nearby marshals. "It is important to cover this because people will panic a little bit if they are involved in an accident and they forget what is useful," explains Trafford.

After raising the initial alarm, the drivers are instructed to tell the authorities the exact location of the accident using their on-board road book and explain where the car has stopped if it is away from the road. They then need to put out the warning triangle and SOS board that will inform the next competitor about the crash.

The next car on the scene is instructed to stop and give assistance, and the car after that then slowly carries on to the following radio post to make sure the message gets back to the rally's headquarters. "It's a belts and braces approach that ensures everyone knows there's been an accident and the emergency services are mobilised," says Trafford.

Utilising the FIA's Medical Extrication Vehicle, all the drivers then practiced the 'Rautek' technique. This involves putting one arm behind the back of a casualty, taking their nearest arm and putting it across their chest. The person performing the technique

then takes the hand of the competitor's arm behind their back so they are holding the injured driver in their own arms and under the armpit of the opposite hand. The rescuer then uses their other hand to support the casualty's head, takes hold of their neck and then levers themselves backwards and out of the car.

The drivers also learnt how to deal with unconscious patients, as well as how to treat severe bleeding and burns.

"But it's not just for the WRC drivers to help each other in a rally car," explains Trafford. "It's also for if they come across an accident on the road because they are travelling thousands of miles and if they come across accidents, it's useful for them to be able to offer assistance because they have skills that could save a life."

This ties in with the FIA and IFRC road safety

collaboration. Since 2014 they have been working together on the implementation of projects dedicated to improving first-aid awareness and have developed over ten initiatives on first aid training for road safety and post-crash recovery globally.

DRIVER SAFETY

The value of this training was not lost on the drivers, all of whom engaged enthusiastically with the session.

"It is very important for us," says Volkswagen's Ogier. "We have done first aid training before, but now it will become more regular. Like everything in life, unless you keep doing these things often, it is all too easy to forget so it is so important for us, even though we hope we will never have to use it."

If the programme is taken forward then



Dr Paul Trafford instructs the WRC participants in Monaco



All participants practiced the lateral safety position

each group of drivers will receive further first aid training from the FIA and IFRC on three more occasions throughout 2016 using local medics and trainers at those events, before completing the course at the end of the year.

At the end of the season the drivers will be tested in a practical scenario where they will be able to demonstrate their knowledge. If they pass this test they will receive an official award from the IFRC and be recognised as having achieved a certain standard in first aid training.

“This adds big value,” says M-Sport driver Mads Østberg. “If there is an accident in our sport there is no guarantee to be with medical people, because we compete over such large areas. To be able to help each other is really important and it means you can

“TO BE ABLE TO HELP EACH OTHER IS REALLY IMPORTANT AND IT MEANS YOU CAN POTENTIALLY SAVE THE LIFE OF ANY COMPETITOR”

potentially save the life of a driver, co-driver or any competitor. It’s nice to learn the basics and have training about what to do and help.”

In the future, the FIA and IFRC hope to make the first aid training sessions available to National Sporting Authorities (ASNs) around the world so that national-level rally competitors will possess the same amount of

MEDICAL EXTRICATION VEHICLE

The medical extrication vehicle was developed on behalf of the FIA Medical Commission and designed to be a portable and reusable model of a closed-cockpit racing or rally car to train safety personnel.

The vehicle, which includes a steering wheel, tunnel, console, pedal box, footrest, gear stick, handbrake and optional seats and bodywork, can be packed into a square box, weighing just 95kg.

The car also uses replaceable steel tubes that can be cut away during extrication drills. These can be refitted at very low cost, which means that extrication teams and fire forces can practice real-life rescue simulations.

knowledge and can act appropriately if they come across a serious accident.

“The idea is that, eventually, every competitor in the world who wants to do a rally and hold a rally licence will, through their ASN, have to do a first-on-scene course,” explains Trafford. “The ASNs would then liaise with their local Red Cross officials who will know the standard that course needs to be because it will have already been established.”

A good example of this took place recently during the Formula E event in Mexico, where drivers were instructed by Red Cross Volunteers on what to do in emergency situations.

FAN FOCUS

The IFRC is also working on a first aid course for the fans stood at the side of a road so they can assist if a major accident occurs or if they come across one on the public highways. This is a one-and-a-half hour session for training spectators and as part of the agreement with the FIA it will be promoted during WRC events.

Dr Pascal Cassan, Head of the IFRC Global First Aid Reference Centre, believes that the WRC training, even before it is extended, has the potential to save lives.

“We believe that this programme will help to save lives in the event of a serious accident as well as improve first aid knowledge and understanding throughout the sport,” he said.

The nature of rallying means it covers remote roads and medical assistance can sometimes take a long time to arrive at the scene of an accident. But thanks to the techniques taught in first-on-scene sessions, drivers with the skills and knowledge to help their fellow competitors will be just moments away to offer help in life-threatening situations.



On remote stages it is essential that drivers have medical knowledge

DR AMJAD OBEID

Chief Medical Officer, Bahrain Grand Prix and FIA Medical Commission member

Dr Amjad Obeid has worked at the Bahrain Grand Prix since it first appeared on the Formula One calendar back in 2004. After gaining experience in various positions on the Bahrain medical team, he was made the event's CMO in 2007 and has since fulfilled the same role in the Indian Grand Prix and will do so again for the inaugural Azerbaijan Formula One event later this year.

AUTO+Medical: How did you become involved in motorsport?

Dr Amjad Obeid: Back in 2004 I was a member of the team at the first Bahrain Grand Prix. I participated with the medical team and that developed my high interest and passion for motor sport and I have continued to provide the medical services for the race.

I approached the organisers from within the medical team after I had worked in a couple of other positions: I worked in an ambulance, I worked in the extrication team and then I became the deputy chief medical officer after a year. From 2007 I took over as the chief medical officer for the Bahrain Grand Prix.

A+M: What did you learn from your experience in those different positions?

AO: I think that was actually a good start for me, as a medical officer, that I worked in most of the positions in the medical team. It gave me a better understanding of how it really feels to be part of the team, as sometimes there might be people who are assigned to be a chief medical officer without really working on track.

I did my part and worked to see how we really need to improve on the track and saw how I could take care of my medical team when they are out there. For example, if they told me, "one doctor is not comfortable with this," I can



remember when I was on track and have a full understanding and appreciation of those situations and how to respond.

I also figured out how to improve our performance based on that experience and I developed and tailored the training programme for the medical team as a result. This was always my concern and my passion – how to train my team to be the best. I always want to be the best so I work to help them to provide the best medical services on track.

As a doctor, I'm very comfortable in my hospital, and in my resuscitation room as I'm an emergency physician and I have my nursing staff there, but I have to provide this medical care on track in a very high adrenaline environment within motor sport. This care needs to be on standby and fortunately we don't have lots of accidents, but if that were to happen we should be ready for it. We should also do it in the best possible way with the limited resources you have out on the track.

So my work with the team from the very beginning in Bahrain gave me an idea of how I could provide the training they need to convert them from acting as clinical doctors, nurses and paramedics, and bring their medical expertise and knowledge of how to take care of people in a hospital and put them on the track. That was a good thing that I gained and I learned from that time. Every year we try to improve and we try to upgrade our team with extra training provided.

