

THE FUTURE OF SPORTS

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“Sports, which in the past were essential in forging a tribal and then a national identity, are now forging a planetary identity.”

—Michio Kaku
Theoretical physicist, futurist and author of *Beyond Einstein*

“The future ain’t what it used to be.”

—Yogi Berra

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INTRODUCTION



LAST YEAR WE ASKED A GROUP OF FUTURISTS to help us look into the future of the sports industry, and to make bold predictions for the next 25 years. We hoped to start a conversation about the challenges and opportunities that lie ahead. We were surprised and gratified by the intense interest, commentary and debate the report generated from our friends and colleagues in the business. We obviously weren't alone in the desire to start defining the questions that will shape sports in the years to come.

We published the first iteration of **The Future of Sports** and quickly realized that we had more questions than answers. That's the inspiration for this second edition.

Technological change is accelerating at an astonishing rate, and in just one year we've seen some great strides that are captured in this publication. It's increasingly clear that teams and leagues can no longer be reactive to today's technology—we have to be at the forefront of developing tomorrow's. We are positioned to become not just early adopters, but partners and investors as well. I hope this publication will spark both your interest and creativity in shaping what's next.

My contemporaries may initially approach this subject matter with skepticism and a feeling that it's not applicable to our demographic. I certainly did. But I'd argue that exploring the themes laid out in **The Future of Sports** will prove relevant to the most pressing questions we face as owners and league executives. At the very least, the exploration will be quite enjoyable.

And what's good for business can also have a larger impact. In a world that feels ever more divided, sports' ability to unite people across borders is both increasingly important and increasingly possible. Fellow sports fans, no matter where they are from or what language they speak, are never strangers for long. These are critical years, as franchises and leagues compete for international attention and seek to build ties with fans who live thousands of miles away. It is time to start thinking of the entire globe as our hometown market.

As the stewards of sports, we must simultaneously keep true to their essential character and ensure they remain relevant through ongoing cultural and technological changes. Our job is to connect the past to the present and to lay the groundwork for future generations of athletes and fans. I can think of no more challenging, or rewarding, a task.



Jeremy M. Jacobs
Chairman of Delaware North
Owner of the Boston Bruins

SLINGSHOTS

A **TECHNOLOGY'S "SLINGSHOT" MOMENT** happens when it bursts from the domain of the very few into mass-market application. Throughout this report, we'll highlight seven technologies on the verge of slingshotting and discuss how they'll change the sports landscape. Look for the icons in the pages ahead.



AI

- Artificial intelligence subcategories machine learning and deep learning will process vast data streams to enhance coaches' game strategies and real-time decision making.
- The NBA is embracing the early stages of artificial intelligence in the form of advanced analytics based on human-built models.
- The next two steps—play calling and game scenarios—will be simulated by active, independent decision-making AI models, and the powerful analytics models will be self-evolving using machine learning.



BIOINFORMATICS AND HEALTH

- As low-cost gene sequencing goes mainstream, teams will build genetic performance profiles to personalize each player's nutrition and fitness protocols.
- Pathogen transfer in stadiums is inevitable—70,000 people cheering, eating and drinking in close proximity is a playbook for catching the fall flu. Virus-hunting nanobots, applied via an inert spray at the entry and exit gates, would return fans home with fewer germs than when they arrived.



DIGITAL MANUFACTURING

- 3D printing and manufacturing will drastically reshape the sports supply chain.
- Additive manufacturing like 3D printing will unlock trillions of dollars in positive impact if just 1 of 10 parts in a product are made locally.

- Better products will be designed more quickly and delivered in near real time.
- In-stadium 3D printing allows teams to personalize memorabilia for fans, while commercial printing makes highly personalized player equipment design and manufacturing possible.



GLOBAL SMARTPHONE CANOPY

- By 2020, 7 billion people will be connected to the internet, representing several billion new sports fans joining the global marketplace for the first time.
- 5th-generation wireless coverage gives the world untethered connectivity at speeds necessary for streaming immersive virtual reality at 60 frames per second.



IMMERSIVE VISUAL COMPUTING

- Augmented reality: The world becomes an infinite display, allowing teams and fans to access and use new forms of visual data during practice and games.
- Layered data and visuals will immensely enhance fans' live viewing experience, with the availability of instant information and statistics about each moment and each player on the field.
- Virtual reality: In-stadium panoramic camera systems will create fully immersive sensations of the games for watching in full VR.
- Social VR will lead to widespread adoption of the technology, allowing fans to routinely meet up in virtual spaces to watch games.



SENSORS

- Sensors are proliferating in jerseys, athletic wear and equipment, creating exponentially growing data sets for AI systems to process, granting unprecedented insights into performance—and providing a never-ending stream of micro-outcomes for sports bettors to wager on.
- Infrared and LIDAR blasters built into every smartphone will serve as depth sensors to create 3D maps of every space in the "real" world, allowing content-rich VR and AR overlays to flourish.



BLOCKCHAIN

- Will blockchain systems replace the banking industry? Too soon to say.
- Blockchain enables fluid, dynamic contracts that will radically change the way players, teams, leagues and arenas structure their working relationships.
- Blockchain-powered digital rights management can track every mashed-up highlight clip through its reuse, making sure the original rights holders get paid while allowing them to share the wealth with fan-producers who remix and popularize the content.

EDITORS' LETTER

FRIENDS OR FOES?

For the last two years, we've been researching and reporting from the front lines of the sports tech boom. We've sat down with inventors at scores of startups. We've seen hundreds of demos and pitch decks. We've scrutinized the teams these startups assemble. We've tracked the best of them to market. The race is palpable as they burn the midnight oil. Meanwhile, we've watched the flow and pooling of global capital, along the way predicting several of the mergers, acquisitions and megadeals that have transformed the landscape in a single stroke.

For decades, professional sports franchises have relied on the big four revenue streams: gate receipts, media rights, sponsorships and merchandising. The explosion of new technologies, however, has given rise to many side businesses and ancillary markets that piggyback on the popularity of professional sports. These industries wouldn't even exist if pro sports weren't there, yet many of them have contributed little or nothing to the bottom lines of pro leagues and franchises.

The radical reshaping of the ticket resale business was a harbinger of this trend. For decades, resales were mainly the domain of small-time scalpers, lurking outside stadiums and parking lots. But as the transactions moved online, ticket resales exploded into an \$8 billion market, becoming many fans' habitual first option to find tickets. Franchises have realized they need to fight back to get their share and regain control. They're especially worried that these new intermediaries now have the data on fans and can market directly to them, severing the franchises' 1-to-1 customer relationships. "What I really want is more Clippers fans in our arena, rooting for our team," Steve Ballmer remarked at a recent conference. "And less of these California transplants buying the tickets to see their hometown Celtics or Bulls. That's why I want to control ticketing."

We can see this dynamic at work in sports social media, sports tourism, video games, unlicensed merchandising, sports news, fantasy sports and sportsbook betting. Billions in revenue—tens of billions in some cases—are now being generated, as technology has allowed new businesses access to millions of fans. There is now legitimate concern that sports ancillaries have become a partial replacement for attending games and watching on television. Until now, these ancillary businesses have gotten by on the argument that they benefit franchises indirectly by engaging fans and promoting their brands. But franchises have started wondering if they are truly friends or foes. Even as the leagues partner with some technologies, they're banning others, such as live streams from fans' smartphones. A turf war has begun and it is taking place across the globe. Teams and leagues are beginning to flex their muscles as rights owners. They want their rightful cut, and they want to control their communication and connection with their fans.

