impact MAGAZINE

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STANDING FOR SAFETY

Why PPE Standards Are The Key To Cutting Workplace Injuries

MEET THE TEAM

Introducing new D3O® Ambassadors Seth Jones and Team Troy Lee Designs

HEAD FIRST

The role of headgear in addressing team sport concussions

impact magazine

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INTRODUCTION

stuart sawyer
CEO

When I was starting out in business, like many entrepreneurs I was guilty of trying to do too much. Some of the best advice I ever received was from an old family friend who said: "The day you stop hopping from one foot to the other is the day you start to move forward."

I will never forget that phrase because it captures the challenge we face every day at D3O. We have such a unique technology, providing so many benefits across a number of sectors, that we have to constantly ask ourselves where we think we can make the most difference, whether in an industry or a product category. Then we pose two crucial questions: does the market want that difference, and can the end-user really benefit from it? If we are unsure of the answers, our response may be to say 'no', or 'yes, but not now'.

As you will read in this issue of *Impact*, together with our partners we are breaking new ground in personal protective equipment across the industrial, defense and law enforcement sectors. We are translating our expertise in brain trauma in the defense industry into pioneering work to reduce head injuries in team sports. And our work in sports protection with the likes of NHL star Seth Jones and biking guru Troy Lee is influencing how we protect workers in the PPE sector.

We have materials, products and processes that can do many things, but we can't do everything. Nor should we try. That is why we are focused. That way, when we say we're going to do something, we are confident we will do it well.

This is part of what we call the 'D3O difference'. We can measure this difference in a number of ways; we can demonstrate it through testing protocols for our technology and materials. This difference is also in the attitude and ethos that runs through the entire company. I remember being in a meeting about a particular brief that appeared to be impossible. But our principal product developer said: "We can do this" – and he was right. It was his belief in our materials, designs and processes, combined with our ingenuity, that did it. This way of working and thinking is the 'D3O difference'.

We recruit people who really understand the sectors we operate in. They are experts and we know they will have a vast and deep understanding of how to solve protection problems. In many of the challenges we face, we never settle or think something is finished. For example: when will back-of-hand impact protection ever be thin or dexterous enough? How do we make life and performance better for those we protect? When does protection translate into the inner confidence needed to achieve the impossible? When does our ingenuity and inspiration become our user's advantage?

To achieve these goals, we are always willing to challenge ourselves. This is a mindset I have learned not only through business but also through sport – first as a professional windsurfer, more recently skippering an 11-strong crew on a 40-foot racing boat, Black Dog.

Earlier this year we won the prestigious Royal Ocean Racing Club's IRC National Championship overall. We were far from the favorites in the press leading up to the event, but it was our acute focus, determination and, above all, our ability to work and operate as a team that allowed us to pull off the extraordinary. Everyone knew what they were doing, both individually and how and where they fitted in as a part of the overall team. We all pulled together to win. I'm proud to say the same of our team at D3O.

HEAD TRAUMA
ON THE MODERN BATTLEFIELD

DEFENSE AND LAW ENFORCEMENT PERSONNEL MUST BE PREPARED FOR ANY SITUATION. *IMPACT* EXPLORES HOW LIGHTWEIGHT, COMFORTABLE PERSONAL PROTECTIVE EQUIPMENT HELPS KEEP OPERATORS FOCUSED ON THE MISSION WITH REDUCED RISK OF TRAUMATIC BRAIN INJURY

From Special Operations Forces under fire to SWAT teams responding to an incident on the street, the operator must have complete confidence in their personal protective equipment (PPE). A moment's hesitation in response caused by an an issue with their PPE could jeopardize an entire mission or result in personal injury. PPE must be rugged and reliable, should use the most advanced technology available, protect the end-user from potential threats, and be as comfortable, mobile and lightweight as possible.

An integral feature of an operator's PPE set-up is the ballistic helmet. During the early 20th century, helmets were little more than upturned metal dishes with a thin layer of web strapping: cumbersome, heavy – some weighing more than 3.5lbs – and uncomfortable. However, a rapid increase in the mass and velocity of ballistic threats such as bullets and shrapnel led to higher casualty rates during World War II and brought greater focus on the role of head protection.

UNDERSTANDING MODERN-DAY THREATS

The threats faced by modern-day defense and law enforcement officers fall into three categories:

- **Ballistic impact** from artillery, small arms fire, mines, mortars and improvised explosive devices. Consequences include penetrating wounds and behind-armor blunt trauma.
- **Blunt impact** from falls, vehicle crashes, parachute drops and impacts with solid objects and the ground. Consequences include closed and open head injuries, skull fractures, hematomas and brain contusions.
- **Blasts** from bombs, artillery and improvised explosive devices. Consequences include brain trauma, hematomas, contusions and diffuse axonal injury, a tearing of the brain's long connecting nerve fibers when the brain shifts and rotates inside the skull.

All these threats have the potential to cause traumatic brain injury (TBI), which results from an impact, penetration or rapid movement of the brain inside the skull, disrupting its normal function. TBI can be the consequence of a direct bump or blow to the head, or a non-impact force such as a blast wave causing the head to jolt violently.

For law enforcement officers, the principal causes of TBI are falls, vehicle crashes and blows to the head from foreign objects. Among service personnel, analysis by doctors at the Walter Reed Army Institute of Research[1] found that 60 percent of those wounded in Iraq or Afghanistan by an explosion, a vehicle accident or fall, or a gunshot wound to the face, neck or head, suffered TBI. More than 380,000 active duty military personnel sustained a TBI between 2000 and 2017[2].

THE CAUSES AND CONSEQUENES OF TBI

Most cases of TBI are mild concussions causing a momentary loss of consciousness. More severe cases involve a period of unconsciousness or amnesia.

The signs and symptoms of mild TBI include headaches, blurred vision, dizziness, nausea, fatigue, sleep impairment, problems with speech, mood changes and anxiety.

Moderate to severe TBI can manifest itself through any of these, as well as more complex symptoms that may appear hours, days or even weeks after a head injury: dilation of one or both pupils, loss of coordination, numbness in fingers and toes, slurred speech, profound confusion, convulsions or seizures, and a state of agitation and aggression. In some cases, moderate to severe TBI can lead to longer-lasting physical, cognitive or emotional trauma.

Military service members and law enforcement personnel are often exposed to blasts in training and operations, including the shockwaves that follow a blast such as during an explosive forced entry. Blast shockwaves create a sharp increase in pressure moving through the brain, damaging cells, compromising blood vessels and causing brain inflammation. The accepted 'safe' blast pressure threshold is 4 pound-force per square inch (psi), used to determine stand-off distance, but an operator may encounter multiple 'safe' blast events, giving a cumulative negative effect. 'Breacher's brain', as the condition is known, can lead to symptoms similar to concussion including headaches, dizziness, fatigue, memory problems and sleep disturbance.

Research by the National Center for Post-Traumatic Stress Disorder (PTSD) shows that the primary cause of TBI in veterans of Iraq and Afghanistan was a blast, followed by a combination of a blast plus a motor vehicle accident[3]. Blast exposure can accelerate brain ageing, leading to long-term conditions that affect quality of life and job performance, as well as increasing the risk of early-onset Alzheimer's and other neurological disorders.

REDUCING THE END-USER BURDEN

The defense and law enforcement sector poses unique challenges, according to Thomas Lavalle, 3M's Global Vertical Marketing Manager for Defense, Public Safety and Health Care: "We have to understand the mindset of end-users, whose priorities are to complete the mission, then be sure the personnel in their team are safe, then get themselves home safe last. This approach begs a vital question: what does safety mean to the individual? It's not simply what they're wearing – it's their knowledge that what they're wearing will equip them to perform their operations as efficiently as possible. In summary, to deliver lethality, mobility and survivability."

> **"OUNCES EQUAL POUNDS, AND POUNDS EQUAL PAIN, HENCE THE CRITICAL NEED TO DRIVE WEIGHT OUT OF EVERY ELEMENT OF THE HELMET SHELL DESIGN"**
>
> **BILL VANMULLEKOM, D3O**

The core components of a helmet are an external hard shell, an internal liner and suspension system to achieve a customized fit and minimize acceleration and deceleration of the head, internal padding to ▶

1 'About Post Traumatic Stress Disorder (PTSD) and Brain Injury in Iraq's War Veterans', http://tiny.cc/9c4p9y
2 'Number of Service Members Diagnosed with Traumatic Brain Injury', http://tiny.cc/ki4p9y
3 Cited in 'Combat-Related Traumatic Brain Injury and PTSD: A Resource and Recovery Guide', Cheryl Lawhorne-Scott and Don Philpott, Government Institutes, 2010

provide impact protection and comfort, and a retention device such as a chinstrap. Some include external rail sections to mount accessories. A helmet's fundamental purpose is to reduce the risk of head injury by preventing penetration from a ballistic impact, and to absorb energy from a blunt-impact or blast event.