“ MY CONCERN AND MY PASSION IS WORKING OUT HOW TO TRAIN MY TEAM TO BE THE BEST AND PROVIDE THE BEST MEDICAL SERVICES ”

A+M: Have you had any experience from any other position in motor sport safety?

AO: I joined as an emergency physician at the beginning, but as we work as a team we consider ourselves to be marshals. Whenever there is a big event in Bahrain we have a committee where all the marshals sit together and we all gain experience.

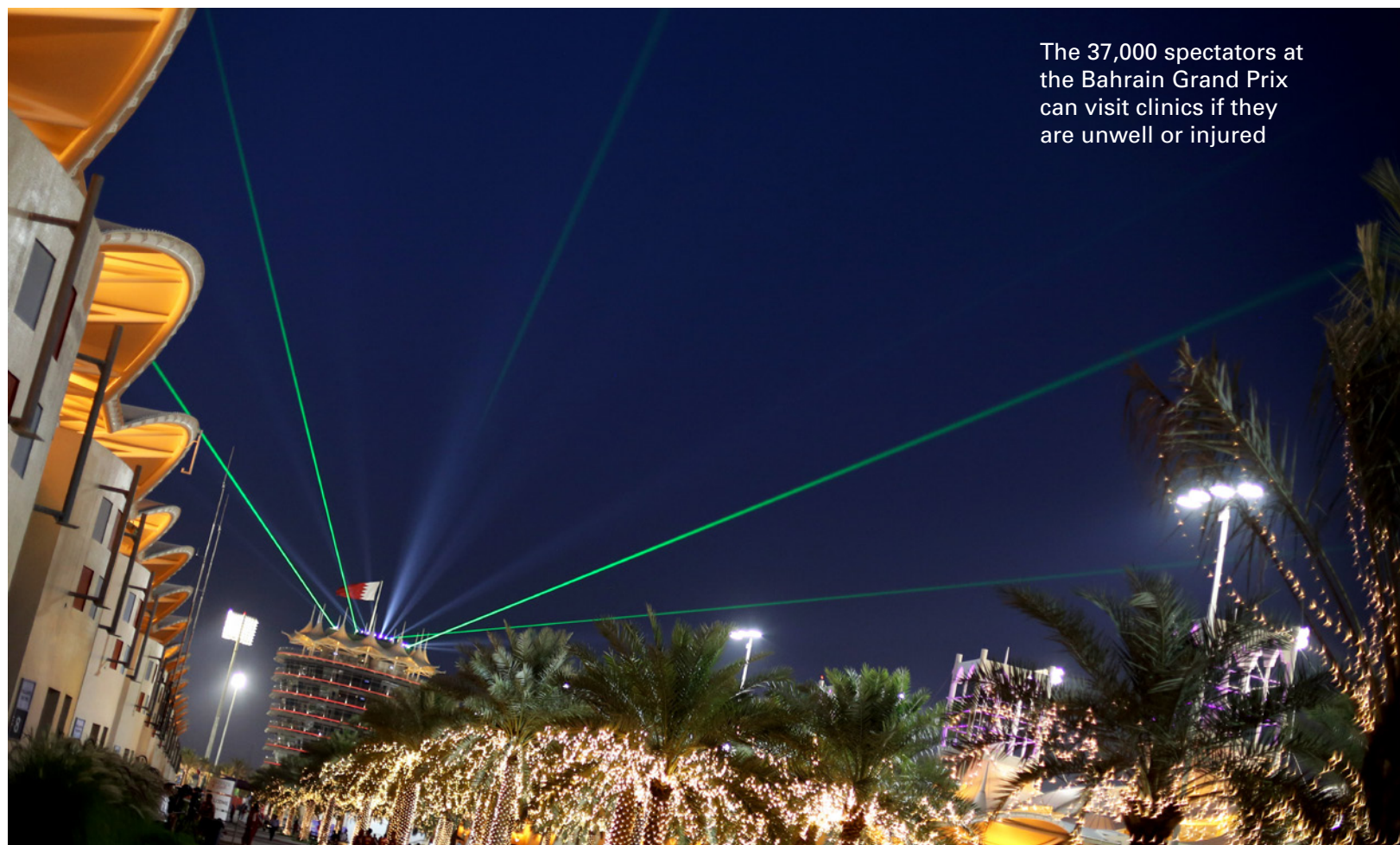
When you are in this field you try to search for what marshalling means and how you co-operate between the other on-track teams, whether that's marshals, fire marshals, recovery marshals or whoever to make any event that we are covering successful.

A+M: What does your work as CMO at the Bahrain Grand Prix involve in the period leading up to the race?

AO: We have several weekends for local championships and while I don't go to them very frequently, the doctors and the medical team covering them are members of the medical team that covers all the international events in Bahrain.

I also produce safety designs and discuss with the organisers of the Grand Prix about where we need to put the medical team and what the medical requirements are for those events as they do not do an event without having a prior discussion or agreement in place. So if they say they want to use the small circuit or the long circuit and whether that means they need a certain size of medical team, a certain supply of ambulances or extrication equipment, or if there is any problem or emergency, they can of course immediately call me at any time.

I don't work full-time at the Bahrain International Circuit as the Bahrain Motor Federation (BMF) assigns me and I don't work for the circuit, I only give advice as a BMF official. I just give them what we advise as an ASN, what we require as a minimum and



The 37,000 spectators at the Bahrain Grand Prix can visit clinics if they are unwell or injured



“ EVERY YEAR WE UPGRADE OURSELVES, AS MEDICINE IN MOTOR SPORT IS NOT SOMETHING THAT YOU CAN JUST READ IN A BOOK ”

discuss what we need. Then it is up to the circuit and they should comply with those safety regulations.

A+M: What is your role during an actual race weekend?

AO: During the Formula One event I am deeply involved. I do training for the medical teams before the race as we do drills and simulations. In Bahrain, we were one of the very first countries to practice full simulations before Formula One events.

In 2007 we trained for an accident on the track with an extrication simulation and since then the FIA has made that a mandatory exercise for its medical delegates and the medical rescue teams. So we had this idea and we developed it and we use it in every event, whether it's Formula One or the World

Endurance Championship, or any series. Even before it was mandatory to do the simulation on track we did it to give a sense of coordination to the medical teams and show them how to practice and prepare for an accident that might occur during the weekend.

A+M: What medical and safety facilities do you use during the Bahrain Grand Prix?

AO: We have one of the best medical services that can be provided and we divide that service into three parts. The first part is for the track medical team – the people who are all around the track. Then we have the track's permanent medical centre and the third part is for the spectators who attend the races.

The track medical team is made up of the 11 ambulances we use, the three extrication and six medical intervention teams, as well as six

teams who work on foot in the pitlane. Those people are only concerned with the track and taking care of any injuries that may occur with the competitors or marshals.

The second part of the team is stationed in the track medical centre, which is a permanent medical facility and is fully equipped and ready to receive any trauma patients. We always maintain this medical centre and it has four trauma beds, a minor surgery procedures room, anti-doping facilities, a small pharmacy, X-rays and Radiology. It is all part of the FIA requirements and the strict rules that we always comply with. Inside the track medical centre we have doctors and surgeons, emergency physicians who are able to provide any needed medical services whether it's for a driver, mechanic, marshal or any of the organisers. So if someone got injured or sick we

would be able to handle this person. Also part of the medical centre is the air-medical evacuation, the medical helicopter, which is available for all four days of the race. Before the race we do several drills and simulations on how to load a patient and fly them to the local hospitals. We even do this drill with the standby hospital, whether that is the Ministry of Health or the military hospital in Bahrain.