This is a wild time. The wins and losses on the field are no longer the only compelling drama. The competition off the field is equally riveting.

Josh McHugh, Editor in Chief

Po Bronson, Contributing Editor

Ethan Watters, Contributing Editor

THE FUTURE OF SPORTS TEAM



JOSH McHUGH's career began at **Forbes**, where he opened the magazine's Silicon Valley bureau. Next stop: contributing editor at **Wired**, with assignments for **Vanity Fair**, **Outside** and others. He worked on EA's **Madden NFL** and **NCAA Football** ad campaigns for Wieden + Kennedy. The film **Dunkumentary** chronicles his 6-month attempt to dunk a basketball. The CEO of Attention Span, Josh holds a BA in English from Yale.



PO BRONSON is the author of seven books, most recently **The New York Times** bestseller **Top Dog: The Science of Winning and Losing**, which has become mandatory reading at many professional sports franchises and USA Olympics programs. His science journalism has won nine national awards, and he has been cited in over 100 academic journals and over 300 books.



ETHAN WATTERS is a journalist who has spent the last two decades writing about culture and psychology. He is the author of **Crazy Like Us: The Globalization of the American Psyche** and **Urban Tribes: A Generation Redefines Friendship, Family, and Commitment**. His writing has appeared in **The New York Times Magazine**, **Outside**, **Discover**, **Men's Journal** and **Wired**, among other national publications.



CHRIS COWART is a designer, business innovator and venture investor. Outside the office, he is a sponsored athlete in cyclocross and kitesurfing. While at IDEO for 14 years, he won numerous design awards and patents. He serves as design faculty and futurist at Singularity University in Silicon Valley. He lives in Redwood City, California, with his family, where he serves as a trustee at Phillips Brooks School in Menlo Park.



LISA OLSON is an award-winning sports journalist and columnist for the **Sporting News**, **AOL Sports**, the **New York Daily News**, **The Sydney Morning Herald** and **The Telegraph**. Her work has been featured in the anthology **The Best American Sports Writing**. She has reported from Afghanistan, Pakistan, Asia, Australia, South Africa and New Zealand, covering rugby and soccer World Cups, the Super Bowl, the Olympics and a vast array of sports feature stories.



NATALIE JONES is a reporter based in Oakland, California. She loves to work with sound, write prose, and dig up facts. When not doing those things, she consumes a lot of media and spends a lot of time outside. Some favorite topics to cover are health, agriculture, food and the environment. She has reported for **NPR**, **KQED**, **KALW**, **Grist** and **Civil Eats**.



ANTON MALKO has worked in Athletics Communications at the University of California since 2005, covering many of its 30 sports, including rugby. He traveled to the 2016 Summer Olympics to follow the Golden Bears' 50 participants. A native of New York City and graduate of Connecticut College, he lives in San Francisco with his wife and two sons.



TYSON LAW is the design director for Attention Span Media and is a multidisciplinary designer who specializes in user experience design and architectural environments. He received his M.Arch from the University of Pennsylvania School of Design, where he studied architecture and fabrication technology. He also holds a BS in Electronic Media, Arts and Communication from Rensselaer Polytechnic Institute.



SHAWN ROBERTSON is a Bay Area-based senior art director and designer. She studied at California College of the Arts, San Diego State University and UCLA. With a background in design, art, theater and women's studies, she fills her free time with art, friends, family and singing.



SUZEE BARRABEE is an art and print producer who has spent most of her career working in advertising on a range of accounts such as Nike, Chevrolet, Facebook, Comcast and the NBA. She has had the pleasure of working with such diverse talent as Britney Spears and an alligator.



LARRY HABEGGER is cofounder and executive editor of Travelers' Tales books, where he has worked on all of the company's 130-plus books and helps oversee their publishing program. He writes mainly on the subject of world travel, is cofounder of The Prose Doctors (an editors consortium) and editor in chief of Triporati.com. He played baseball at Dartmouth and loves to hike, paddle a kayak and play golf.



MATT SPERRY is an account manager and digital strategist for Attention Span Media. With a background in philosophy and a passion for sports, Matt has had an eclectic career spanning roles such as art director, riflery instructor, butler and personal assistant to a former US ambassador. You can usually find him playing pickup soccer around Boston or heading off into the mountains of Vermont.



ERIC PEARCE, LUKE BRONSON AND HENRY GORELIK To research the fan habits of teenagers, we went straight to the source. Our street team of 15-year-olds investigated video games, fantasy sports, Generation Z and global expansion. Luke Bronson and Henry Gorelik attend University High School in San Francisco. Eric Pearce attends Lowell High School. Luke also serves as a youth ambassador for the San Francisco Deltas, an NASL soccer team.

SPECIAL THANKS David Reardon (reporting and research), Aaron Frank (machine learning advisor), Justine Gubar, Andy Dolich, Dylan Casey, Steve Baker, Todd Merry, Gary Bettman, Garrett Law, Cam Neely, Peter White, Tracy Hughes, Merrick Madsen, Garrison Murphy, Mark Charles, Long Ellis III, Katie Gorman, San Francisco Writers' Grotto, Sean Wagstaff, Shannon Roy, Sam Nordemann, Andries Maritz, Paul Saffo and Attention Span Media

The metrics on them are scary. They've disappeared from the trackable universe into "dark sharing." Two-thirds use ad blockers on their laptops, and mobile blocking will follow. Even Facebook and Twitter are losing Generation Z by the millions. 99 cents is their favorite price. They think nothing of pirating video streams, but they rarely watch sports from start to finish because the highlights tell the story. **CAN THE SPORTS INDUSTRY EVER MAKE MONEY ON THEM?**

GENERATION REMIX

HYPERSOCIAL JUST NOT WITH YOU

We thought Facebook was their television and Twitter was their radio—the technologies that defined their generation. Twitter's 140-character limit seemed the epitomization of their notorious 8-second attention span. Then, in the last two years, something happened.

MILLENNIAL DAILY TWITTER USE

2014 80% CHECK
60% POST
2016 37% CHECK
ONLY 12% LOG IN



Only 1 in 9 use Twitter to express themselves or communicate. Fully a quarter of users 13 to 17 years old abandoned Facebook this year: Facebook has lost 11 million young users.

"DARK SHARING" refers to communication that can't be tracked or measured by web analytics programs. On internet content sites, now half of web traffic hits pages from sources that are un-trackable. Dark sharing now accounts for 84% of all social sharing. Millennials prefer social networks like Snapchat, Whisper and Secret—but they're also skipping centralized sites to message each other, often in groups, using iMessenger, WhatsApp, Line, WeChat,

Kik and other apps designed to avoid texting charges.

WHERE MILLENNIALS WATCH SPORTS VIDEOS



*VIDEO STORIES ON ESPN'S SNAPCHAT DISCOVERY CHANNEL ARE GETTING UP TO 30 MILLION VIEWS IN THEIR BRIEF 24-HOUR LIVES.

Don't expect YouTube to pay for any sports rights. They already have 4 billion video views a day, bringing in over \$6 billion a year in advertising.

"Twitter is for athletes and politicians to reach us. I don't know anyone who posts to Twitter."

—From a Generation ReZearch focus group

HERE'S THE SECRET: The kids now coming of age are actually the most informed young sports fans in history. They are cord cutters, but they have not cut themselves off from sports. Sports programming and data are such a deep part of their culture that they feel a sense of ownership. And that's the very trick to reaching them—empowering them to take sports media as we know it, mash it up and distribute it as they see fit.

AD BLOCKING & STREAM STEALING WILL BROADCAST GET NAPSTERIZED?