Brandon, an instructor with combat immersion training provider ArmorCorps and a former U.S. Marine, has first-hand experience to support that view: "Moving into the back of a troop carrier, my body inverted and I landed with all that weight on the top of my head. Were it not for my helmet, my injuries would have been a lot worse."[4]

"Serving officers trust that their PPE will do what it is designed to do, every time, without failure," says David Jackson, U.S. Defense Program Manager at D3O, who has more than 25 years of defense experience including eight years in the USMC Infantry and seven years with SWAT K9.

The average U.S. military warfighter carries at least 60lbs of gear, with an extended patrol often double that figure. Every component and accessory increases the total weight, which is particularly felt when added to the helmet.

"A common adage is that ounces equal pounds, and pounds equal pain," says Bill VanMullekom, Executive Vice President of D3O, LLC, who leads the defense and industrial PPE sectors for D3O. "Extra weight is a burden for a soldier or law enforcement officer. They must execute the mission without being distracted by their own comfort level and fatigue. Their helmet will likely need to accommodate accessories including night vision devices and communications packages. Hence the critical need to drive weight out of every element of the helmet shell design."

In late 2016, the U.S. Army started early field trials on a new helmet to meet the requirements of its Soldier Protection System (SPS) Integrated Helmet Protection System (IHPS). This helmet gives soldiers best-in-class protection, while also reducing the total weight of their personal protective equipment[5].

The aim of the IHPS is to provide a lighter ballistic helmet capable of dealing with modern-day threats. Features include full head, face and jaw protection; passive hearing protection against explosions, gunshots and flashbangs; and improved blunt-impact performance. The modular design allows for the up-armor capability of a ballistic applique, a ballistic visor and ballistic mandible guard to enable the solider to scale protection to the threat or mission[6].

> "SERVING OFFICERS TRUST THAT THEIR PPE WILL DO WHAT IT IS DESIGNED TO DO, EVERY TIME, WITHOUT FAILURE"
>
> DAVID JACKSON, D3O

"Considering the current global environment, there is tremendous interest in procuring improved head protection," says Terry Griffith, Defense and Law Enforcement Global Business Unit Manager with 3M Advanced Materials Division. "Ceradyne Inc., a 3M company, has proven expertise in providing innovative, lightweight head protection systems that keep the users safe from a variety of threats including explosive devices and rifle bullets."

Drawing on this expertise, the U.S. Army awarded Ceradyne a contract to deliver the Integrated Head Protection System (IHPS). "The IHPS is the first helmet system to offer the soldier a much higher level of protection against blunt impacts without sacrificing the highest level of ballistic protection to weight," says Griffith.

RESPONDING TO EVOLVING THREATS

"Our approach is to work with customers and end-users to understand the threats and risks they face, and the standards and specifications we are required to achieve," says Vasilios Brachos, Senior Defense Product Development Manager at 3M. These include the National Institute of Justice voluntary equipment performance standards, of which three are for helmets: ballistic, riot and crash (the last relating to motorcycle helmets).

As 3M's Thomas Lavalle explains: "These standards specifically state that there is no blunt-impact protection requirement in the ballistic standard, and no ballistic requirement in the riot standard. This presents a challenge to the communities who are identifying threats (both existing and that could emerge) and correlating them to the industry standards. Driving this insight into industry helps the procurement teams to understand the end-user's environment in order to develop their requirements and make informed decisions. We are then able to push the technology envelope on design and manufacturing, and work with our industry partners, such as D3O, to explore enhanced impact protection."

"We have learned that legacy impact liners and pads cannot keep up with evolving threats," adds David Jackson of D3O. "As we move from the requirement for a helmet to resist an object with an impact speed of 10 feet per second to 14 feet per second and beyond, it's vital that the helmet shell and suspension pads work together. In addition, the geometry and mass of a helmet's accoutrements can affect its blunt-impact protection and comfort.

"D3O has the proven capability to adapt products to end-user needs so they can wear this equipment without sacrificing blunt-impact protection," Jackson continues.

"Our system delivers reduced transmitted forces overall, a reduction in the inertial mass of the helmet to minimize head acceleration, and quicker recovery times to maintain protection between a first and second impact. The unique application of D3O® allows us to evolve and develop these aspects while optimizing protection in our partners' helmet designs and geometry.

"For the end-user, D3O gives the peace of mind of knowing that what we make far exceeds the specification so service personnel can focus on the task at hand, enhancing survivability and enabling the successful completion of the mission."

THE CHALLANGES OF LAW ENFORCEMENT

"More and more law enforcement officers are now wearing head protection similar to that worn by the military," explains 3M's Thomas Lavalle. "As U.S. Special Forces began to operate in more urban warfare environments we have seen a share of common tactics and approaches in domestic law enforcement. Equipment has been part of that."

"As well as delivering on ballistic performance," adds Vasilios Brachos of 3M, "the interoperability requirements of the modern military helmet, where it interfaces with a range of other devices, has a direct crossover to law enforcement. There's a constant flowdown of core technology."

In the same way that bulletproof vests have become a key component of PPE for law enforcement officers, ballistic helmets developed with attention to weight, ergonomics, modularity, comfort and the appropriate level of protection should follow. Indeed, advanced, fit-for-purpose headgear could be the difference between a police officer addressing the threat posed by an armed assailant or becoming another casualty themselves.

INNOVATION TO CREATE EFFICIENCY

The last ten years have seen huge leaps forward in head protection for law enforcement and military applications. This technological advancement is unlikely to slow down.

New materials, geometries and optimized design will continue to drive innovation. These innovations, coupled with enhanced manufacturing equipment and methodologies, will bring performance gains in head protection. "We have found ways to lay the pads in the helmet to increase the number of contact points with the head, thus maximizing comfort," Bill VanMullekom of D3O explains. "In future, instead of a number of separate pads, what about a modular impact protection system that slips into a helmet shell? Or sub-components integrated around a suspension system?"

"In terms of future innovation," says Vincent Borbone, Product Development Specialist at 3M, "the fundamental requirement probably will never change: the most protection at the lowest weight. By constantly reviewing every step of the manufacturing process, every raw material that goes into the product, and keeping our focus on design optimization, we can achieve that goal of increased performance over weight. It's fair to say that we scrutinize every component and count every ounce in order to achieve those four key aims: lethality, mobility, survivability and sustainability."

"We have many, many different variables creating little tiny stresses on us as operators," concludes former U.S. Marine, Brandon. "Many of those stresses tend to come from helmets. Everything we can do to lower those stresses – to make our equipment slightly more comfortable, slightly lighter, one less thing we have to worry about – at the end of the day it makes us more efficient."[7]

4 Quoted in video '3M Tactical Light Weight Ballistic Helmets', http://tiny.cc/rj4p9y
5 'Soldier Protection System', U.S. Army Acquisition Support Center, http://tiny.cc/nk4p9y
6 Cited in 'Army Could Field Motorcycle-Style, Ballistic Helmet by 2020', http://tiny.cc/el4p9y

7 Quoted in video '3M Tactical Light Weight Ballistic Helmets', see previous reference

Troy STORY

WITH THE TROY LEE DESIGNS TEAM NOW OFFICIALLY D3O® AMBASSADORS, MEET THE MAN HIMSELF – ARTIST, RIDER AND EPONYMOUS FOUNDER OF THE ACTION SPORTS APPAREL AND CUSTOM PAINT COMPANY

It's entirely fitting that when Troy Lee dials in to talk to Impact magazine, he's got two wheels beneath him. "I'm out riding with my son," he says down the line from Corona, California. "We've just pulled over into the shade to speak."

Bikes and motorcycles have been at the heart of Troy's life since childhood. Now in his late 50s, his enthusiasm for everything on two and four wheels shows no sign of waning: "My grandad co-founded the Bonneville Speed Trials, which is still the premier motorcycle land speed racing event," he recalls. "My dad was a motorcycle racer around Southern California. I grew up in that environment. This is what I've always loved doing and these are the people I want to hang out with. I'll be racing with my 19-year-old son at the weekend."

Troy's forefathers were also 'pinstripers', exponents of the fine decorative style used to customize motorbikes and helmets. He inherited their talent, and while barely into his teens was painting and lettering for his dad's racing friends and rivals. He vowed to leave the brushes to one side when he became a professional motorcycle rider at 18, "but whenever I got injured I'd start painting again". Troy realized the commercial potential of his artistic skill and decided to devote himself to it full-time – though it took a domestic incident to get him started: "The story goes that my mom kicked me out of the house when I started using her oven to customize helmet visors and left the place smelling of burnt plastic," he laughs. "Actually it was my stepdad – though it made me realize it was time to make my way in life anyway."