Finally, we have a fascinating vendor area at the Bahrain International Circuit and more than 37,000 people who attend the Grand Prix. This is indeed a very large area that has its own proper medical services and spectator clinics should any of them get sick or injured. There are clinics in every stand where a spectator can go and there will be medical help provided to them.

A+M: Have there been many changes to the medical facilities and services since the Bahrain Grand Prix began in 2004?

AO: Every year we always upgrade ourselves, as medicine in motor sport is not something that you can just read in a book, it is an experience. I've got members of my medical team who have been with me since 2004; so they are experts and not only that, they enjoy their work. Part of creating your work is to enjoy it and I'm very proud of them. The more experience and expertise you develop as a medic, the better and more confident you are in providing medical service. Of course every year if we find there is an area of improvement that we need to make in terms of training or documentation or planning our sessions and seminars, then we will do it.

For the last seven years we have organised a Bahrain motor sport seminar, which is a one day medical course where I gather the whole medical team in a big hall and we give a full

refreshment on medical updates on topics that include extrication, trauma management, medical theory and how to apply that on the track. I also get speakers to come from my hospital and from different hospitals in Bahrain; sometimes I get speakers to come from outside the country as well.

We have also been made a regional training provider (RTP) by the FIA Institute as we were recognised as a training centre here in Bahrain for all the medical teams in the region. Bahrain and Germany were the first two countries to receive this RTP award, from a medical perspective, and we got it in December 2014.

Based on our experience, the Bahrain Motor Federation and myself were also involved in the training for medical team at the Grand Prix of India. I was the CMO for the Indian Grand Prix for two years and in the third year I supported them, so in total we prepared, trained, and maintained the medical team in India for three consecutive years.

This year the BMF will be providing support to Baku for the first Azerbaijan Grand Prix, and training has already started with the team there. We went over recently to prepare the team and the standby hospital, as well doing the safety and medical applications with the FIA. This has all developed the experience the BMF has, as well as my own, over the years.

A+M: So will you also be the CMO for the 2016 Azerbaijan Grand Prix?

AO: Yes, I was appointed and I have already started my training for the medical team. In January, we trained with the extrication team in Baku and with Dr. Jean-Jacques Issermann and Professor Jean-Charles Piette, the FIA medical delegate. Professor Piette and I inspected the track and discussed the deployment of the medical team, as well as the need to prepare the medical team ahead of Baku 2016. We have



“ YOU DON'T JUST TRAIN A PERSON ONE TIME AND THAT IS IT, YOU ALWAYS CONTINUE TRAINING THEM TO ALWAYS KEEP THEM TUNED. ”

started our first training sessions, mostly for the extrication team. We will have another medical seminar for them after the Bahrain Grand Prix and then move onto the full team training on medicine.

A+M: Does the street circuit layout in Baku affect the protocols for the medical team?

AO: It will be challenging but the basic principals are the same and I'm also expecting it to be a really nice race. It's very challenging as the Baku circuit layout is going to go from the old city to the new city. We will need to provide the proper medical coverage for the sharp and critical turns along the course and we need to plan the rescue procedures, how do the teams actually go into the track and then how they leave. We also need to make sure that they are properly equipped and that the medical team fulfils the requirements and regulations set by the FIA.

We will also plan where they will park their vehicles and I have done an extensive study for the track. As we walked the track we stopped at every point to say where we could park our medical cars and approach the track in the event of an accident. I did my proposal and then this was all discussed with Professor Piette and he approved that.

A+M: What is the most rewarding part of your work in motor sport medicine?

AO: The most rewarding thing is that as I'm an emergency physician I deal with trauma care, critical patients and pre-hospital care, so I feel that being in motor sport combines my specialty and my passion. I love motor sport and I love the very beautiful organisation of the sporting teams. For example, I love how they co-ordinate things, how they do teamwork and as a result I always try to implement that in my own team.

Every member of the team is as important as the other ones. I have learned that as you do your work and you enjoy it, the rewarding feeling comes from covering big events and big races in Bahrain. I am proud that I am serving a big event in my country and I am proud that I am part of the medical team. But not only are we providing the services, we have been recognised as one of the best medical teams thanks to the RTP. That makes you enjoy it even more and it's rewarding to give even more of your time to it.

A+M: Can you describe the biggest challenge you have faced as a motor sport doctor?

AO: The biggest challenge for medicine in motor sport is the continuity. You need lots of medical equipment and training for a medical team and it is challenging to provide them all the time. You don't just train a person one time and that is it, you always continue training them

to always keep them tuned.

For example, someone on my team may say "come on, we took the same training last year," and my reply would be "no, it's not a matter of that, we always need to be ready, updated and properly tuned up." So the challenge is continuity and providing the necessary support.

You hear that in some parts of the world there are some races, challenges and championships that are not FIA sanctioned events. There are motor sports and people racing on track without having proper medical coverage and you feel very sorry because those athletes and drivers deserve proper medical care. So the challenge is the continuity of motor sport medicine, and also the support and the distribution via an exchange of knowledge between all the medical teams around the world.

A+M: In what ways would you improve motor sport medicine?

AO: That's a very critical question, but there are races that are sanctioned by the FIA, so all of those events have, at least, a proper medical plan as part of the governing body's rules and regulations. Without those rules the FIA will not accept a race. So the challenge is for other non-FIA championships to improve. Any race that is not an FIA championship and does not have the rules and regulations and proper safety guidelines needs to be improved.

The most critical ones for example might be some drag races, especially if it is not an FIA one, and of course open track days. If people go and they are not experienced and just want to race, that would be a challenge. But I would like to improve all non-FIA sanctioned events that are taking place because they may not have implemented these strict rules and regulations and there is no one to monitor them.

MEDICINE'S HIGH COUNCIL

AUTO+Medical takes a look at the various medical and safety topics that were presented at the 2015 International Council for Motorsport Sciences annual congress

The International Council for Motorsport Sciences held its annual three-day congress on 9-11 December 2015, where a number of medical and safety topics were covered in presentations given by officials from within the field.

Several research studies were presented and discussions took place on how to implement new theories into future practices. Amongst the topics that were presented on day one was an explanation of how to download meaningful information from Accident Data Recorders by IndyCar director of engineering Jeff Horton, and Dr Mark Bayley's Dan Marisi Memorial Lecture on the best rehabilitation practices for post-concussion syndrome.

On Day two, Formula One race director Charlie Whiting described all the safety preparations necessary to host a world championship Grand Prix, before Dr Claude Meistermann, Chief Medical Officer for Rallye de France Alsace, reviewed motion sickness in rally co-drivers and navigators.

Among the techniques that were presented on the final day of the congress were Road America safety director Carson Wilkinson's talk on fire suppression and IndyCar safety team manager Mike Yates' explanation of the mechanics of a response to a crash.



The 2015 ICMS annual congress was held in Indianapolis



Practical safety demonstrations took place on each day of the congress

The congress was concluded with a demonstration of racetrack safety team drills and techniques, which was moderated by Dr Rob Seal, CMO of the Canadian round of the FIA World RallyCross championship.