AD BLOCKING Two out of three millennials use ad blockers on their laptops. On mobile, it's not common yet in the US but likely to follow the global trend toward mobile ad blocking. One third of smartphones in Asia employ ad blockers—and the rate is double that in India and Indonesia. **However, it's not that they hate ads. The number one reason they run ad-blocking software is that the ads slow down the loading of pages.**

In fact, according to a recent study by USC's Center for the Digital Future, young millennials actually like ads with sports more than any other generation.

MILLENNIALS ENJOY ADS DURING SPORTS

56% Learn important things from ads
37% Like ads during sports
21% Sports wouldn't be as good without ads

STREAMING It's not illegal to watch someone else's stream. So it's no surprise that watching pirated streams of sports is common. However, the number one reason millennials watch pirated streams is that **the content they want to watch isn't available to easily buy.**

In fact, it's the older generations accustomed to free television who are least willing to pay for sports content. **Fans under age 36 are willing to pay a higher price for sports channels than any other generation.** Even more notable is that they're willing to pay a higher price for a sports channel's IP stream than they'd pay for the same content on a television channel—because stream access can be watched anywhere: at home, at work or on mobile.

Facing average bills of \$99, 35% of millennials have cut the cord and stopped subscribing to cable TV. Young millennials are now averaging only eight hours of linear TV a week. Is the era of unbundled, à la carte channel subscription inevitable?

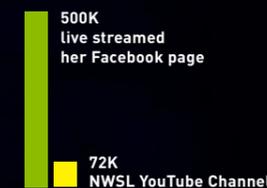
• India has offered à la carte channels since 2011. A la carte on top of skinny cable is coming to Canada this year.

• 63% of all sports fans are interested in paying for a sports channel. And 86% of Americans are sports fans. On average, they'll buy 3.5 sports channels.

FORGET UNBUNDLING The real change will be the end of channels as we know them. **Tomorrow's consumers will only want to pay for the hours (or games) they are actually watching.**

New sites like PopChest that make blockchain payments for content easy and fast, will train consumers to expect to pay only for what they actually watch (10 cents at a time), and this expectation will become pervasive. Can't figure out what channel your Spurs game is on? That's irrelevant—just watch on their Facebook page.

ALEX MORGAN'S FIRST ORLANDO PRIDE GAME, VIEWERSHIP



CHANNELS—instead of being a locked bundle of shows and games—will instead morph into brands whose content appears all over the place, not just on television or a single dedicated streaming site.

POTENTIAL SPORTS CHANNEL INCOME

63% FANS WILLING TO PAY FOR A SPORTS CHANNEL X 3.5 CHANNELS EACH

| GENERATION Y | GENERATION Z |
|--|---|
| BORN 1985–2000 | BORN FROM 2000 ONWARD |
| GREW UP DURING A STRONG ECONOMY WITH LITTLE GLOBAL UNREST | GROWING UP DURING RECESSION AND TERRORISM, MARKED BY SPORADIC MASS VIOLENCE AND NATIONAL DIVISIVENESS |
| THEIR BOOKS AND MOVIES EXPLORED MAGIC AND FANTASY, OFTEN IN QUASI-HISTORIC KINGDOMS | THEIR BOOKS AND MOVIES PORTRAY DYSTOPIAN FUTURES WHERE KIDS ARE IMPRISONED OR HUNTED |
| SPEND MONEY READILY WITHOUT PRICE AWARENESS | 57% WOULD RATHER SAVE MONEY THAN SPEND IT |
| CONSIDER DIVERSITY IMPORTANT FOR FAIRNESS AND INCLUSION, EVEN IF IT COSTS | THE MOST DIVERSE GENERATION EVER SEES DIVERSITY AS CRUCIAL TO PROBLEM SOLVING; GREW UP WITH AN AFRICAN-AMERICAN PRESIDENT AND HAVE SEEN SAME-SEX MARRIAGE LEGALIZED |
| ONLINE TOOLS FED THEIR NEED FOR ACCEPTANCE, BUT THEY'VE HAD TO LEARN HARD LESSONS ABOUT HARASSMENT, LACK OF ANONYMITY, BEING TOO KIND TO STRANGERS AND LOSS OF PRIVACY | HAVE BEEN TAUGHT SINCE BIRTH TO AVOID SPAM, ADS, PHISHING, BOTS AND PREDATORS, CONNECTING ONLY WITH REAL FRIENDS ONLINE |
| SAW NAME-BRAND COLLEGE EDUCATION AS PATH TO SUCCESS—TAKING ON MONUMENTAL DEBT AND DRIVING UP APPLICATION RATES EVERYWHERE | MORE LIKELY TO "HACK" EDUCATION BY TAKING ADVANTAGE OF CHEAPER COMMUNITY COLLEGES, ONLINE CREDITS AND PROFESSIONAL COURSES |

SO, WHAT DOES GENERATION Z WANT?

They love **SPORTS**. 81% of millennials participated in athletics during childhood—more than any previous generation. That percentage is going up about 10% each generation. Participation evolves into fandom and zeal for fitness.

They follow **STARS** more than teams. Stop blaming them for this—they haven't been around on this world long enough to develop team loyalty. In fact, they like it when stars change teams; it makes sports more interesting.

They love **FOOTWEAR**. They follow the new releases of cleats like the Milan press follows fashion week. They collect athletic shoes and have an active secondary market, reselling to their friends not just pristine shoes—but used shoes their friends couldn't afford to buy new. (*The Financial Times* pegs the secondary market for sneakers at \$1 billion.)

They want to be able to choose from **DIFFERENT ANNOUNCER TEAMS**. And toggle between them to hear what others are saying. And turn up the crowd sounds.

Highlight shows, sports reality shows, talk shows and documentaries are not second tier to them, not something to suffer through because a game isn't on. They like **ALTERNATIVE SPORTS CONTENT** just as much as live games.

In the same way, they like the **OFF-SEASON NEWS** cycle and trade drama just as much as they like the playing season.

They love humorous **BLOOPERS** from sports. They can't get enough sports humor. They share videos of players making dumb mistakes as much as, or more than, great plays.

They care more about **THE TRANSCENDENT MOMENT** than who won or lost. They don't care what sport it's from, or whether it happened in the NFL or in Pee Wee league. Often it's a single play exhibiting extraordinary athleticism, but it's just as often as when a player overcomes adversity—Mo'ne Davis pitching in the Little League World Series or Eric Berry fighting lymphoma to make the Pro Bowl again.

They attend games not "for the game" but to hang out with friends or family and enjoy top-notch food and beverages. Their favorite thing during games: becoming part of the action by getting featured on the **JUMBOTRON**.

Even if sports betting were legal, they'd rather play **FANTASY**, because a fantasy team is a mash-up of players across teams—the ultimate parlay and the ultimate bar bet.

HOW GEN Z REMIXES A SINGLE HIGHLIGHT INTO ENDLESS VARIATIONS

CHANGE THE SETTING

- REENACT THE PLAY IN YOUR BACKYARD
- REENACT THE PLAY IN MADDEN
- DEPICT IT WITH LEGOS
- WITH POKEMON / IN MINECRAFT
- AS GRAND THEFT AUTO CHARACTERS

GRAPHICAL STYLINGS

- CARTOON THOUGHT BUBBLES
- SPLIT FRAME / HISTORIC HIT
- SUPERHERO COMIX FILTERS
- SUPER-SLOW MOTION
- SUPERIMPOSE A NEW HEAD

SET THE AUDIO

- LIP-SYNCING
- ADD POSTGAME QUOTE
- FAMOUS LINE FROM MOVIE
- ORCHESTRAL MOVIE MUSIC
- BLOOPER SOUND EFFECTS

THE HIGHLIGHT A college football running back trucks a lightweight cornerback onto his rear end.