THE TROY LEE FAMILY

He founded Troy Lee Designs (TLD) in 1981, gradually adding lines of motocross and mountain bike helmets, apparel and protective gear alongside the customization business. Since 2001, when he formed a motocross race team (featuring himself), Troy has built up a roster numbering more than 200 professional and amateur moto and bike athletes.

"I hope it's a thrill for a young rider to get a personalized TLD helmet," he muses,"but it's just as much a thrill for me because I get to work with such great athletes."

Each helmet is a unique expression of the designer and the athlete: "During the hour or so we sit together designing their helmet, I learn so much about their life. I never made it to the level some of these guys are at but I get to fulfil my dreams through my art and helping my athletes reach their full potential."

With the development of the TLD team comes an inevitable responsibility for athlete welfare: "Some of the stuff they're doing these days is just flat crazy! I have to watch them in slow motion so I can understand the tricks! Backflips, twists, corkscrews, there's a new name every few months. This is why it's hard running a race team. You put a lot of pressure on yourself to keep the athletes safe. "They are precious, they're not a dime a dozen. And you want them to stay at the top for as long as they can. They're going to keep pushing the limits of performance so it's vital that they're protected. That's why we partnered with D3O, we really believe they're a leader in safety."

INNOVATION FOR EVERYONE

Troy knows very well the risks of the sports he's involved in: "When I started we didn't wear too much protection. My mom made my first leathers and we wore open face helmets. I've got a few screws in my body…

"In the past, we used to grab protection off the shelf with no real idea how it performed. But as the bikes continue to improve and the athletes keep going faster, we have to make sure they're safe and feeling great at the same time. By addressing the demands of professional racers our business can deliver innovation for everyone.

"Fact is, with this number of athletes, barely a week goes by without one of them getting hurt. Almost all of them would prefer to wear nothing, they'd pretty much race naked, but often it takes an accident for them to realize the full benefit of protection. ▶

"D3O ALLOWS ME TO FOCUS ON THE ART – THEY TAKE CARE OF THE PROTECTION"

"As we develop better products utilizing D3O® technology, they begin to see how it's possible to put a knee guard on, for example, then crash and still walk away. The orange speck on the gear tells them they're protected. The confidence that comes from having D3O® protection can be the difference that gets them over the line first."

Nor is Troy ever short of suggestions for fresh talent to add to the roster: "The team tell me about the fastest new kids across motor racing, bikes, IndyCar, NASCAR. They say Troy can help you out, put a little more protection on your body. Then when I get to paint their helmet it's the icing on the cake."

Troy's life never stands still. If he's not equipping and advising elite bike and motorcycle riders, he's protecting stunt performers rolling cars, jumping off motorbikes or, in the case of Eddie Braun, powering a rocket across the Grand Canyon in the Evel Knievel tribute film 'Stuntman'.

When he's not immersed in these high-adrenalin worlds, though, you'll find him back at the TLD Studios, carefully crafting a stunning helmet design.

"My business card still reads 'Sign painter'," he reflects. "It's my roots. That's what I was doing this morning. It's where I began, and what I always go back to. D3O allows me to focus on the art – they take care of the protection.

"It's kinda funny how I've got to mix art and movies and stunt guys and racers," he says. "It's amazing too because I get to follow all my dreams. I'm a little all over the place but that's what makes my life so worth living."

the big issue

KEEPING WORKERS SAFE ON SITE

An overview of North America's PPE standards for health and safety managers

standards help to regulate North America's billion-dollar PPE industry. How are they developed, implemented and communicated? And how do they support health and safety managers tasked with keeping their teams free from harm?

“Our business is the health and safety of workers and first responders,” says Craig Wallentine, Board Vice Chairman of the International Safety Equipment Association (ISEA). “Standards are a vital tool to help us achieve this. At every stage of the value chain, standards support compliance to keep workers free from harm.”

ISEA defines a standard as ‘a document, established by consensus and approved by a recognized body, that provides rules, guidelines or characteristics for a product for common and repeated use’[1].

“Standards enable manufacturers to determine the performance requirements for protective products they design and the procedures to test them,” adds Wallentine. “They also make life easier for end-users,” says Rodney Taylor, Global PPE Sales & Marketing Manager at impact protection specialist D3O. “They equip health and safety managers to make informed choices about the right product for the job, verifying that a product is suitable for its intended purpose by establishing a baseline level of performance.”

“We are thrilled to have a wide array of stakeholders on our committees to help ensure high-quality, market-relevant, voluntary standards,” adds Mary Mikolajewski, Manager of Technical Committee Operations for ASTM International (formerly the American Society for Testing and Materials), which develops and publishes more than 12,000 consensus technical standards.

A key word here is ‘consensus’. In some parts of the world, mandatory testing and certification is the norm. In the U.S., the most common type of standard is the voluntary standard, developed by interested parties with knowledge of a product or process and an understanding of how to establish common performance characteristics and guidelines.

Although a voluntary compliance framework places responsibility on health and safety managers to provide appropriate PPE for their workers, Wallentine believes this approach also helps to produce standards that are meaningful to those end-users: “We are now seeing standards that are not top-down or academically driven. They are being developed in response to an issue, by a consortium of manufacturers, consultants, end-users, academics and others with a professional interest, working together to advance the level of protection and best practice for a population at risk.”

As a result, health and safety specifiers are free to choose from a range of products competing on factors including design, durability, comfort and cost – but not on key performance characteristics. ISEA’s aspiration is for more end-users to benchmark their procurement against a PPE standard, specifying minimum performance levels for each protective item across every application on their job sites.

NAVIGATING THE PPE LANDSCAPE

According to a report[2] published in March 2019 by Allied Market Research, the North America PPE gloves market was valued at $2.4 billion in 2017 and is estimated to reach $3.75 billion by 2025.

This increasing level of investment (and associated marketing activity) from a growing number of PPE manufacturers and distributors means health and safety managers face a challenge to stay up to date – not only with a plethora of innovative new products, each making bold and sometimes unsubstantiated claims, but with the new and revised standards that regulate a particular sector.

“There are so many vendors offering different gloves,” says Ron Hope, Value Safety Manager for Luck Companies, which includes Luck Stone, the U.S.’s largest family-owned operator and producer of construction aggregates. “And the cost is not standard either; it varies a lot depending on what you are looking for. A standard, as a recommendation at least, with defined performance levels, will help when trying to decide which glove is appropriate for each task.”

In addition, as Jill Clements, Chair of the ISEA Hand Protection Product Group, notes, “some health and safety managers take the fact of a new standard or revision very seriously indeed when specifying PPE, while for others it’s more about compliance. Some want to understand in detail how the products they are procuring for their employees conform to a particular standard, while others just want the product to be sufficient to protect their workers at the least available cost.”

To add a further level of complexity, there is something of an ‘alphabet soup’ of bodies representing, monitoring and overseeing PPE standards. According to Chris Meadows, D3O Technical Sales Manager, Chair of the ISEA Hand Protection Committee and a member of ASTM International committees, “there are some 600 different standards development organizations, including trade associations, most operating in specialist areas but each with a different approach to how they develop standards. Around 200 produce standards that are accredited by the American National Standards Institute (ANSI).”

Even the best-intentioned health and safety manager can sometimes be excused for struggling to navigate this acronym-packed PPE landscape:

WHO DEVELOPS THE STANDARDS?

Among the many organizations developing standards are:

- The **International Safety Equipment Association (ISEA)**, founded in 1933, a trade association representing PPE manufacturers, distributors and test laboratories. It is also a leader in the development of safety equipment standards which are approved by the **American National Standards Institute (ANSI)**.

> "standards equip health and safety managers to make informed choices about the right product for the job, verifying that a product is suitable for its intended purpose"
>
> RODNEY TAYLOR, D3O

- **ASTM International**, which develops and publishes more than 12,000 consensus technical standards for a wide range of materials, products, systems and services.
- The **National Fire Protection Association (NFPA)**, which develops and publishes more than 300 consensus codes and standards to minimize the possibility and effects of fire and other risks. NFPA codes and standards are administered by more than 250 volunteer-run Technical Committees.

WHO APPROVES STANDARDS?

- ANSI has an overarching role to coordinate the activities of the organizations in the U.S. that develop standards. ANSI doesn’t write standards itself or approve products; it approves the processes used to create the standards and approves the final results as American National Standards.

WHO PROVIDES OVERSIGHT?