Here, AUTO+Medical takes a closer look at three of the presentations, which covered injury prevention in pit crews, the history of in-ear accelerometer technology and safety organisation at motor sport events.

DR DAVID FERGUSON: PIT CREW PERFORMANCE

Dr David Ferguson, Assistant Professor at Michigan State University, presented the findings of his study on training programmes that improve performance among NASCAR pit

crews and reduce the number of injuries they suffer over the course of a season.

In a race, the ideal time a NASCAR crew aims for at each stop is between 12.5 and 14 seconds, according to Ferguson, but despite the high priority placed on perfecting pitstops, few scientific studies have focused on the performance of the mechanics.

He said: “Only two medical studies have been conducted on NASCAR pit crews, which were published in 2011 and 2014, and just one has been conducted during elite level competition.”

Ferguson also described how the fast-paced nature of a NASCAR pitstop meant crew members often suffer from different physiological issues, which range from meniscus tears in their knees and rotator cuff

problems in the shoulders, to wrist and ankle sprains, across a season.

“Around 20 per cent of active pit crew members experience one of these injuries during the season,” he added. “They undergo physical therapy during the season and if necessary have surgery in the off-season.”

Ferguson explained how a study he had designed, which was published in the Journal of Strength and Conditioning Research in September 2014, sought to identify the physiological stressors that are placed on pit crew mechanics, as well as the physical requirements needed to be a successful pit crew operator, and proposed a training regime to maximise those attributes and limit injuries.

The research looked at the change in body composition of ten pit crew operators across a NASCAR season from the Stewart-Haas Racing team – four tyre carriers, four tyre changers and two jackmen.

The training programme aspect of the study focussed on preventing injuries and over-training during the course of the season, with performances peaks throughout the year, by implementing a new exercise regime for the pitstop mechanics.

The pit crew members on the new training

regime were measured against a control group of development pit team members. Both parties travelled together and ate the same food, and were evaluated at the start and end of the season. These tests consisted of DEXA X-rays to measure bone mineral density, a vertical jump to assess power and a Wingate anaerobic power test.

Ferguson explained how the results of the fitness programme showed that the trained pit crew members had a higher body mass than the control group by the end of the season and had less of a decrease in lean body mass percentage. The trained crew members also demonstrated a significantly improved vertical jump at the end of the season versus the control group, which performed slightly worse.

Following the end-of-year Wingate test, the trained group had improved their mean power by around 200w, and their peak power by approximately 700w, whereas the control group demonstrated less mean power and a lower peak power compared to the start of the season.

“This would translate to a 22 per cent reduction in pit crew injuries across a season,” concluded Ferguson.

DR STEVE OLVEY: SENSING PROGRESS

Dr Steve Olvey, Associate Professor of Clinical Neurology/Neurosurgery at the University of Miami-Miller School of Medicine, explained the history of in-ear accelerometers and concussion studies in US motor sport.

Olvey, who is also a founding Fellow of the FIA Institute, and CMO for Formula E in the United States, described how the background for using in-ear accelerometers to signal concussion dates back to a meeting between representatives of US motor sport stakeholders in Sebring, Florida, in 1999.

He said: “The project was initially met with



much scepticism. But after a second meeting one month later, Endevco, an instrument measuring company, took the initiative and designed the first accelerometers."

Olvey also explained how Delphi, an automotive solutions business, modified the in-ear accelerometer models before the initial tests on the project were carried out in 2001 and 2002.

He said: "The use of the technology in an actual race car was delayed due to arguments over its validity and accuracy, but those arguments were eventually dispelled."

Several IndyCar drivers trialled the in-ear accelerometer system in 2004 and by 2012 the technology was being used by the entire field.

Olvey then described how he began a new study regarding the use of in-ear accelerometers in IndyCar racing between 2012 and 2015 that only examined crashes with a maximum resultant value of greater than 50G. "This is because concussion is not felt to ever occur below a head acceleration of 50G," he explained.

The new study looked at 43 crashes from three IndyCar seasons: 16 in 2012, 13 in 2013 and 14 in 2014. In each accident the in-ear accelerometers recorded the forces exerted on a driver's head, which ranged from 50 to 250G, with crashes of 50-60G recorded the most times, at 16.

Olvey explained how a total of five concussions were reported in that period, but said that three were recorded without data due to wiring issues and so only two concussed drivers had the complete data set from the in-ear accelerometers.

In his conclusion, Olvey stated that the information from these two crashes and the development of the in-ear accelerometer technology showed that the data from the devices is reproducible and injury thresholds

could be established. But he believes the low number of concussions means that they are not overly beneficial when it comes to designing some safety products.

He said: "There are too few concussions to be useful in equipment design. Setting a trigger threshold of greater than 80G for mandatory testing makes sense as ear accelerometers detect high-G impulse loading."

TIM MAYER: BEHIND THE CURTAIN

Tim Mayer, Independent Director of the Automobile Competition Committee of the United States (ACCUS), used his presentation to outline all the safety elements he believes are necessary for a successful motor sport event at a circuit in the US.

Mayer, who explained that there is no single solution that would suit every situation, described how he splits race safety systems into two groups: 'inside the race fence' organisation, for participants, and 'outside the race fence' structures, for spectators.

"The main difference in regulation," said Mayer, "is that inside the fence is principally controlled by the sanctioning bodies and the FIA. While outside the fence is generally regulated by state or local rules, by insurance requirements, or in the best-case scenario, self-developed procedures."

During his discussion on inside the fence organisation, Mayer described the dimensions of openings for marshals and drivers to enter and exit the track, which are 1000mm by 600mm and are situated 1000mm above the top of the barriers, as well as the need for clear communication with marshals.

He said: "The three most important things to remember with marshals is that they are volunteers and should therefore be treated with respect. They need to be fully trained and keeping good communication with them,



Presentations covered various aspects of motor sport safety

ideally via a landline or a backup radio, is vital."

After detailing the required equipment list, including vehicles for rescue teams and specific technology for specialist series such as Formula E, Mayer explained that some kits need to be stored in the pitlane to maintain safety standards in one of the more active areas of the track due to the number of personnel, cars and hazardous materials in the vicinity.

Mayer also recommended that a circuit's race control is situated with a full view of the track, that event organisers have a strategy for dealing with extreme weather conditions, and put a plan to help the families of injured competitors in place beforehand.

As part of his discussion on outside the fence safety systems for spectators, Mayer advocated forward planning with regards to the number

of fans who might show up to watch any motor sport event and that officials remain in contact with local authorities and designated medical centres at all times.

"The basic rule of thumb is the 'reasonable man' test," said Mayer. "This means, given the size and scope of your event, what understanding may reasonably be expected to happen regularly or occasionally, and if you have the resources to deal with them in time."

Mayer also endorsed using a clear and confident command chain to avoid mistakes and maintain order at any motor sport event.

He said: "I highly recommend establishing an 'Event Control'. For very large events this is split into two parts: 'Public Safety' and 'Event Operations'. This is to keep life safety issues separate from entertainment issues."