Yes, they want to "interact" with the content—not just share it or comment. **THIS IS THE COCREATION GENERATION**. What they really want is to take sports content and mash it up for dramatic or comic effect, mixing in their own audio and commentary.

01 BROADBAND

Broadband.tv's deal with the NBA to create the Playmakers channel—allowing content creators to play with NBA clips. BBTV has 16 billion monthly views on YouTube and 76,000 licensed content creators.

02 CREATOR STUDIO

Adidas' Creator Studio, which empowers soccer fans to create and submit designs for their club's alternate jersey, gamifying the entries by social media vote, is right on target for this generation.

03 MUSICAL.LY

The Musical.ly app, which empowers lip-syncing to pop music, has over 100 million users.

04 MASH-UP

Trick shots, elaborate handshakes, spectacular fails and insane footwork are all juicy fodder—and their reach can be exponentially multiplied by being reedited by thousands of creators, not just one—all incentivized to share in the income.

05 MICROPAYMENTS

The micropayments market is well established in Asia.

Stop policing illegal use of highlights—empower it and monetize it, allowing kids to share fractional royalties with leagues. The future is a "mixed ownership" model. Frictionless, digital-rights management attached to the blockchain—sites like PopChest and Interledger—can make sure everyone gets their cut.



"Generation Z lives and breathes at the convergence of fashion, sports, culture and technology. They experience sport through apparel, and likewise experience fashion through the lens of sport. They communicate with friends through style; their choices embody references to music. And above all, their apparel must help them perform."

—Lindsey Koch, vice president of strategic branding, New Era

MIGRATION, TOURISM AND NEAR-UNIVERSAL ACCESS TO BROADCASTS AND SOCIAL MEDIA
HAVE UNLOCKED BILLIONS OF POTENTIAL FANS—but they don't live in your city, and don't necessarily speak your language. The next 10 years will be a gold rush, as professional teams and leagues race to claim this emerging audience.

GLOBALIZED FANDOM



GLOBAL TRENDS

BASKETBALL IS THE NEXT SOCCER

CRICKET FANS ARE BORED—AND UP FOR GRABS

CYCLING IS THE NEW GOLF

AMERICAN FOOTBALL HAS LEGS ON THE GROUND

HANDBALL IS CRUSHING FIELD HOCKEY IN EUROPE

THE DEMOGRAPHICS OF TENNIS—A GLOBAL TOUR WITH CHAMPIONS FROM SO MANY COUNTRIES—ARE PAYING OFF

| KEY | BASKETBALL | CRICKET | FOOTBALL | BASEBALL | SOCCER | TENNIS | BADMINTON | HANDBALL | KABADDI |
|-----|------------|--------------|----------|----------|--------|------------|-----------|-----------|---------|
| | RUGBY | FIELD HOCKEY | CYCLING | FOOTY | HOCKEY | VOLLEYBALL | GOLF | PING-PONG | MMA |

USA

GOLF The number of US golfers has dropped 24% from its peak in 2002. Nearly every metric—TV ratings, rounds played, golf-equipment sales, golf courses constructed—shows a drop-off. **_MMA** After being banned 20 years ago by the governor, MMA in New York State is legalized again in May 2016 by a vote of 113–25. **_CRICKET** ESPN2’s broadcast of the T20 World Cup final on a Sunday morning drew 2.4 million viewers. Three exhibition games of T20 cricket were played in American baseball stadiums, with 84,000 tickets sold. **_SOCCER** Even though NBC paid \$1 billion for the English Premier League rights, ratings in the US are 19% higher for Liga MX on Univision.

CANADA

TENNIS In the last five years, tennis participation has leapt 32%.

BRAZIL

BASEBALL Yan Gomes from São Paulo becomes the starting catcher for the Cleveland Indians. Gomes signs a 6-year, \$23 million extension with the club. FOX and ESPN broadcast 8 games a week, and ratings have doubled since 2012. **_FOOTBALL** 12,000 fans attend the American Football Gigante Bowl in Beira Rio. There are reportedly 3.3 million NFL fans in the country.

ARGENTINA

HANDBALL The European sport of handball accelerates in popularity in Argentina after their national team wins the gold medal at the Pan Am Games and Diego Simonet becomes a star.

UK

GOLF Between 2004 and 2013, one in five golfers in England gave up their club membership; in the same period, membership dropped in Scotland by 14%. The story is similar in Australia and Japan—which has lost 40% of golfers from a peak in

the mid-1990s. **_CYCLING** After Sir Bradley Wiggins won the Olympic gold medal and the Tour de France in the same year, cycling became the new golf. Chris Froome’s three Tour de France wins have accelerated the trend. Sales of bikes manufactured in the UK are growing 69% annually. **_SOCCER** 30,000 people attended the Women’s FA Cup final between Chelsea Ladies and Notts County Ladies, more than double the previous record. Across England, the number of girls and women playing soccer has increased by 40,000 in two years.

NETHERLANDS

FIELD HOCKEY Even here where the best in the world play, field hockey salaries are less than \$100,000 and subsidized by club coaching and construction work.

DENMARK

HANDBALL For the Handball Euros, 75 networks broadcast the tournament to 175 countries. The event smashed attendance records. 70% of all televisions in Denmark were tuned in. That record was soon eclipsed by the DR1 League finals, which received an 80 share. Dane Hans Lindberg, who plays for Hamburg, earns 11 million euros a year.

FRANCE

MMA Though MMA is still officially banned in France, World Warriors Fighting Championship (WWFC) utilized the MMA cage; police officers in attendance did not shut the event down. **_HANDBALL** Even though Eurobasket sets a record for basketball viewers in France, the EHF Handball Euros draw even more French viewers.

GERMANY

HOCKEY Two of the three teams with the highest attendance in the Russian KHL hockey league—are actually in Germany. **_FOOTBALL** The New Yorker Lions from Braunschweig win their 2nd Eurobowl in a

row, to go with their seven German Bowl titles. The Eurobowl has been played since 1986. **_CRICKET** Immigration from Afghanistan and Pakistan stirs up cricket participation over 300%. The 100th registered cricket club is founded near the Czech border.

POLAND

FOOTBALL The Polish American Football League has 74 teams in 36 cities. The Polish Bowl is played in front of 20,000 fans. It’s now the fastest growing sport in Poland. **_MMA** UFC Fight Night 64: Gonzaga vs. Cro Cop 2 drew over 10,000 to the Tauron Arena in Kraków, Poland.

ITALY

BASKETBALL The Boston Celtics play an exhibition against Olimpia Milano.

CROATIA

FOOTY Australian rules football gains popularity in Zagreb. Four teams from Zagreb make up a six-team league, the CEAFL.

SLOVENIA

HOCKEY When Anze Kopitar becomes a star in the NHL, youth hockey participation in Slovenia doubles. 1,500 people in Slovenia stayed up until 3 a.m. to watch a Stanley Cup finals game.

GEORGIA

RUGBY Rugby overtakes soccer as the country’s most popular sport. When Georgia played Russia in the European Nations Cup, 65,000 people crammed into the national stadium in Tbilisi.

RUSSIA

BASKETBALL Diana Taurasi skips the WNBA season to earn \$1.5 million with UMMC Ekaterinburg—15 times what she can earn in the US. **_FOOTBALL** 13.3% of Russians are now NFL fans. **_VOLLEYBALL** All the highest-paid volleyball players

were in Turkey; that changed when volleyball star Ekaterina Gamova signed a \$1 million-a-year contract to play with Dinamo Kazan in the Russian Super League.