- The **Occupational Safety and Health Administration (OSHA)** is an office within the Department of Labor which sets and enforces workplace health and safety rules. OSHA requires that many categories of PPE meet the standards approved by ANSI, but OSHA does not specify how products are certified. Indeed, OSHA’s role is not to certify or approve any product.
- The **National Institute for Occupational Safety and Health (NIOSH)** is a division of the Center for Disease Control and Prevention which researches and publishes worker safety recommendations.

In summary, at Federal level NIOSH promotes the scientific field of occupational safety through research and education while OSHA creates and enforces regulations.

DEVELOPING STANDARDS THROUGH COLLABORATION

Standards exist to help protect workers in hazardous environments and support those responsible for purchasing PPE to keep workers safe. “Without the reliability of a standard,” says Rodney Taylor of D3O, “health and safety managers and buyers run the risk of under-specifying PPE, leaving workers at greater risk of injury, or of over-specifying, which can incur unnecessary expense.”

Data from the International Association of Drilling Contractors[3] shows that in 2016, injuries to fingers accounted for a third of all total recordable injuries and almost 20 percent of lost time injuries. Meanwhile the hand and wrists accounted for around 11 percent and 10 percent respectively. Given these statistics, a significant number of PPE standards relate to hand protection. Two are particularly relevant to industrial health and safety managers:

ANSI/ISEA 138, the American national standard for performance and classification for impact resistant hand protection, published in March 2019, is an excellent example of the collaborative approach to standards development referenced by Craig Wallentine.

Standards for industrial gloves ▶

1 'What is a standard?', ISEA, http://tiny.cc/hqcnaz
2 North America & Europe Personal Protective Equipment (PPE) Distribution Market Analysis by Product, By End-use, And Segment Forecasts, 2018-2025
3 PPE Gloves Market by Material, Product type and Application: North America Opportunity Analysis and Industry Forecast, 2018-2025

that protect against cuts, punctures, abrasion and chemical exposure had existed in the U.S. for many years, but no means existed to assess the performance of PPE designed to protect against back-of-hand impact injuries. The desire for an impact protection standard gained momentum with the inclusion of impact protection in a 2016 update to the European hand protection standard EN 388. However, the update was based on an impact standard for motorcycle gloves and was not focused on the specific needs of the industrial safety gloves market.

In contrast, ANSI/ISEA 138 was developed for industrial gloves and the special protection they offer to workers. Work on the standard began in 2016 by a specialist sub-group of ISEA's long-established Hand Protection Group. This comprised seven major glove manufacturers; materials expert D3O, who brought valuable cross-sector expertise from the motorcycle market; and a surgeon specializing in plastic and reconstructive hand surgery.

REINFORCING THE NEED FOR STANDARDS

PPE is seeing waves of innovation in materials technology, including patented materials such as D3O®, which reinforces the need for this standard. "If manufacturers are not going to support regulation," says Wallentine, "then the consortium approach to a standards group, bringing together different viewpoints and strengths, is a good way forward."

ANSI/ISEA 138 establishes minimum performance, classification and labelling requirements for occupational hand protection products. Glove impact performance is characterized using three distinct levels with 1 for the lowest level up to 3 for the highest level. In addition, the level must be clearly identified with a mandatory pictogram specified by the standard. The goal of these requirements is to aid health and safety managers in selecting the most appropriate product for a task.

"Before ANSI/ISEA 138," recalls Jill Clements, "we had gloves with bumper guards which some manufacturers referred to as impact protection. When tested, they were found to offer protection against nothing more substantial than a knock. There's a place for these gloves in the market but we now have an impact protection standard that gives clarity as to how much energy is being transferred through the glove, together with mandatory product marking to identify performance levels.

"As a result, the language around what constitutes genuine impact protection has evolved, so we now have far greater precision: safety managers are better equipped to understand the difference between bump protection and impact protection."

If ANSI/ISEA 138 is proving to be a game-changer for PPE standards, others have also set important benchmarks in the evolution of worker protection. "**ANSI/ISEA 105-2016 Hand Protection Classification**, for example, is a good example of how a revision to a standard can really connect with end-users' experience and needs," says Wallentine.

This voluntary standard, first published in 1999, covers classification and testing for mechanical protection (cut, puncture and abrasion resistance), chemical protection (permeation resistance, degradation), ignition resistance and vibration reduction. The standard incorporates performance levels, this time from 0 to 6, but the 2016 revision goes further than previous versions in specifying nine cut resistance levels, together with clarification of a single test method rather than the two previously to determine these new cut scores.

"This industry never stands still," says Rodney Taylor at D3O. "Technologies, manufacturing methods and materials have all improved since the standard was last revised so the latest change reflects this by increasing the number of cut resistant levels in the highest performance range."

RESPONDING TO MULTI-THREAT ENVIRONMENTS

ANSI/ISEA 105-2016 is an example of a standard supporting more effective worker protection in a multi-threat environment. "Although 105 is known throughout industry as 'the cut standard', it's important for health and safety managers to understand its other features," says Clements. "A manufacturer marketing a cut protection glove that meets this standard should also reference, for example, the glove's level of chemical permeation protection."

Many workplaces represent a multi-threat environment and the feet are susceptible to most of them. The number of bones in our feet represent one-quarter of the total in our body, making this part of our anatomy particularly susceptible to industrial injury. Hazards can range from sharp tools to falling equipment, slippery surfaces caused by spills to hot surfaces in a welding bay.

ASTM F2413-05 Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear covers a range of performance requirements including impact and compression resistance for the toe area, metatarsal protection, chainsaw resistance, puncture resistance of the sole, electric shock resistance and the possibility of ignition of explosives and volatile chemicals.

In conducting a hazard assessment, a health and safety manager needs to be aware that protective footwear can meet all the requirements of the ASTM standard or only specific parts of it, so long as it meets the requirements for impact and compression resistance. All footwear manufactured to the ASTM specification must be visibly marked with the specific portion of the standard with which it complies, using clear and legible marking on at least one shoe of each pair.

MAKING THE CASE FOR SUPERIOR PROTECTION

Compliance to a standard does not necessarily equal complete protection for a worker. "Data from testing certainly helps a manufacturer design new products," says ISEA's Craig Wallentine. "It should also be used by health and safety managers to make better buying decisions. Data analysis empowers a manager to ask: is this product genuinely going to protect my workers? And am I spending too much or too little on my PPE?"

> "Data from testing empowers a manager to ask: is this product genuinely going to protect my workers? And am I spending too much or too little on my PPE?"
>
> CRAIG WALLENTINE, ISEA

At Luck Stone, Ron Hope recognizes the benefit of standards in ensuring consistency in protection: "They give us an ally to help implement a glove policy or procedures within our company," he suggests.

That said, no company wants to overpay, and there can be a significant price difference between, for example, a level two cut glove and a level four.

However, when reviewing a company's PPE provision, Jill Clements encourages health and safety managers to understand an item's total lifecycle cost: "The average cost of a hand injury is $20,000, and that's without factoring in surgery or lost time or whether someone else is available to do the job. If a higher-specification product reduces injury levels, its real cost comes down."

Rodney Taylor of D3O compares PPE to insurance: "It's an investment in cost avoidance. We hope we never have to use it, but it's there for a good reason. And the return on an increased investment in PPE – meaning a reduction in injuries and insurance claims – has to be measured over a longer period of time."

USING STANDARDS TO PROMOTE SAFE PRACTICE

Standards inevitably raise issues of compliance because, as Taylor explains, "they usually require an end-user to provide more, or better, PPE. We are always asking how we can make the compliance burden lower. We also need to be sure that when we've finished writing a standard, we're not mandating a product that will be so horribly uncomfortable no-one will want to wear it. So a careful balancing act is needed."

Clements increasingly finds health and safety managers seeking guidance at a task-specific level: "They might ask: I'm specifying for workers handling sheet metal, tell me what level of cut protection I need. My response is to encourage detailed job task analysis and an evaluation of current PPE provision, together with a close reading of the relevant standards. If a health and safety manager wants to mitigate against all reasonable risks and can cover the cost of doing so, the standards will equip them with the knowledge to move to the highest level of protection available."

Chris Meadows of D3O highlights the need for education of safety managers around transition periods when new or revised standards are introduced: "At what point does a standard come into force? Do you have to be assessing products against the new standard or is an old one still valid? There is this double layer of complication for health and safety managers if you have a new standard in place but a question mark about its implementation."

There is an associated flipside to any desire constantly to revise standards, ▶

> "Participation is key [for the ongoing development of standards]. We are always looking for groups such as managers and end-users to participate in the process. Their insights are crucial"
>
> MARY MIKOLAJEWSKI, ASTM INTERNATIONAL

according to Taylor: "The typical development cycle for a standard is three years. Then add on the time it takes for the standard to be promulgated throughout industry. From my experience, this can again be years rather than months. Simply writing a standard, publishing it, listing it on a website and waiting for the market to respond is an ineffective process. We've got to find out where the end-users are, discover how they learn about new standards and quickly take the message to them. Otherwise health and safety managers will simply be swamped by revisions to standards they've barely come to terms with in the first place."