THE ROAD BACK:

DANIEL DE JONG

GP2 racer Daniel de Jong reflects on his accident during the 2015 feature race at Spa-Francorchamps and offers his thoughts on medical care and recovery techniques for racing drivers



On lap seven of the 2015 GP2 feature race at Spa-Francorchamps, Daniel de Jong suffered a huge accident. His MP Motorsport car hurtled off the track at the Blanchimont corner following contact with DAMS' Pierre Gasly and slammed into the tyre barrier at 300 km/h. After a lengthy extrication process, de Jong was transferred to hospital where he was diagnosed with a fractured vertebra. The Dutchman missed the next two GP2 rounds, but he returned to complete the final two events of the season.

AUTO+Medical: Can you describe what happened in the accident?

Daniel de Jong: I was behind two cars going through the Stavelot corner and Pierre Gasly was the driver in the front of me. He and the other driver were fighting with each other, so I was expecting that they would make a worse exit from Stavelot, because of the fight. I prepared for the corner, so that I would make a better exit out than both of them. My exit was better, as I had more momentum out of the corner, but halfway down the next section of track I started to lose momentum, possibly because of turbulence coming from Gasly's car. This forced me to take the outside line.

I wasn't overtaking as fast as I was expecting, but in the meantime Gasly was steering to the outside of the Blanchimont corner to prepare for the following Turn 18, which you can do flat out in GP2.

I don't think Gasly noticed me because he was concentrating on the guy in the front and we hit each other. My front tyres jumped off the ground, so I didn't have any grip to turn. I also didn't have time to react because the speed was high, around 300km/h, and the distance to the wall was short.

A+M: Do you remember anything about the impact itself?

DDJ: I don't remember anything. I only



remember that I put my hand in front of my head, as automatic self-protection, I think. But I only remembered that a few hours later, because one hour after the crash I couldn't even remember the start of the race.

A+M: How was your treatment by the marshals immediately after the crash?

DDJ: Well I lost consciousness three times after the crash, so unfortunately I don't know all the good stuff that the marshals did. But for some seconds under the tyres in the wall I awoke and I saw some light coming through the tyre wall and some shadows moving from a marshal who asked me if everything was ok. But before I could reply I lost

consciousness again, because I couldn't breathe very well. Then I awoke again when they put me in the ambulance, so I missed a big part. Anyway I am still alive and I didn't get paralysed as they pulled me out of the car, so I think that everybody did a fantastic job.

A+M: Do you remember anything else about the extrication process?

DDJ: I only remember that I awoke when I was still under the tyre wall and then I awoke again in the ambulance and then again in the medical centre of the circuit. But overall I was really calm in my mind as I wasn't scared and I didn't care about the crash.

Everything was working fine and I asked how the race finished and if the car would be ready for the next day. I even wanted to walk to the toilet, as I only felt pain in my chest, which I thought was because of the crash and would be over soon. But I had to stay on the bed because they told me that I had broken my back. I wasn't expecting that.

A+M: How would you describe the care given by the medical and safety crews who attended the scene of the crash?

DDJ: Well I couldn't imagine better people around me than I had that day. It might sound weird, but you could see some kind of passion in those people who wanted to help me. They just asked me simple questions; no difficult conversations and they told me everything that would happen next in the process. They even joked with me, so that made it all less dramatic.

They only thing I didn't like afterwards, but it must be said this was not the fault of the medical and safety crew, was that my father saw the crash with the team in the pit lane and it took really a long time to get

information about my situation to him and he couldn't get any transport to the medical centre. After some discussions somebody finally brought him to the medical centre and I think that was the one point that could be more professional as it was really important that my family knew I was ok.

A+M: What happened when you were transferred to hospital?

DDJ: The people there gave me all kinds of medical checks to see if my arms and legs could move, as well as blood pressure and heart rate measurements. I think that was a standard process, a checklist they go through, because they did the same in the medical centre. Then we took an X-ray to see if I had broken anything, and I had.

A+M: What surgery was performed at the hospital?

DDJ: Well basically they turned me around and opened my back. The sixth vertebra at the top of my back was broken, so they put a plate on the fifth and seventh vertebra to disable the sixth vertebra. Basically they made those three vertebrae into one vertebra.

They put a total of four screws into my fifth and seventh vertebrae, but they did it very carefully. Every time the screw went deeper in, they stopped and took pictures to make sure they were not hitting my nerves. Then they closed my back up really nicely with stitches on the inside and they glued the top of my skin back together.

A+M: Can you describe your recovery process?

DDJ: I think my recovery process was really fast. I had to stay in bed for one day in the hospital, where I watched the second GP2



De Jong missed two GP2 rounds after his crash

race on the Sunday. Then, on Monday, a physio came and he gave me a brace. We started to walk around a bit, but sometimes I got really dizzy. The next day we tried walking on stairs and when that was going well they said that I could go home, because they couldn't do much more for me.

It sounds really easy, but I was in a lot of pain because my whole back was really stiff and I could not turn in bed during the night, so they had to give me a lot of painkillers otherwise I couldn't fall asleep. Then, after I was taken home by ambulance, as I wasn't allowed to sit straight for long, I stayed in bed most of the time. This was because sitting straight or walking made me really tired but my back started to heal really quickly.

I was walking more than was probably



De Jong had to train with a back brace

allowed, but I realised that when I tried to walk a bit and move my body I started to recover faster. Mentally it was just a great feeling to walk and I have never been so happy that I could. You start to realise how proud you have to be in your own body and how special we humans are.

A week after the crash I went on holiday with my family to Italy. We had thought about cancelling it because of my back, but I said we should go as it's the only time in the year that we all get to be together. As the next round of GP2 was in Monza, which was the reason we went on holiday in Italy, MP Motorsport brought a camper to our holiday house, so that I could lie down in a bed when I was travelling.

Finally, when we were on holiday there I could really start to feel how my body was starting to recover. This was mainly through sleeping a lot, but also because I was with my family and we had a lot of fun together. Then, after the five days of relaxing, I went to Formula Medicine to continue my recovery with all kind of training.

A+M: What advice did the doctors give you to aid your recovery?

DDJ: The doctors already knew that we were going to work with Doctor Ceccarelli from Formula Medicine, and they really said I would be fine in that case. For the first week they said that I just need to lie down, rest a lot and when I was going to walk I should always use the brace. Then they told me to ask Dr Ceccarelli for further recovery advice.

Dr Ceccarelli asked me: "Do you want to be back in the car fast or do you want to recover well?" I said I wanted to recover well, because I don't want to have issues when I am 35 years old. He agreed, so we started to do simple exercises and treatments.



De Jong racing in Monaco before his accident

A+M: What physical training did you undertake during your recovery process?

DDJ: We started with really basic exercise, a lot of elastics and cardio. Not running of course, but walking and cycling. We also did a lot of mental training, because that is one of the training parts that they do in Formula Medicine. Initially, because I couldn't do a lot, being so fresh from the operation we started with a lot of mental training.

Then, after a long week, I went home with all the training exercises and I started to train on my own in my local gym. I did everything that they told me to do and every day I could feel improvements. If I did an exercise one day and it hurt a bit, then the next day it didn't hurt at all anymore, so I could really

start to notice that my body was recovering really fast.

After two weeks I went back to Italy and we started to upgrade the exercise. We also took new body and brain scans as well, because Dr Ceccarelli wanted to check my brain functions because as I'd lost consciousness three times he wanted to be sure that I hadn't damaged my brain.

I had to use the brace for six weeks, but after four weeks I felt like I didn't need it anymore. I still used it because you have to listen to the doctors. After two months we took X-rays again and they said that my back was fine and I could do everything I wanted. We upgraded the training so I started to run and lift weights again.