AFGHANISTAN

CRICKET At the T20 World Cup, Afghanistan shocks the world by beating the West Indies.

VIETNAM

BASKETBALL Five years after American Henry Nguyen founded the Saigon Heat in the ASEAN League, the Vietnamese Basketball Association begins play. Basketball is now the favorite sport of 6% of the country.

CHINA

PING-PONG The country that has won 23 out of 27 gold medals in ping-pong is falling out of love with table tennis. Television audiences of world championships have dropped 90% in the last decade. **_BASKETBALL** Zhejiang Golden Bulls sign American star Brittney Griner for \$600,000 a year—12 times what she was earning in the WNBA. **_FOOTBALL** Interest in the NFL has grown from 1% to 8% in just the last two years. There are 16 teams in the American Football League of China, where all players must be Chinese or of Chinese descent. **_TENNIS** A record 134 million people in China watched the 2011 French Open Final. There are 11 Chinese women within the top 200 tennis players in the world. **_SOCCER** Chinese President Xi Jinping publishes a 50-point road map to make his country a world soccer power. The Chinese Super League promptly spends \$300 million in the winter transfer window on top foreign players—more than Europe’s top five leagues combined. Four of the 10 highest-paid players in the world now play in China.

JAPAN

RUGBY After stunning South Africa, one-fifth of the entire Japanese population, with an audience share of 64%, tunes in to the Rugby World Cup to watch Japan beat Samoa 26–5. **_BASEBALL** The Japanese television audience for the World Baseball Classic is the highest-rated cable program in the country’s history, with larger TV audiences than the Olympics or World Cup. **_TENNIS** Kei Nishikori of Japan rises to #4 seed in the world.

KOREA

HOCKEY Ahead of the 2018 Winter Olympics, the Korean national hockey team is bolstered by the granting of South Korean citizenship to six North American players who’ve been playing in the Asia League for Korean teams.

UGANDA

BASEBALL Uganda becomes the first African country to send a team to the Little League World Series.

SOUTH AFRICA

BASKETBALL The NBA hosts an exhibition between Team Africa (players of African descent) and Team World in Johannesburg, with special appearances from Hakeem Olajuwon and Dikembe Mutombo.

INDIA

CRICKET Though still the country’s #1 sport, cricket is losing its crowd-pulling power on television, creating massive opportunities for other sports. Television viewership for the game across all formats has dropped 40%. Over the last decade, the number of hours spent watching cricket has dropped almost half. Even the T20 India Premier League 2016 ratings are down 22%. **_FIELD HOCKEY** Field Hockey, already the

poor cousin to cricket, falls further from grace. At a player auction for a league restart, the best player in the world sells for less than \$100,000. **_KABADDI** The first Kabaddi season championship between the Jaipur Pink Panthers and U-Mumba was watched by 86.4 million fans, approximately one out of every four viewers in India. The 37-day “season” attracted 435 million total viewers. **_SOCCER** Over 68,000 spectators showed up at the Salt Lake Stadium in Kolkata to watch Atletico beat Chennaiyin 2–1 in the 2015 Hero Indian Super League. Just two years old, the league averages 27,000 fans. **_BASKETBALL** Punjab is the home of Satnam Singh Bhamara, who became the first Indian to ever be selected in the NBA. Skipping college, Bhamara became the 52nd pick in the 2015 NBA draft for the Dallas Mavericks. **_BADMINTON** Following Saina Nehwal’s bronze medal at the London Olympics, India’s first-ever medal in badminton, the Indian Badminton League opens in 2013 with a \$1M prize fund, the largest ever offered in the sport.

AUSTRALIA

CYCLING Over the last decade, cycling shot up from 13% of the population to 19%. **_BASKETBALL** Australian Ben Simmons becomes the #1 pick of the Philadelphia 76ers. **_HOCKEY** The Trans-Tasman Champions League of hockey Down Under was canceled due to financial problems. Attendance, regularly under 1,000 at the AIHL, sank the event against the New Zealand champions.

KEY

| | | | | | | | | |
|------------|--------------|----------|----------|--------|------------|-----------|-----------|---------|
| BASKETBALL | CRICKET | FOOTBALL | BASEBALL | SOCCER | TENNIS | BADMINTON | HANDBALL | KABADDI |
| RUGBY | FIELD HOCKEY | CYCLING | FOOTY | HOCKEY | VOLLEYBALL | GOLF | PING-PONG | MMA |

GLOBAL ADOPTION

97% of Real Madrid's fans will never see their team in person. Three of the top five countries that generate the most traffic on the club's website are not Spanish-speaking nations. Back in 2011, the club helped build a \$185 million youth academy—in Guangzhou, China. Still, some spare no expense to see Los Blancos: for each Classico, an estimated 3,000 Israelis fly to Madrid, at an average ticket price of \$900.

Cross-cultural marketing is no easy thing. Baseball didn't become widely adopted in Japan until the meaning of the game changed to emphasize group harmony and obsessive ritual, mirroring Japanese culture.



KOBE BRYANT

“Any sport looking to expand or broaden horizons should copy the NBA's blueprint from 20 years ago. David Stern had a vision and he made it happen with grassroots sermonizing in places like Africa and China.

Grow your brand with the intention of challenging and redefining your industry, while at the same time inspiring the world. Learn to see things differently or through someone else's lens. In basketball, kids are taught to see things in mostly twos: a pick-and-roll, a give-and-go, a 1–2 fast break. In soccer, it's all about multiple combinations and looking several steps ahead. If you train your eye to see different combinations, your brain will follow. It's the same when you're running a league or a team. See the future beyond your own court.”



SHAHID KHAN

Owner of NFL's Jacksonville Jaguars and Fulham FC in the English Football League, Pakistani-American self-made billionaire.

“Interest in American football is growing at a colossal speed in London and throughout Europe and is part of the global culture. Look at places such as India or Pakistan, where maybe the market is saturated with cricket while other sports have gone ignored.

Billions of people in rural areas and great cities are thirsty for more sport. Even just 10 years ago they had to wait to read in the newspaper about these fantastic games being played by these gladiators a world away, but new technology and social media has changed all that. In 10 years from now, we won't be talking about [putting] an NFL team in London because it will exist. We'll be exploring options for teams in Dubai or Lahore. The TV rights will be enormous. There is a global thirst for sports more than any other sort of entertainment, because it taps into the core of all of us, no matter our upbringing or country of birth.”



VIVEK RANADIVÉ

Owner of NBA's Sacramento Kings, Indian-American engineer, author, philanthropist and founder of real-time business computing company TIBCO.

“It's important to tap into the rising middle classes globally. These are fans who are analytically sound, who love to debate about players and teams, and those debates translate

across borders. Whether they're in Northern California or Mumbai, they'll paint their faces and create a communal experience during game time. We tap into that passion with a Sacramento Kings website in Hindi. We host Google Hangouts during games for our international audience. By maintaining a strong alliance with fans in other countries, we also have unique opportunities to discover the next diamond in the rough, the next Yao Ming. Will he come from India, Russia? Is he now just a 10-year-old boy in India wearing a Kings or a Warriors jersey?”

FUNDAMENTAL FACTORS

DRIVING GLOBAL FANDOM

01 THE RISE OF THE GLOBAL MIDDLE CLASS

The middle class is expected to **INCREASE** by 1.4 billion people over the decade—a 42% increase in South America, 59% increase in Africa and 83% increase in Asia. As societies grow younger and more educated, their interest grows in sports, politics and culture. They have the income for game tickets and monthly television bills.