To support the learning process, ASTM International operates an online platform, Compass, to keep health and safety managers up-to-date with the latest versions of PPE standards.

As for the ongoing development of standards themselves, "participation is key," says Mary Mikolajewski of ASTM International. "We are always looking for groups such as managers and end-users to participate in the process. Their insights are crucial. We also offer benefits such as interlaboratory studies to help refine standards."

Meadows hopes to see more consistency in approaches to performance standards with independent third-party testing of products rather than self-certification, together with greater engagement with health and safety professionals and end-users so their concerns can be addressed and better standards can be developed for them.

Nevertheless, Jill Clements of the ISEA Hand Protection Product Group is optimistic about the ongoing relevance and credibility of PPE standards: "The future lies in what's happening now. We are seeing groups of reputable companies who have been in an industry for a long time setting aside their commercial rivalries to work together in a way that effectively regulates the market and educates end-users. This approach brings significant validation to the standards that are now being created."

SPOTLIGHT ON D3O® IMPACT ADDITIVE™

HOW THIS PIONEERING INGREDIENT IS REVOLUTIONIZING BACK OF HAND PROTECTION

Most gloves used for industrial PPE across the construction, automotive and oil and gas industries have back of hand protectors, with the vast majority made from thermoplastic rubber (TPR). Until now, there was very little that manufacturers could do to change the characteristics of the compositions they were using. They could either add more plasticizer to make their gloves softer or less to make them harder, each approach having a negative effect on comfort, dexterity or level of protection.

D3O® Impact Additive™ (iA) combines advanced polymer chemistry that can be blended into existing processing and manufacturing techniques, delivering unmatched impact protection properties to traditional TPR.

"D3O® iA is a liquid additive that can modify the existing properties of TPR to deliver greater impact protection while also enabling softer, thinner gloves," says Rodney Taylor, Global PPE Sales and Marketing Manager at D3O.

Impact testing revealed that TPR enhanced with D3O® iA reduces transmitted force by up to 34 percent compared to standard TPR of the same type, thickness and geometry.

"We had initially set ourselves a target of a 15 percent reduction," says Taylor, "so the results are very favorable. This figure has been consistent across a wide range of plastisol formulations.

"It is satisfying to have applied our expertise in materials science to this unique product. It's a completely disruptive process to be able to add impact protection to the back of a glove without altering the way in which a manufacturer processes TPR."

iA
Impact Additives

MORE PROTECTION, LESS BULK

Previously, glove manufacturers could only use D3O impact protection as bumpers sewn onto their products. Now they can add iA into their formulation with no change to their design, manufacturing and supply chain.

"One of the main things we were looking to accomplish was enhanced protection against impact without any disruption to a manufacturer's supply chain," Taylor explains. "iA is added to the plastisol and is very easy to mix, with no need to use any special equipment outside of the traditional TPR manufacturing process."

The resulting gloves can demonstrate an increase in impact performance of up to 34 percent with no increase in bumper thickness.

In addition, D3O® iA reduces the hardness of the TPR bumpers by up to 18 percent. This, together with improved temperature stability in extreme hot and cold conditions, delivers greater dexterity and comfort without compromising on performance – critical factors to ensure worker compliance.

Because iA is easily blended with existing plastisol during production, intricate molding designs can also be achieved to improve the look and feel of new gloves.

Manufacturer feedback has praised the supply of iA as an additive rather than a complete plastisol composition. Future opportunities for such protection could include other applications where TPR is used, both industrial gloves and other types of gloves that have TPR elements on them.

SUPPORTING INDUSTRIAL SAFETY STANDARDS

D3O® iA is part of a wave of innovation in materials technology and design. "What is significant now is that there has been an explosion within the back-of-hand impact category in the last eight years," says Paul Harris, VP of Product Strategy and Innovations at PPE manufacturer MCR Safety.

The emergence of iA has also played a part in the recent development of ANSI/ISEA 138, the American national standard for performance and classification for impact resistant hand protection.

ANSI/ISEA 138 is like other standards in establishing minimum performance, classification and labelling requirements for occupational hand protection products. Where it goes further, however, is in incorporating performance levels, clearly identified with mandatory pictograms. A level 1 glove provides entry-level protection; level 2 delivers a mid-level balance of protection and dexterity; a level 3 glove provides the highest level of protection. iA makes level 3 protection achievable.

"The revolution in back-of-hand impact performance through material advances such as D3O® iA has made ANSI/ISEA 138 practicable," says Taylor. "It has facilitated a standard that is a game-changer in terms of PPE protection."

PROTECT AND SERVE

IMPACT EXPLORES HOW INNOVATIONS IN BLUNT TRAUMA IMPACT PROTECTION, COUPLED WITH NEW APPROACHES TO CROWD MANAGEMENT, ARE CHANGING THE WAY LAW ENFORCEMENT OFFICERS INTERACT WITH CITIZENS

'An individual in a crowd is a grain of sand amid other grains of sand, which the wind stirs up at will' – this famous quotation from 19th century French psychologist Gustave Le Bon encapsulates an approach to crowd management that is very familiar to Rene Gaemers.

A former officer with the Royal Dutch Military Police and Amsterdam Police, and co-founder of Netherlands-based protection specialist XION®, Gaemers is also a crowd management and tactical training expert. "Crowd and public order management has changed remarkably little since the days of Le Bon," he says.

"Much law enforcement training is still based on the idea that when people gather, they turn into one entity with each person shedding their identity and becoming potentially predisposed to violent collective action. The response is invariably a provocative show of force."

Gaemers cites as an example the recent confrontations between the Mouvement des Gilets Jaunes protesters and French police: "The core principle of public order management is that the majority of crowds that gather are law-abiding citizens exercising their legal right to protest. In Paris, you had the police kitted up and what began as peaceful demonstrations became violent confrontations with a hostile counter-force."

CALMING TENSIONS

Social media and the ease with which grievances can now be shared places law enforcement agencies under ever greater scrutiny, says Gaemers, "from the top by government and from the bottom by the people."

This, he believes, is causing agencies to retrench into traditional strategies for crowd control – including a 'RoboCop' approach to visual appearance: "If you turn up at a crowd gathering looking like you've come to fight rather than talk, you risk dehumanizing people who are then more likely to pick up a brick than have a conversation."

"THE FLEXIBILITY AND LOW PROFILE PROVIDED BY D3O® PROTECTION CONTRIBUTES TO A NON-AGGRESSIVE APPEARANCE"

Simon van Lammeren, XION

"If instead you keep the lines of communication open, it becomes easier to see that although a crowd may have gathered for one purpose, it still consists of individuals, each with their own norms and values."

At the heart of Gaemers' philosophy of 'a crowd management system for our times' is specialist officer training in de-escalating incidents, together with a new approach to protection: "Our research among serving officers shows that conventional personal protective equipment (PPE) is rigid, bulky and restrictive. Officers don't like wearing it, so they are likely to become irritable when putting it on – creating a mindset that is then less disposed to negotiation and more prone to aggression. We found that 45 percent of officers in one force chose not to wear a full set of PPE because it was so uncomfortable – they chose comfort over protection."

NEW STANDARDS FOR PPE

XION's blunt trauma impact protective base layers incorporating D3O® technology offer maximum protection for key areas of the body without compromising on freedom of movement. "The flexibility and low profile provided by D3O® protection contributes to a non-aggressive appearance that is central to this new approach," says XION co-founder Simon van Lammeren.

"One of our biggest challenges has been to influence the tendering processes for PPE among law enforcement agencies," he adds. "Most tend to copy and paste prior requirements for rigid foam protection, mounted on plastic with straps. Instead, the protective pads in XION® products are CE certified to the EN1621 motorcycle standard, which is a commercial standard that's regularly updated. In our view, this standard is more relevant to equipping officers in the future so they are protected but not visually threatening."

Gaemers has partnered with Neil Pollock, a retired public order and tactical advisor with the Metropolitan Police in London, and the U.S. Government Training Institute (GTI), to address the needs of state and local law enforcement agencies through research-based training. The resulting five-day Public Order Commanders Course from the Public Order Management Academy (POMA) is a direct response to increasing demand from within the law enforcement community for a rethink of approaches to crowd management. "The first of many to come," says Gaemers.

According to Brian Naillon, vice-president of the GTI, "there is always a need to assess the effectiveness of current tactics, techniques and procedures (TTPs). It is simply the nature of effective response management. There is a constant need for adaptation when it comes to rules of engagement as laws, platforms and people are constantly evolving and the industry must continue to morph to match this ever-changing environment.