A+M: When did you decide that you were ready to return to racing?

DDJ: We set a mental goal and that was for me to be back in the car for the last race of the GP2 season, but I felt I could do Sochi, the third to last race of the season. However, then I realised that while my back was all fine I'd lost a bit of strength and conditioning. I did all the recovery exercises but I hadn't reached my old training level and so we didn't do Sochi. But we decided to do the last two races because I had some extra weeks to work on my condition.

A+M: What did you feel when you drove the car again for the first time?

DDJ: We decided that I should drive a World Series 3.5 car before I stepped back in the GP2 car. This was because we wanted to be sure everything was fine with me as it would be a waste of time and money if we were at a GP2 event and after practice I realised that I wasn't strong enough to race.

But to be fair, when you drive out of the pit lane in a World Series car and give it a bit too much throttle and feel like the rear of the car is going the break out, that's when you think to yourself 'ah, this is how it was'. Then everything starts to be normal again and I didn't have any issues with my back, so it was all fine.

A+M: What advice would you give to any other drivers if they go through a similar experience?

DDJ: Always choose the proper recovery process and don't just go for the quick one, because I think that a slow-but-thorough recovery will be better in time compared to rushing back. If you want to get back too fast you end up over-using your weaker body parts and then you start from zero again.

I realised that the mind is the best medicine that you can get. Try to laugh, try to be with your family. If you can be optimistic and proud of yourself then you will recover even faster. The days when I felt down mentally were the days that I didn't feel any improvements in my body.

A+M: Do you have any advice for doctors who have to deal with racing drivers who are recovering from big accidents?

DDJ: Be fair and honest and tell them the best steps that they can make to be fully recovered. Keep them up-to-date with the latest information and improvements that they are making because if a sportsman doesn't hear any information or encouragement they will mentally suffer and start to ignore the injury because you just want to be back on track.

A+M: How would you rate the care you were given throughout your recovery process?

DDJ: I don't see any reason why I cannot give it a ten. I can do everything again and sometimes for days at a time I don't even think about having a plate in my back. Even if the care was a six but the people successfully put me back to how I am now then it would still be a ten. The end result, which is the most important, is that I can do everything happily again.

I'd like to say a massive thank to all the people involved in my recovery process. That's all the marshals and people at the medical centre at Spa, Liege Hospital, FIA doctor Jean-Charles Piette, as well as Dr Ceccarelli and his Formula Medicine team. Also thank you to everyone who showed interest in my recovery process and the whole GP2 family.



SCIENCE

KEEPING SAFE AND SOUND

A team of American doctors has studied the risk of hearing loss at motor sport events and produced recommendations to help drivers, crews, and spectators avoid potential permanent hearing damage.

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Team personnel already use hearing protection

BACKGROUND/AIM

The team set out to investigate spectator awareness around the issue of noise-induced hearing loss at a motor sport event. As well as attitudes toward the use of hearing protection, noise levels and the actual use of hearing defence during this same meeting were documented.

METHODS

During the three days of the World Endurance Championship and American Le Mans Series rounds at the Circuit of the Americas in Austin, Texas, in 2013, surveys were conducted on 825 spectators who attended the race.

The survey asked if fans had been to a previous motor sport event, and examined their attitude towards, and use of, hearing

protection. Peak decibel levels during the event were recorded around the track using a decibel meter and hearing protection being used by spectators was directly observed and documented.

RESULTS

Of the 825 spectators surveyed, 82.2 per cent had previously attended a major motor sport event. While 91.9 per cent of the total group was aware of the possibility of noise related hearing injury, 49.5 per cent of those who were aware of hearing injury reported it as a concern and 53.7 per cent of the entire group described their intention to wear hearing protection during the race.

Of the survey participants, 77.8 per cent said that they would use hearing protection if it were given to them for free at the track.

Direct observation of 1,024 spectators in the grandstands at the circuit revealed an actual hearing protection usage rate of 43.4 per cent. Peak decibel levels (dB) at spectator areas around the track ranged from 89dB to 128dB.

CONCLUSION

There appears to be significant awareness of the possibility of noise-induced hearing injury in spectators at a major motor sport event, but only 50 per cent of those who are aware reported it as a personal concern. Less than half of the observed spectators at this event used hearing protection. In order to achieve greater use of hearing defence at motor sport events and help prevent noise-induced hearing loss amongst spectators, there is a continued need for ongoing

education, as well as novel methods for the effective distribution and use of hearing protection.

INTRODUCTION

Noise-induced hearing loss is a cumulative process occurring through years of repetitive and prolonged exposure to noise levels between 90dB and 140dB. It is a metabolic process that damages sensory hair cells in the ear, which may ultimately die and do not regrow, leading to hearing loss at multiple frequency levels. It is distinctly different from direct acoustic trauma, which occurs at decibel levels that are greater than 140dB, which causes immediate hearing loss from mechanical damage to inner ear tissues.

Exposure to potentially dangerous levels of noise at motor sport events is a common

occurrence for drivers and pit crew, and noise-induced hearing loss has been addressed as an occupational hazard for these individuals. Occupational exposure to noise is a well-known problem that has been addressed, in the United States, by the US Department of Labor in the past, with resulting regulations.

These rules and standards limit prolonged exposure to potentially dangerous noise levels, with a maximum acceptable exposure of eight hours to 90dB at a time, as the weighted average. For every five dB of higher-level exposure, the maximum acceptable exposure time drops in half. For exposure levels of 110dB, the maximum acceptable exposure time would be 30 minutes. More recent government recommendations, set by the National Institute for Occupational Safety and Health (NIOSH), are more strict and suggest only eight hours of exposure at 85dB and cutting that time in half for each additional three dB.

Occupational hazards such as hearing damage have been addressed in motor sport through educational programmes and the placement of team requirements mandating the use of hearing protection in the pit and crew areas. However, recreational exposure to high noise levels at motor sport events and the use of hearing protection amongst spectators is less well understood and studied. The risk of hearing loss among spectators is not as significant as that for drivers and crew given the lower noise levels and brief, intermittent exposure levels they experience. There have been recommendations in prior reports and the media that an increase in fan awareness around the topic of noise injury is needed.

We had hypothesised that the majority of spectators at a major motor sport event

would already be aware of the possibility of noise-induced hearing injury, and that there may be other factors present that affected their choice to wear hearing protection or not. We also set out to document the peak decibel levels occurring in spectator areas around the track during this event to confirm the presence of high noise levels. In addition we directly observed and documented the actual use of hearing protection by spectators during this event.

MATERIALS AND METHODS

Data was collected in September 2013 during a three-day race weekend, which included two major race series: the FIA World

“THE USE OF HEARING PROTECTION AMONGST SPECTATORS IS LESS WELL UNDERSTOOD”

Endurance Championship and the American Le Mans Series. Throughout the event, three research assistants surveyed spectators who had already entered the racetrack gates and agreed to participate in the study. All questions and answers were performed in a verbal manner and the results were recorded using an established survey software program called SurveyGizmo and run on iPads. The authors independently created the survey questions (Table 1).