By 2030, the middle class of Europe is expected to have twice the total **SPENDING POWER** as the North American middle class. The Asian middle class will have six times the spending power.

02 MIGRATION

With over 11 million Mexicans now living in the US, **LIGA MX** on Univision has an American audience that is 19% larger than NBC's audience here for the English Premier League.

With well over 2 million South Asians in the US, **CRICKET** is finally here. New York City councilman Ruben Wills broke ground on a cricket complex in Van Cortlandt Park, where the local Commonwealth Cricket League has over 100 teams. Exhibition attendance and ESPN ratings are climbing.

Emigration from Canada to the UK is helping the popularity of the British Elite Ice Hockey League, where teams such as the Nottingham Panthers draw over 5,000 fans to games.

03 DEREGULATION OF TELEVISION

In addition to CCTV-5, the government's sports channel, **CHINA** allows CSPN and Shanghai Sports, as well as online channels Baofeng Sports (Chinese Super League) and LeTV (American baseball, golf and ATP tennis).

INDIAN law requires à la carte channel purchases; 161 million households have cable or satellite television carrying Prime Sports, Star Sports and ESPN, while pay-per-view has not thrived, keeping sports available to the masses.

IPTV eradicates the difference between online and broadcast delivery. The most-regulated broadcast markets have the greatest IPTV penetration.

Smartphones and **5G CONNECTIVITY** give billions of new fans access.

04 DIVERSITY, EQUITY & INCLUSION

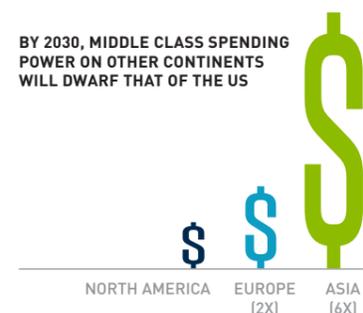
Half of the most recent **NBA** draftees were internationals.

The players in the **PREMIER LEAGUE** represent 70 countries. Only one-third of the 220 starting players on opening day were English.

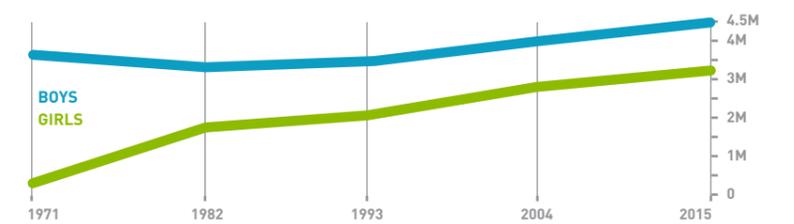
The top 100 players in **TENNIS**, across both genders, are from 45 countries. Players from 30 countries have won a grand slam. And so far it's the only sport with a truly global tour.

89% of avid female sports fans in America played some school sports growing up. By that measure, the demographic trends for **FEMALE FANDOM** will power growth.

But the US is no world leader in female fandom; other markets are even further along. Participation in school sports is higher in the UK, and far higher in China, where 86% of girls participate in school sports. The percent of women who regularly watch sports on television is 10% higher in India, Russia and Brazil than in the US.



FUTURE FANS: NEARLY AS MANY GIRLS AS BOYS ARE NOW PLAYING HIGH SCHOOL SPORTS



In order to reach global markets and capitalize on their remote fanbase, a new “globalization backbone” for the sports industry will emerge.

A NEW GLOBALIZATION BACKBONE

Sports franchises were their own experts in their metropolitan markets—they had the staff and relationships. But to market themselves nationally, they naturally grew to partner with infrastructure companies who had nationwide expertise and relationships. Apparel-licensing companies (Nike), sponsorship agencies (IMG), ticketing networks (Live Nation), talent representation (Octagon).

Today, in order to reach global markets and capitalize on their remote fanbase, pro franchises won't be able to fly solo. A new “globalization backbone” for the sports industry will emerge. By serving (or owning) multiple franchises and leagues, those who develop early, real expertise in transcontinental markets will grow and become the durable infrastructure others rely on.

Need someone to find you a corporate sponsor in India? Need someone to add play-by-play commentary in 20 languages to your video feed? Need someone to sell your luxury box packages to tourists from Japan? Can't get on a French television channel but want to be available via IPTV? Playing

an exhibition game in Beijing and need to know who can move all the tickets? If video pirates in Croatia are stealing your signal, who do you call?

Just as MLB's app and streaming service eventually grew into a diverse multisport and entertainment company that Disney has invested over a billion dollars in, it's those who can actually get things done in international markets who will become the lynchpins others need. With this enormous potential developing, we're witnessing mega-deals all over the globe. New money is coming in from the tech and venture industries, from Hollywood agencies, from Chinese billionaires and from pro athletes who've amassed fortunes. Since major sports teams rarely come up for sale, this money finds emerging opportunities wherever they appear—the new global sports markets.

JUST THE START

- WME and Silver Lake Partners first buy IMG, then buy UFC.
- Dalian Wanda Group buys Infront Media (World Cup rights), Atletico Madrid, Ironman events.
- Alibaba Sports takes over AC Milan and Guangzhou Evergrande FC, then makes deal with World Rugby to develop 1 million Chinese rugby players in a decade.
- Chinese investors Everbright and Baofeng take 65% stake in MP and Silva (Grand Slam tennis, NFL in Europe, Formula 1 and EHF handball).

WHO'S NEXT TO BUY?

- Tencent (already has NBA rights)?
- CAA?
- Lakshmi Mittal or Mukesh Ambani from India?

WHO'S NEXT TO SELL?

- Irdeto B.V. (anti-piracy)?
- A ticket reseller (\$8 billion market)?

“In the early days of BAM Tech [MLB Advanced Media's video unit] not once but twice we considered shutting it down. It was costing us money and not creating any value yet. It takes commitment and it takes time and devotion.”

—Jeff Mallet, principal owner, San Francisco Giants



SPORTS TOURISM

Sports tourism in the US adds up to \$9.45 billion, and it's going up fast. Tourists already spend **\$1.15 trillion** globally. Smart money will increasingly find ways to integrate sports and tourism. Three main categories define the current sports tourism market: fandom, recreational sports travel and youth tournaments.

FANDOM

Price is no object: Through a partnership between CAA Premium Experience and iRENA International based in Beijing, Chinese basketball fans spent as much as \$10,000 each for a package to come watch Kobe Bryant play in his final NBA game.

Long-term benefits: The seven most recent countries (Malaysia, UAE, South Korea, etc.) to join the Formula 1 calendar have experienced an average boost in annual tourism of 69% since their first race.

It's not all about the mega-events: The Olympics and World Cup are mired in controversy because of the construction investment required. A year before the World Cup in South Africa, the country hosted the British & Irish Lions all-star rugby team on a 10-match tour. It required no investment, but 40,000 fans flew into South Africa—making it “more lucrative than

the World Cup,” according to the South African Tourism Bureau.

RECREATIONAL SPORTS TRAVEL

94,000 American **golfers** travel to play in Britain each year.

The Honolulu Marathon has a total economic impact of \$86 million. Most of that is spent by runners coming from Japan, who drop \$68 million while there.

The 2014 Gay Games brought 15,000 people to Cleveland-Akron, Ohio, from other states and countries—8,000 of them athletes. The event pumped \$52 million into the region's economy.