SPECIALIZED SKILLS

"In the U.S., crowd control is only now becoming commonplace along with a recognition that public order requires a specialized team with specialized skills. Many of the tools and procedures still being deployed are antiquated; the 'one size fits all' method is no longer an effective strategy."

In addition, a number of law enforcement agencies have invested in XION®'s low-profile impact protective base layers, including the Swedish National Police, Royal Dutch Military Police and Madrid Motor Police, while agencies in the U.S. including the Portland Oregon Police Bureau have begun trials.

"The Portland Bureau have found that their officers appreciated how the change to their appearance helped them communicate more effectively with members of the public," says van Lammeren. "We are currently equipping 70 members of their team, after which the ambition is for them to begin training with GTI. We hope they will become advocates not only for this non-aggressive approach to PPE but also for a change to the standards specified in PPE tenders."

"All law enforcement officers take an oath to 'serve and protect'," Gaemers concludes, "and that includes protecting protestors. Equipping and training officers so they are both physically and emotionally more agile and responsive is surely the key to building a stronger relationship with the communities they look after." ■

HOW TO KEEP YOUR KIDS SAFE ON THE PITCH

GAMEBREAKER'S MIKE JUELS EXAMINES THE ROLE OF PROTECTIVE HEADGEAR IN REDUCING CONCUSSION INJURIES IN TEAM SPORTS

The recent FIFA Women's World Cup was a spectacular global showcase for soccer. The U.S. team outshone all others on the pitch, but the tournament as a whole – and the final in particular – exposed the ever-present risk of head injuries in the sport.

In front of 58,000 spectators and tens of millions watching on TV, Lieke Martens of the Netherlands and Kelley O'Hara of the U.S. were left prone on the turf after a clash of heads. Both were allowed to play on following treatment, but O'Hara had to be withdrawn later – leading some observers to call into question the consistency of the sport's concussion protocols.

"Soccer must learn from other sports," says Mike Juels, founder and CEO of sports head protection specialist Gamebreaker. "The decline in participation in football in the U.S. is in large part due to media coverage and parental concerns around brain trauma. Heading the ball is a key part of soccer and can't be removed but to pretend there isn't an issue around both collisions and cumulative sub-concussive impacts is foolish. We will see how the sport's authorities respond."

The results of the 2018 Einstein Soccer Study of American amateur players[1] showed that women are more vulnerable than men to concussion from heading the ball. Another 2018 study, of 3,000 players by the University of Wisconsin-Madison[2], found that girls' soccer and football have a nearly identical concussion rate, with 20 percent of players sustaining two or more concussions across both sports.

Picking up on these findings, this year's first ever FIFA Women's Football Convention saw United Nations Under-Secretary-General, Phumzile Mlambo-Ngcuka, suggest that players hold each other and coaches accountable for head trauma during play[3].

In response, a new program at Boston University called SHINE (Soccer, Head Impacts and Neurological Effects) will follow 20 former female players aged 40 and older to learn more about brain injury and the potential degenerative effect of playing a contact sport[4].

A SAFE WAY TO PLAY

Protective headgear is already compliant with soccer world governing body FIFA's regulations. In the Virginia Tech Helmet Lab's first ▶

1 'Soccer Heading Injuries', Albert Einstein College of Medicine, http://tiny.cc/f6veaz
2 https://gamebreaker.com/girls-and-concussions/
3 'Women's World Cup Highlights Sex Differences – in Medical Research', Nicole Fisher, http://tiny.cc/k2veaz
4 http://tiny.cc/v5veaz

ever ratings for soccer protective headgear, released in 2018, the Gamebreaker Pro 2018 with D3O® impact protection was 5-star rated for its ability to reduce linear and rotational acceleration of the head resulting from head-to-head impacts. Yet Juels believes aesthetic considerations may explain pushback on cap-style headgear covering the whole head. "It looks too much like safety," he says.

Headband protection may overcome this perception. Gamebreaker's newly launched AURA Soccer Headband is 5-star rated by Virginia Tech and, according to Mike, the number one rated headband in the world. It has already attracted the attention of major retailers nationwide.

While such statistics are extremely important, Juels believes the true test is out on the pitch: "We want to say to parents 'there's a safe way to play', whether that's soccer or football, then let the results speak for themselves. You can only do so much in the lab. We've seen this with our football headgear and we're going to see the same with soccer."

SPREADING THE MESSAGE

Juels' confidence stems from the way in which a culture of player safety has continued to develop in football: "For many years there were few or no restrictions on contact in training and youth leagues. Now we are seeing a far smarter approach to football at every level.

"If you're talking to a mom or dad, it's all about safety. To an administrator, it's about exposure and liability. To a coach, it's all these things – plus wins and losses. Coaches are realizing that player health is directly related to wins and losses."

TEN TIPS FOR BUYING PROTECTIVE HEADGEAR – A PARENT'S GUIDE

1 DON'T BE AFRAID TO BE A TRAILBLAZER

"When we launched in football we had parents saying my son or daughter wants to wear headgear but doesn't want to be the only one," says Juels. "Now we are mandated at clubs and leagues across the country. With widespread grassroots adoption the FIFAs of this world won't have to mandate change, it'll happen organically."

2 READ THE VIRGINIA TECH HELMET RATINGS

From zero stars to five stars, parents, leagues and coaches can easily find out which products are rated as effective and which aren't.

3 LOOK BEYOND THE MARKETING

The Virginia Tech ratings help purchasers make educated decisions. An important feature of soccer headbands is the amount of head coverage. Gamebreaker's new headband offers a three-inch halo compared to the standard two-inch. Head coverage and performance sit side by side.

4 CONSIDER WHERE THE PROTECTION IS LOCATED

"We're not in the business of designing a product to test well," says Juels. "We could take out a lot of the protection in a helmet or headband and pack it into the areas tested but then athletes would need to say: 'Hey, if we bump heads, make sure we only bump where the padding is. There's D3O® protection with 100 percent coverage with the AURA."

5 SIZE MATTERS

A snug and secure fit is essential for all headgear. The size of a helmet determines not only how it fits the head but also how it stays in place when worn. If you're buying online, try the same model in a store first.

6 CHECK THE RETENTION SYSTEM

Proper fit is only half the equation. Fastening the chin strap and pulling the cap down to just above the brow line gives maximum protection from cap-style headgear.

7 WHAT'S IT MADE FROM?

Soft-shell headgear or a headband should have no metal or hard plastic components, no hard or sharp edges or anything else that could injure the wearer or another player.

8 PUSH FOR HEADGEAR TO BE PART OF TEAM UNIFORM

Branding a soccer headband with team colors and badge turns it from a safety device into part of the uniform. With a large number of female soccer players already wearing something to keep their hair in place, a protective headband could perform a dual function.

9 CHECK THE TEAM OR LEAGUE YOUR KIDS WILL PLAY IN

NFL players get one padded practice per week. NFL and NCAA coaches are supportive of limiting contact. However, at youth and high school levels the responses are still more varied. If you don't want your kids having extensive contact, talk to the leagues about doing it like the pros.

10 ACCEPT THAT HEADGEAR IS ABOUT RISK REDUCTION, NOT RISK REMOVAL

The Virginia Tech Helmet Ratings indicate the percentage of risk that a headgear can mitigate. "We're teaching the game differently, and I suspect 15 years from now new innovations will continue to change the way football is coached. What we need to do is teach kids the proper way to play the game," says Mike Leibin, former Football Coach at Thousand Oaks High School in California[6].

At Rice University, celebrated head coach Mike Bloomgren has introduced strict head safety protocols along with mandatory Gamebreaker headgear. "He asks his players to look up and see the people they are trying to become," says Juels, "and encourages them to practice as the professionals do."

Juels credits the Texas State 7on7 Organization for moving towards mandatory soft-shell helmets for players in state qualifying tournaments in 2019. He also praises the Texas Youth Football & Cheer Association (TYFA), one of the largest tackle leagues in the U.S. with more than 10,000 participants, for working with Gamebreaker to develop a three-year roadmap that will limit padded/contact practices to one per week and mandate soft-shell headgear for flag divisions and 7v7.

This message is spreading nationwide. Greg Legore, Equipment and Logistics Director for the near-50-year-old Conejo Youth Flag Football Association in California, says: "Helmets themselves cannot promise a concussion-free game, but protection gives peace of mind. Parents like soft-shell helmets because they are lightweight, easy to carry and easy to clean. Coaches don't have to worry about trying to snap a chin-strap for the younger players. The velcro fastener makes it easy for children to use and they stay fastened."[5]

"You have to create a culture centered around player safety in all contact sports," Juels concludes. "The younger generation are much more receptive. They're saying: this is my body, this is my head. I'm going to need it for the rest of my life, so I'm going to protect it now."