A single researcher collected noise level data from around the track and they used an Omega HHSL402SD decibel meter, which was calibrated each day using an Amprobe SM-Cal1 calibration tool. Peak levels were recorded after testing over three laps where



The Audi LMP1 car was the quietest machine on the grid

there were multiple vehicles in groups, as well as single vehicles of different classes and makes. These noise levels were recorded in spectator areas at 21 different locations around the track, and distances to the track edge were measured and recorded using a Leupold Rx1000i rangefinder.

Separately, another researcher recorded data on the actual use of earplugs by spectators during on-track action. This observation was performed in the main grandstand area of the track using row-to-row, close visual confirmation and counts were recorded using an Easton dual pitch counter. This study was performed on two separate days and in different grandstand areas to avoid the potential for duplicate observation of the same spectators.

RESULTS

There were 825 spectators who participated in the voluntary survey and answered the six questions. There were also 170 spectators who refused to participate in the survey, citing reasons that ranged from a lack of time and interest, to concerns that data would be used in a lawsuit of some sort.

The majority of respondents had been to a prior major motor sport event, totalling 678 of 825 (82.2 per cent). Of the group, there were 758 (91.9 per cent) who were aware of the possibility of noise related hearing injury at a motor sport event. For those who had previously attended a motor sport event this awareness slightly increased to 632 out of 678, or 93.2 per cent.

There were 388 participants (47 per cent) who said that hearing injury was a concern to them, and this frequency did not increase significantly for those who had been to a prior event, at 320 out of 678 (47.2 per cent).

Of the total group surveyed, there were 443

(53.7 per cent) who had planned to wear hearing protection at the event prior to their arrival. This increased to 639 (77.8 per cent) when asked if they would use free earplugs if they were provided at the track. Of the 754 survey participants who said they were aware of the possibility of noise-related hearing injury, 601 (79.7 per cent) stated that they would use hearing protection if it were given to them. Only 187 (22.7 per cent) of the respondents felt that the noise level at this particular event was louder than expected. This dropped to 132 (19.5 per cent) for those who had been to a prior event.

Direct observation of 1,024 spectators sitting in the main grandstands over two separate days revealed that 444 (43.4 per cent) were using ear protection during the on-track running (Table 2). The use of hearing protection was higher on the second day (46.5 per cent versus 37.6 per cent).

Noise levels recorded in spectator areas at 21 separate locations around the 3.4mile track, and the recording distance from the track at these locations, were documented (Table 3). These levels were logged as peak decibel levels and not sustained averages and were measured over three separate laps during the mid-point of racing. The range of peak noise levels for groups of vehicles went from 89dB to 128dB, with measurements also recorded from lapping vehicles on their own.

Peak noise levels were also recorded for individual cars during the World Endurance Championship race on day three (Table 4). This peak level was recorded at one location, 21m from the edge of the track just before Turn 1. Data was collected over a ten-lap period to assure that single vehicle peaks were obtained with adequate distances in front of and behind each vehicle to exclude supplemental noise interference. The highest

TABLE 1:

	Yes	%	No	%	TOTAL
Have you ever been to a major motor sport event before?	678	82.2%	147	17.8%	825
Are you aware of the possibility of noise related hearing injury?	758	91.9%	67	8.1%	825
Is hearing injury at motor sport events a concern of yours?	388	47.0%	437	53.0%	825
Were you planning to wear ear plugs today?	443	53.7%	382	46.3%	825
Would you wear ear plugs today if they were given to you?	639	77.8%	182	22.2%	821
Is the noise level at today's race louder than you expected?	187	22.7%	636	77.3%	823

TABLE 2

	Day 1	%	Day 2	%	TOTAL	%
USING EAR DEFENCE	136	37.6%	308	46.5%	444	43.4%
NOT USING EAR DEFENCE	226	62.4%	354	53.5%	580	56.6%
TOTAL	362		662		1,024	100.0%

TABLE 3

MG= main grandstand area

Turn	Distance (M)	Peak level 1 (dB)	Peak level 2 (dB)	Peak level 3 (dB)	Average peak
1	18	122	121	120	121.0
2	45	120	100	100	106.7
3	48	112	115	116	114.3
4	34	117	115	110	114.0
5	27	122	117	110	116.3
6	45	110	118	124	117.3
7	48	123	120	116	119.7
11.5	16	128	126	118	124.0
12	28	128	128	124	126.7
13	23	100	108	99	102.3
14	46	95	90	92	92.3
15	18	126	122	122	123.3
16	35	121	117	125	121.0
17	53	89	95	91	91.7
18	48	91	94	93	92.7
19	39	112	123	110	115.0
20	18	123	124	125	124.0
MG 1	18	120	120	125	121.7
MG 2	18	127	120	124	123.7
MG 3	27	124	118	120	120.7
MG 4	27	124	124	126	124.7
Average	32.3	115.9	115.0	113.8	114.9

TABLE 4

Car type	Peak dB
Audi etron LMP1	86.6
Porsche GT3	111.4
Corvette	119.7
LMP2	121.0
Toyota LMP1	121.7
Aston Martin Vantage	122.1
Ferrari 458 Italia	122.6
Average	115.0

peak level for a single vehicle was the Ferrari 458 Italia, at 122.6dB, and the lowest came from the eventual overall race winner, the Audi eTron quattro, at 86.6dB.

DISCUSSION

Noise-induced hearing injury and hearing loss for racing teams at motor sport events is a known occupational risk, and over the years this hazard has been addressed with the implementation of mandatory hearing protection for team members.

The hazard of noise injury does also exist for spectators attending motor sport events, but to a lesser extent. Our survey data shows that the vast majority of motor sport viewers at a single event were well aware of the possibility of such noise injury, but only about half of them expressed concern about this topic. Less than half of those fans who were observed actually chose to use hearing protection during this event, as was directly spotted by watching spectators in the grandstands. Some of the cars taking part in the event did indeed produce documented high peak decibel levels, capable of causing noise-induced hearing loss.

As a result of this study, a question arises around problems that may exist amongst spectators regarding their appreciation of noise injury, and therefore, whether steps should be taken to help educate and protect these fans when the majority already appear aware of the issue and yet deliberately choose to not use hearing protection. It is an interesting question especially in light of the fact that many fans have voiced their desire for higher noise levels in other series, such as Formula One, where the recent addition of V6 turbo engines has resulted in muted noise levels versus the previously used naturally aspirated engines. These attitudes have been acknowledged and validated by some in motor sport leadership who have actually called for teams to investigate making louder engines to satisfy fan desires.

A lack of knowledge may still exist among the very fans who responded that they were aware of the issue of noise injury and its dangers. They are not likely aware of the fact that hearing loss and damage can occur well below the threshold that people will generally perceive as painful or even uncomfortable. The results of long-term noise exposure below the level of concern expressed by these spectators can still cause chronic and irreversible hearing loss, which will only be noted long after the damage has been done.