YOUTH TOURNAMENTS

According to a National Association of Sports Commissions study, the travel industry built around youth sports brings in an estimated **\$7 billion**.

Round Rock, Texas, built a sports complex with 20 baseball fields,

6 basketball courts and 12 volleyball courts. The soccer and football fields will be ready by 2018, but already **up to 40,000** children come to the city for tournaments every year.

Rochester, Minnesota, is the king of **volleyball** tournaments, bringing in 110,000 visitors a year who booked 32,000 hotel rooms.

ALL OF THE ABOVE

HarborCenter, Buffalo: A hockey epicenter with hotel, restaurants, shops:

- Practice facility for Buffalo Sabres

- Home ice for 2 college teams, a women's team and a junior team

- Host for 2018 World Junior Hockey Championships, NHL Draft and NHL Scouting Combine

- Hosts 25 youth tournaments; 75% of the teams from out of town, as far away as Russia and Japan



“Promoting sports tourism is a major goal of our Western New York sports holdings. With the Bills, we attract almost half of our season ticket members from outside the Buffalo market, including 10% from Canada. We estimate that the Sabres see 15% of fans cross the border from Canada each game night.”

—Kim Pegula, co-owner, Buffalo Bills and Buffalo Sabres; president, Pegula Sports & Entertainment, builders/operators of HarborCenter sports complex

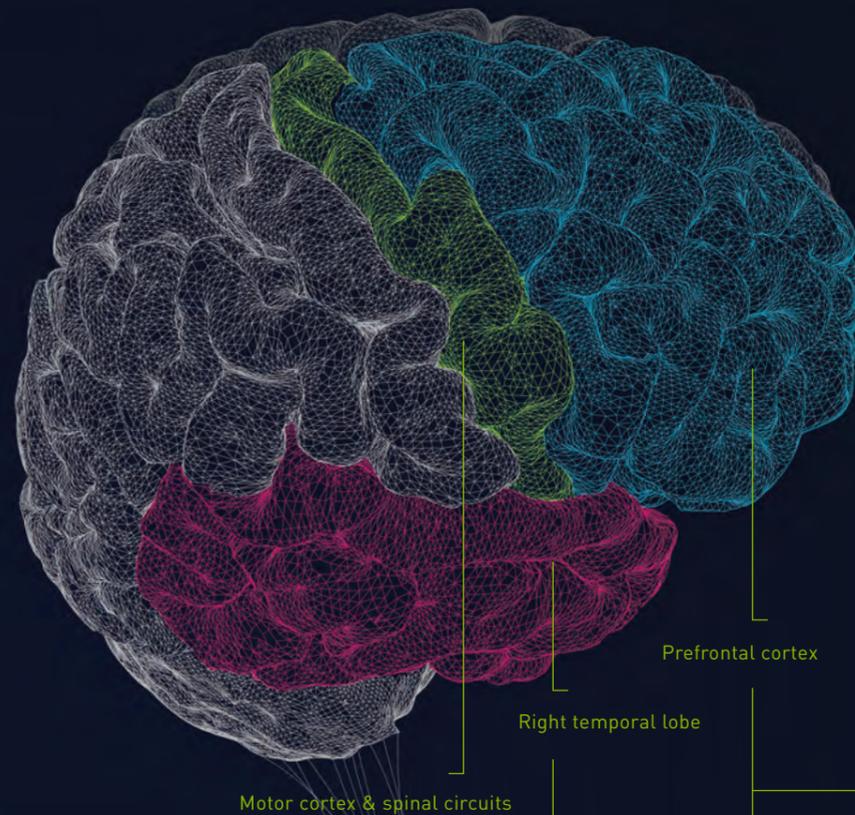
WHAT'S THE DIFFERENCE BETWEEN THE 40-SECOND ROCKET BURN OF ADRENALINE and the sustained, elevated state of an athletic high, which can seem to last for hours? Rowers and runners describe a sense of euphoria; basketball players say the rim seemed wider; baseball players report perceiving time as moving in slow motion.

The ability to execute under pressure—to achieve an athletic flow state—is actually an amalgam of many mental processes. Just as the physical challenges for athletes are broken down into building blocks such as speed, power and agility, so too are the mental aspects of sports now being parsed into neural abilities that can be targeted. The next evolution of this field: neurohacking that delivers specific brain-body states optimized for individual sports and individual athletes. Dozens of new companies are springing up, offering a buffet of the latest neurocoaching methods.

NEUROCOACHING

MUSCLE SYNCHRONY

HACK: 31% gains in power and 15% gains in endurance through **transcranial direct-current stimulation**—the delivery of a low, continuous electrical current to the brain through electrodes touching the scalp. The current raises the resting potential of motor cortex neurons, bringing them closer to their threshold potential and allowing the neurons to fire more readily, with less work. Also called the neural state of **hyperplasticity**, this approach may be the key to unlocking power, coordination and endurance. The result—after three weeks of training—is the learned capacity to collectively recruit all needed muscle groups with greater precision. This technology, developed from implants that detect and prevent epileptic seizures, is being used in training by athletes of all kinds—from golfers wanting to improve their putting to ski jumpers wanting to improve their launch from the ramp.



UNINTERRUPTED FOCUS

HACK: **Neurofeedback technology** measures brain wave activity and allows athletes to better understand how to control their mental states. This technology is becoming cheaper, easier to use and more mobile. Eventually, implantable sensors will provide unlimited, round-the-clock information on brain activity. With virtual reality goggles, an athlete will soon be able to simulate standing inside her mind, watching it function, while learning to better control emotion and cognition. In addition, with the use of mobile EEG readings, researchers will determine which mental states work best for individual sports activities. Eventually, coaches will be able to test brain wave activity before competition to determine which athletes are mentally prepared.

SPEED UP REACTION TIME

HACK: **Macular carotenoids nutritional supplements.** Zeaxanthin appears to influence many aspects of the central nervous system's functions. These effects extend from optical filtering within the neural retina to improving the efficiency of well-established processing streams in the brain and motor systems (Bovier, 2014).

MOTION PREDICTION

HACK: **Stroboscopic glasses.** In high-speed games, players have to make instantaneous decisions in reaction to only a glimpse of the action. Athletes learn to function with less information—resulting in improved reaction time, visual acuity and sense of timing. In a two-week study using professional hockey players, stroboscopic training showed an 18% improvement over a control group in specific on-ice skill tests.

“That improvement for on-ice skills for professional players is huge.”

—Stephen Mitroff
Duke University neuroscientist

New glasses, using similar techniques, will be developed to increase other visual abilities, including peripheral vision and multiple object tracking.

31% INCREASE IN PROPULSION FORCE FOR NATIONAL TEAM SKI JUMPERS AFTER TRANSCRANIAL STIMULATION

10% IMPROVEMENT IN REACTION TIME AFTER TAKING ZEAXANTHIN TO BOOST THE NEUROVISUAL SYSTEM

18% IMPROVEMENT OVER A CONTROL GROUP IN SPECIFIC ON-ICE SKILL TESTS



“Muscle memory is not in the muscles. It’s in the brain. Conventional wisdom wrongly characterizes strength as being solely powered by muscle function. But it’s also neural. “Learning” is accomplished both by improving motor neurons’ timing and through neurogenesis—growing new neural pathways. Consider the athlete who begins weight training; strength improvement occurs in the first two weeks, even though muscle growth isn’t much of a factor until the third week. It’s from brain learning, not muscle growth. Electrical stimulation of the neurons—tDCS—speeds up learning and improves neural drive.”

—Daniel Chao, CEO of Halo Neuroscience

“Even when you think you’re exercising as hard as you can, there is always some reserve of ability.”