5 'Testimonials', gamebreaker.com, http://tiny.cc/lhweaz
6 'Testimonials', gamebreaker.com, http://tiny.cc/1hweaz

INDEPENDENTLY TESTED

HOW DO THE VIRGINIA TECH HELMET RATINGS HELP CONSUMERS MAKE INFORMED BUYING DECISIONS?

All headgear meets minimum safety requirements specified by standards organizations. However, two helmets that pass the same standard may offer different levels of impact protection.

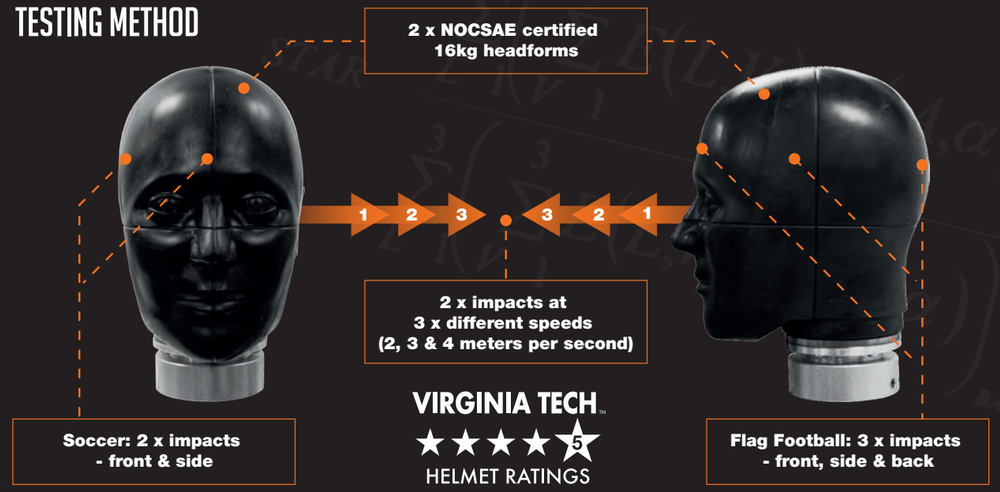
Virginia Tech began publishing Helmet Ratings in 2011 to assist consumers in choosing the most protective products. The ratings are 100 percent independent of funding or influence from manufacturers. Ratings currently exist for headgear used in six sports. Testing is based on two fundamental concepts:

- Each test is weighted to reflect how frequently players experience a specific impact in a particular sport.
- Headgear that reduces linear and rotational acceleration of the head from an impact reduces the risk of concussion.

A Summation of Tests for the Analysis of Risk (STAR) equation is used to evaluate headgear based on the risk reduction it offers relative to not wearing head protection at all. This gives a score between 0 and 1 which corresponds to a STAR rating: 0.0-0.3 equals a 5-star rating ('best available'), 0.5-0.7 equals a 3-star rating ('good'), and 0.9-1.0 equals a 1-star rating ('marginal').

'We encourage athletes to get out of helmets with low ratings and into 4- and 5-star helmets,' reads the Virginia Tech website.

TESTING METHOD



WHAT THE RATINGS SHOW

Gamebreaker AURA

Style: Headband
Price: $59.99

VT rating: ★★★★★

Coverage: 60%
Score: 0.16

STAR rating (0 to 5 stars)

Coverage	For football helmets, the percentage area of the headgear that consists of padded material	For soccer headgear, the percentage area of the headform covered by the headgear	
Score	the STAR value (between 0 and 1)		

CASE FOR THE DEFENSE

INTRODUCING NEW D3O® AMBASSADOR SETH JONES – AND THE KIT THAT KEEPS THE NHL STAR PROTECTED ON THE ICE

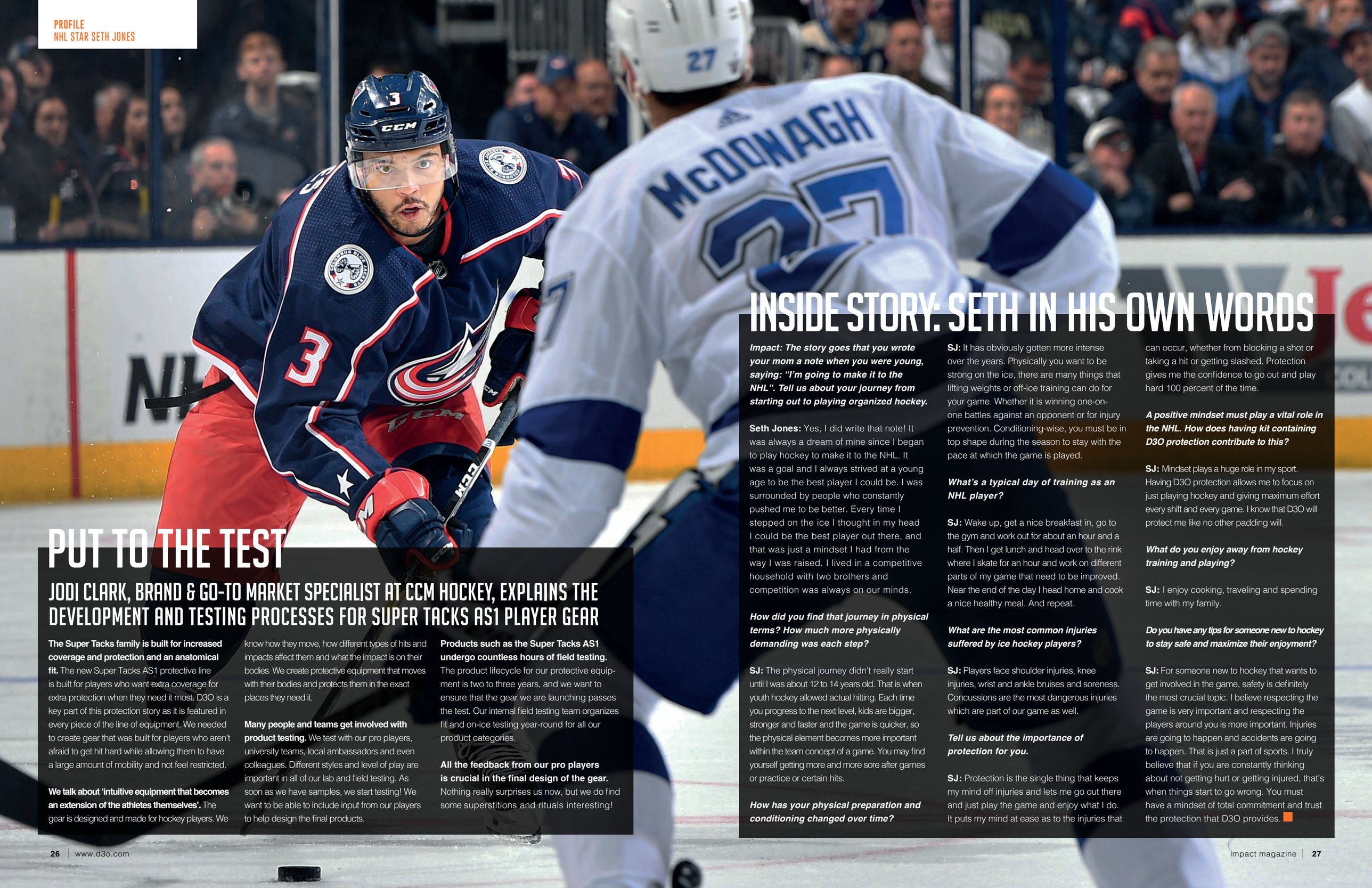
Weighing in at 220lbs and standing 6 feet 4 inches, Seth Jones is as statuesque as you might expect for an NHL defenseman. Such a physique would have served him equally well had he followed a different sporting path – one that might have been expected given his family heritage. His father, Ron 'Popeye' Jones, was a basketball power forward, shooting hoops for the Dallas Mavericks, Denver Nuggets, Boston Celtics and Washington Wizards during an 11-year NBA career.

While dad was playing for the Nuggets, Seth took his first steps onto the ice at the age of five. A year of skating classes, together with the thrill of watching Colorado Avalanche win the Stanley Cup in 2001, convinced Seth that his future lay on the rink rather than the court. "I always got the question in school about why I wasn't playing basketball," he revealed in an interview. "I just didn't want to. I loved the game, I loved watching it. But hockey took all my time and I stuck with it."

Two seasons with the U.S. National Development Team and a major role helping his country win the 2013 World Junior Championships convinced hockey fans of his rare talent. Seth was named the number one overall prospect in the 2013 NHL draft and was eventually selected by the Nashville Predators as the fourth overall pick of that draft. He made his debut on his 19th birthday against the St. Louis Blues and scored his first NHL goal just over a week later.