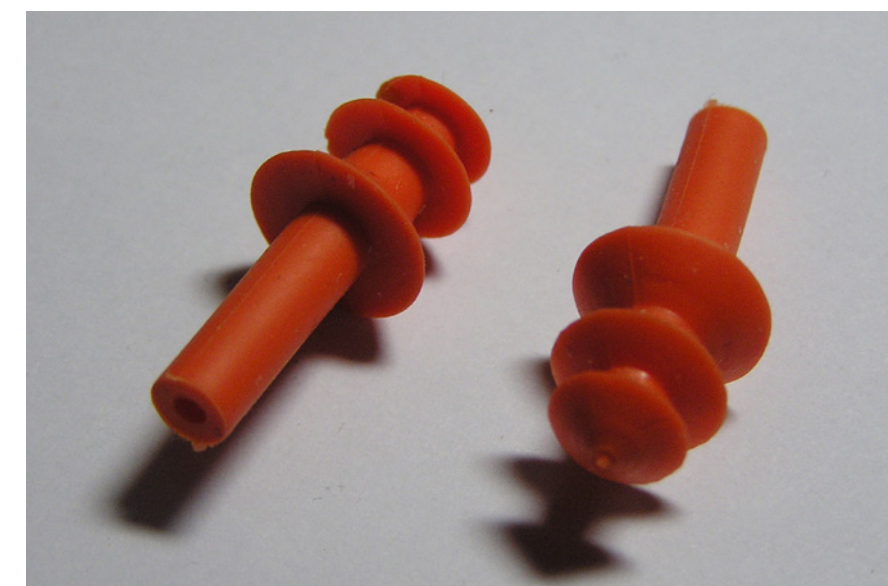
It is therefore advisable, from a medical and safety standpoint, to dismiss the notion that most spectators are aware of noise injury and choose not to use hearing protection, which means there is no need to do more. It appears that spectators may not truly be aware of the potential for injury and further education is still needed. This is because they may not realise that lower decibel levels still

cause significant hearing loss and they should strongly consider the using of hearing protection during the majority of their time at a motor sport event.

Beyond educating spectators on the inherent risks of noise injury, promoters and circuits should explore ways to facilitate the use of hearing protection by fans that desire it when entering the venue. One option is to have a widespread availability of earplugs at every entrance for purchase (or given freely), as well as at merchandise sites. If spectators see hearing protection offered widely at an event and view its use as a part of the sport, they may be more likely to use it.

CONCLUSION

Noise-induced hearing loss is a possibility for spectators who choose not to use hearing protection at typical motor sport venues. It is likely that many fans do not understand that hearing loss can occur at lower decibel levels than they realise. Continued efforts to educate spectators and offer options for hearing protection at venues should be supported.



REFERENCES

- Rose AS, Ebert CS, et al, "Noise exposure levels in stock car auto racing", entjournal.com, Volume 87, Number 12, 2008
- McCombe AW, Binnington J, "Hearing loss in Grand Prix motorcyclists: occupational hazard or sports injury?", *British Journal of Sports Medicine*, 28(1), 1994
- Clark, William W., "Hearing: the effects of noise", *Otolaryngal Head Neck Surgery*; 106(6): 1992
- Campan, et al, "Ototoxic occupational exposures for a stock car racing team: Noise surveys", 2005
- Lindemann J, Brusis T, "Is there a risk of noise-induced hearing loss in automobile drivers and in automobile sport racing?" *Laryngol Rhinol Otol* 1985; 64(9): 476-480
- Kardous CA, Morata T, "High Speeds, Higher Decibels", *NIOSH Science Blog*, 2010
- Hood, J. D., Poole, J. P. "Tolerable Limit of Loudness: Its Clinical and Physiological Significance", *Journal of Acoustics. Soc. Am.* 1966; 40 (1) 47-53

SOUND PROFILES OF THE 2013 AND 2014 F1 POWER PLANTS: ACOUSTICS, PSYCHOACOUSTICS AND SPECTATOR PREFERENCES

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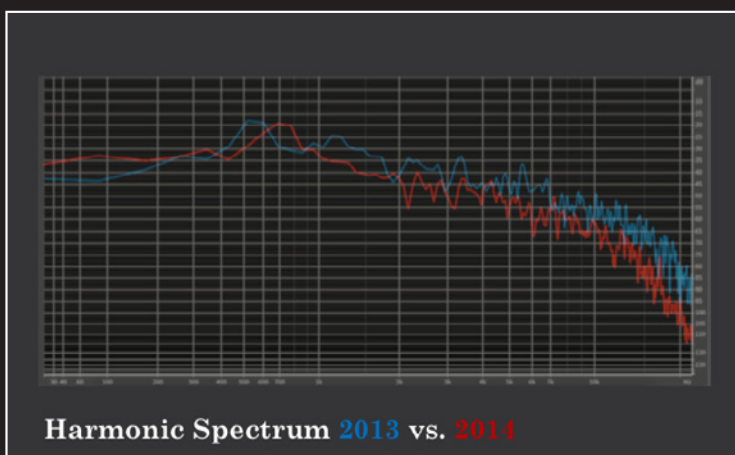
In 2014 the Formula One engine regulations were changed from naturally aspirated V8 engines to turbocharged V6 power units. Additionally, energy recovery systems were enhanced, and the maximum RPM was lowered from 18,000 to 15,000. This move changed the noise profile of Formula One cars and many fans and commentators found that new sound less favorable.

The Circuit of the Americas Medical Group conducted live sound measurements at Formula One races in 2013 and 2014 to better understand why the new sound profile was received unfavourably. We measured and analysed thousands of decibel (dB) level data points and the sound spectra of the Formula One cars, and surveyed spectators on their preferences.

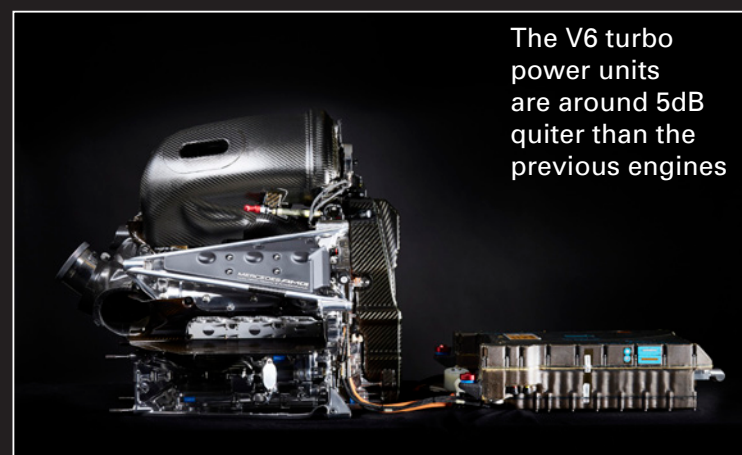
The 2013 V8 engine produced an average 98.8 dB, with 17 per cent of the measurements

at or above 110dB, and a harmonic spectrum from 20 hertz (Hz) to 18 kilohertz (kHz). The 2014 power unit produced an average 93.8dB, with only 2 per cent of the measurements at or above 110dB, and a harmonic spectrum from 20 Hz to 14kHz with a steep drop off after that. Of the spectators polled, 66 per cent preferred the 2013 sound profile, while 16 per cent had no preference, and 18 per cent in favour of the 2014 sound profile.

Sounds are known to elicit strong emotions in human beings. Other than the storied "NOVI" engine of the 1950s and 1960s, few engines sounds are as distinctive as the naturally aspirated models from Formula 1 between 1989-2013. The characteristic shriek and the dB of 110 augmented the sense of speed and power of the cars. By contrast, the quieted and harmonically compressed 2014 sound is controlled and clinical.



Harmonic Spectrum 2013 vs. 2014



The V6 turbo power units are around 5dB quieter than the previous engines



The new power units were brought in for the 2014 F1 season



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For each submission please include a summary of the research and all necessary contact information.

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