After helping the U.S. team win bronze in the 2015 World Championships, Seth was traded to his current club, the Columbus Blue Jackets. Since then, three appearances in the NHL All-Star Game have sealed Seth' reputation as one of the NHL's top defensemen.

"There was never any pressure to follow in my dad's footsteps," Seth said earlier this year. Instead of being known as 'son of "Popeye"', Seth Jones is very much his own man.



PUT TO THE TEST

JODI CLARK, BRAND & GO-TO MARKET SPECIALIST AT CCM HOCKEY, EXPLAINS THE DEVELOPMENT AND TESTING PROCESSES FOR SUPER TACKS AS1 PLAYER GEAR

The Super Tacks family is built for increased coverage and protection and an anatomical fit. The new Super Tacks AS1 protective line is built for players who want extra coverage for extra protection when they need it most. D3O is a key part of this protection story as it is featured in every piece of the line of equipment. We needed to create gear that was built for players who aren't afraid to get hit hard while allowing them to have a large amount of mobility and not feel restricted.

We talk about 'intuitive equipment that becomes an extension of the athletes themselves'. The gear is designed and made for hockey players. We know how they move, how different types of hits and impacts affect them and what the impact is on their bodies. We create protective equipment that moves with their bodies and protects them in the exact places they need it.

Many people and teams get involved with product testing. We test with our pro players, university teams, local ambassadors and even colleagues. Different styles and level of play are important in all of our lab and field testing. As soon as we have samples, we start testing! We want to be able to include input from our players to help design the final products.

Products such as the Super Tacks AS1 undergo countless hours of field testing. The product lifecycle for our protective equipment is two to three years, and we want to ensure that the gear we are launching passes the test. Our internal field testing team organizes fit and on-ice testing year-round for all our product categories.

All the feedback from our pro players is crucial in the final design of the gear. Nothing really surprises us now, but we do find some superstitions and rituals interesting!

INSIDE STORY: SETH IN HIS OWN WORDS

Impact: The story goes that you wrote your mom a note when you were young, saying: "I'm going to make it to the NHL". Tell us about your journey from starting out to playing organized hockey.

Seth Jones: Yes, I did write that note! It was always a dream of mine since I began to play hockey to make it to the NHL. It was a goal and I always strived at a young age to be the best player I could be. I was surrounded by people who constantly pushed me to be better. Every time I stepped on the ice I thought in my head I could be the best player out there, and that was just a mindset I had from the way I was raised. I lived in a competitive household with two brothers and competition was always on our minds.

How did you find that journey in physical terms? How much more physically demanding was each step?

SJ: The physical journey didn't really start until I was about 12 to 14 years old. That is when youth hockey allowed actual hitting. Each time you progress to the next level, kids are bigger, stronger and faster and the game is quicker, so the physical element becomes more important within the team concept of a game. You may find yourself getting more and more sore after games or practice or certain hits.

How has your physical preparation and conditioning changed over time?

SJ: It has obviously gotten more intense over the years. Physically you want to be strong on the ice, there are many things that lifting weights or off-ice training can do for your game. Whether it is winning one-on-one battles against an opponent or for injury prevention. Conditioning-wise, you must be in top shape during the season to stay with the pace at which the game is played.

What's a typical day of training as an NHL player?

SJ: Wake up, get a nice breakfast in, go to the gym and work out for about an hour and a half. Then I get lunch and head over to the rink where I skate for an hour and work on different parts of my game that need to be improved. Near the end of the day I head home and cook a nice healthy meal. And repeat.

What are the most common injuries suffered by ice hockey players?

SJ: Players face shoulder injuries, knee injuries, wrist and ankle bruises and soreness. Concussions are the most dangerous injuries which are part of our game as well.

Tell us about the importance of protection for you.

SJ: Protection is the single thing that keeps my mind off injuries and lets me go out there and just play the game and enjoy what I do. It puts my mind at ease as to the injuries that can occur, whether from blocking a shot or taking a hit or getting slashed. Protection gives me the confidence to go out and play hard 100 percent of the time.

A positive mindset must play a vital role in the NHL. How does having kit containing D3O protection contribute to this?

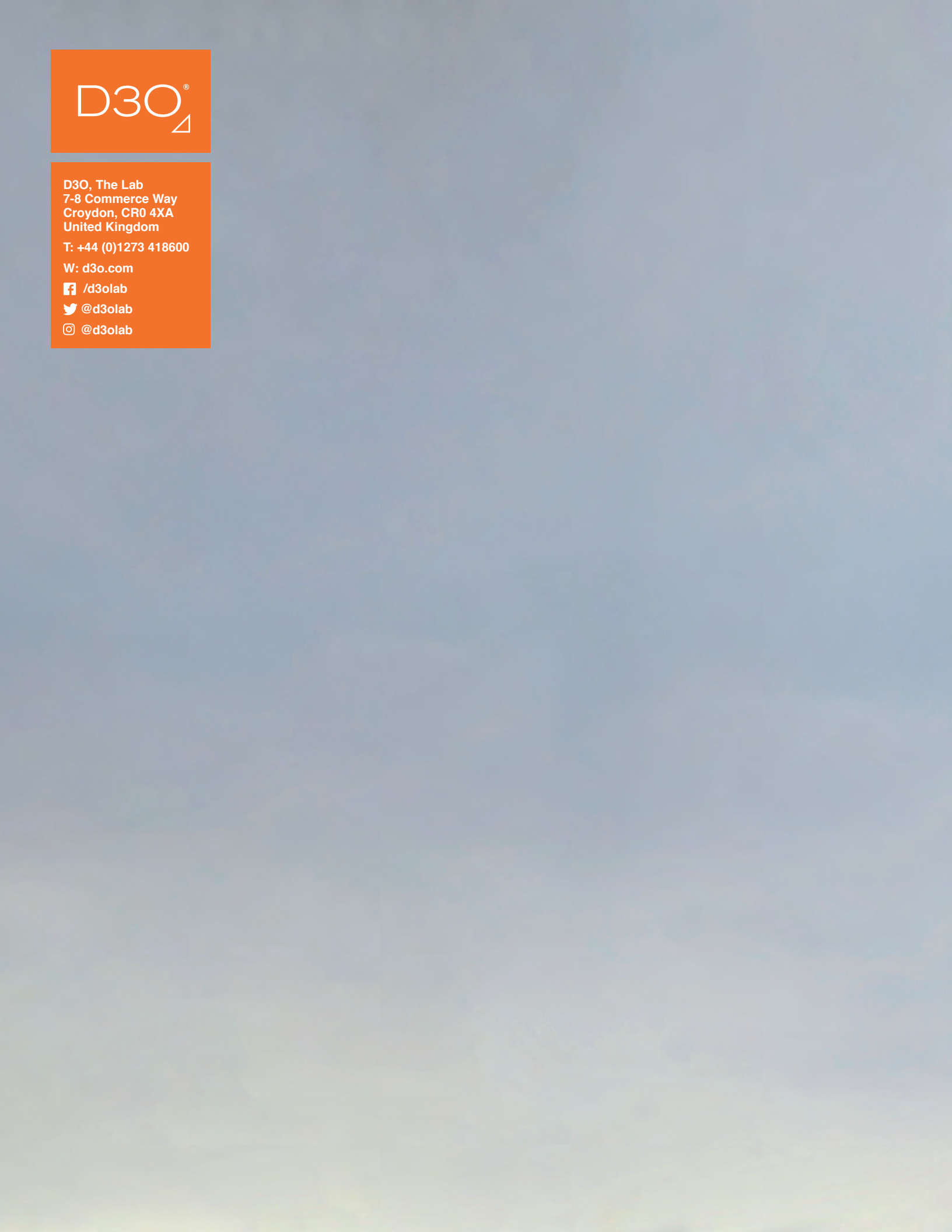
SJ: Mindset plays a huge role in my sport. Having D3O protection allows me to focus on just playing hockey and giving maximum effort every shift and every game. I know that D3O will protect me like no other padding will.

What do you enjoy away from hockey training and playing?

SJ: I enjoy cooking, traveling and spending time with my family.

Do you have any tips for someone new to hockey to stay safe and maximize their enjoyment?

SJ: For someone new to hockey that wants to get involved in the game, safety is definitely the most crucial topic. I believe respecting the game is very important and respecting the players around you is more important. Injuries are going to happen and accidents are going to happen. That is just a part of sports. I truly believe that if you are constantly thinking about not getting hurt or getting injured, that's when things start to go wrong. You must have a mindset of total commitment and trust the protection that D3O provides.



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