—Dylan Edwards, neurophysiologist at Burke Medical Research Institute, White Plains, New York

“Sleep is a real opportunity and a real need.

Players finish an NBA game at 10 p.m., but they’re wired and pumped and really can’t get to sleep until 2 or 3 a.m. Which means the coach has to really question whether to schedule a real practice the next day; they want the players to get their 8 hours of sleep. Teams end up not really practicing much during the season. They don’t have the time.”

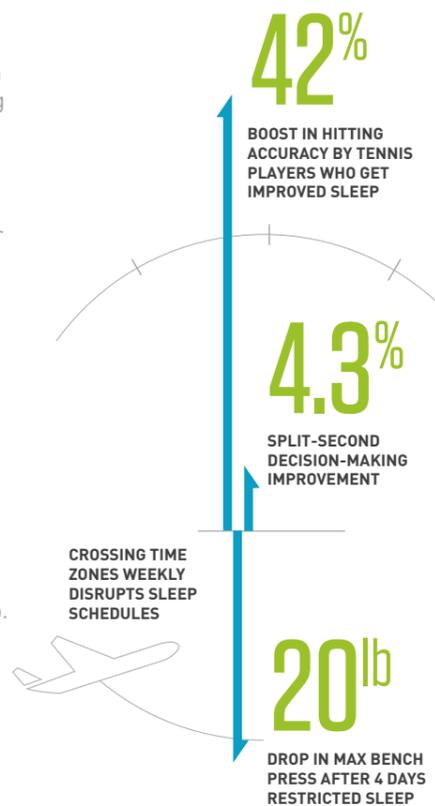
—Steve Ballmer, Los Angeles Clippers owner

RESTORATIVE SLEEP

Sleep improves split-second decision-making ability by 4.3%. After four days of restricted sleep, athletes maximum bench press drops by 20 lb. The challenge is, athletes’ sleep is radically disrupted by night-before jitters and night-after muscle pain. In addition, athletes cross time zones weekly; and with varying game times, they have no set schedule for sleeping.

CURRENT HACK: Pro athletes and team trainers are increasingly experimenting with a variety of supplements, habits and changes in environment to maximize the benefits of restorative sleep. Last season, the San Jose Sharks were coached to swallow chamomile, lavender and tart cherry juice, a melatonin producer that also combats inflammation, as well as a variety of nutrients like zinc and magnesium thought to induce restorative sleep. Sharks players also learned how to create effective sleep environments by minimizing ultraviolet light and keeping their rooms quiet, dark and cool.

FUTURE HACK: Wearable devices today monitor whether an athlete is asleep, but they don’t alter the environment of a sleeper to enhance or extend sleep. New wearables will track both brain-wave activity and body temperature, and then alter conditions to prolong sleep phases—especially the all-important slow-wave sleep, when the body regenerates tissues by building bone and muscle.



“Overall, there is growing interest in sleep from teams across all the leagues. It can have a significant impact on peak performance and overall health. In my opinion, it is one of the most untapped areas of sports performance.”

—Cheri Mah, research fellow, UCSF Human Performance Center; sleep consultant, Golden State Warriors

IS IT NEURODOPING?

Research to map and optimize the brain of the individual athlete will become solid enough that sports organizations will turn their attention to the neurology of teamwork. In 20 years, coaches will routinely use neurological data to maximize team efficacy, cohesion and communication.

Do these new techniques—altering the wiring of the brain—violate the spirit of sports? Some scientists compare brain stimulation to carbo-loading ahead of an event.

“It piggybacks on the ability to learn. It’s not introducing something artificial into the body,” says Troy Taylor, high-performance director for the USSA.

Others are more skeptical. If any of these new neurohacks are shown to have long-term health consequences, then they will likely become regulated and increasingly banned. Similarly, if they prove so expensive that only rich athletes can avail themselves of the advantages, then the public and major regulatory bodies are also likely to raise objections.

Dylan Edwards, a neurophysiologist at Burke Medical Research Institute in White Plains, New York, worries that the availability of tDCS devices will tempt athletes to try “brain doping,” in part because there is no way to detect its use. **“If this is real,”** he says, **“then absolutely the Olympics should be concerned about it.”**

VIRTUAL REALITY, AUGMENTED REALITY, MIXED REALITY: kids—and, eventually, adults—will spend increasingly significant amounts of their lives inside these environments. Goldman Sachs predicts the AR/VR market will be \$85 billion by 2025. Digi-Capital is far more bullish, predicting it'll reach \$150 billion by just 2020. VR and AR are both heralded as revolutionary—VR akin to the invention of movies, and AR heretofore only

depicted in movies. But sports still have to be played in actual reality, with the ball, by athletes, patrolled by referees with old-fashioned 99-cent whistles in their mouths. Are any of those billions for those who play in the real world?

AR/VR ROAD MAP

2017

12 MILLION VR HEADSETS WILL HAVE SOLD BY THE END OF 2016 (7 MILLION TETHERED HIGH-END HEADSETS AND 5 MILLION MOBILE LOW-END). THAT WILL MORE THAN DOUBLE IN 2017.

EVERYONE WHO BUYS A SAMSUNG 7 GETS A GEAR VR FOR FREE. IN 2017, APPLE GETS IN THE GAME AND MATCHES THE OFFER.

200,000 DEVELOPERS ARE CREATING VR CONTENT.

THOUGH NOT HIGH RESOLUTION YET, VR HAS ALREADY BEEN BROADCAST FROM THE NBA SIDELINES TO THE CREW PITS OF THE DAYTONA 500 TO THE TEE BOX OF GOLF'S US OPEN.

VIRTUAL REALITY

Two business factors will shape winners and losers in the virtual reality market in 2017:

CHINA is already 40% of the virtual reality market. But Facebook is banned in China, so Facebook can't sell its high-end Oculus Rift there. Nor can Samsung sell its lower-end Gear VR (which snaps onto a Samsung phone), because it's based on Oculus software. An ongoing saga of censorship clashes with China's government have kept Google on the sidelines as well. Without these North

American market leaders, a massive opportunity has opened for Chinese companies like Pico, Idealens, Deepoon and Pimax. Meanwhile, web giants Alibaba, Tencent and Baidu are buying up dozens of Chinese content and game startups.

HIGH-QUALITY virtual reality headsets still have to be tethered to a computer more powerful than most people have at home. But they can also be tethered to a new video game console, such as Sony PS4 Neo with 4K resolution, which will be released before Christmas 2016. This is going to give Sony's new headset a huge spike in sales, and it will outsell competitors by several million units. (PlayStation sales run over 10 million units a year.) Meanwhile, Microsoft's new Xbox Scorpio—which will work with Oculus Rift—won't be released until a year later for Christmas 2017. Also, a Sony VR headset is \$200 cheaper.

Both factors point to Oculus Rift—the first VR headset most of us have heard about—coughing up the pole position it held from 2014 to 2016.

SPORTS RIGHTS HOLDERS WILL BE HAPPY, ESPECIALLY UFC. Early data shows that streaming video is go-to content for early users of VR, despite

the incredibly inventive games available. Seven of the top 10 Gear VR apps are video content, and 80% of users watch VR video daily. Some portion of that video will be live-streamed sports. But which sports in particular? That transformative sense of really "being there" only happens when the action is a few feet from the camera, such as with boxing and MMA, which can perch cameras above the corner posts. VR live streaming becomes 2D when the action is far away, such as across a soccer or football field.

ON CHRISTMAS DAY, MILLIONS OF KIDS WILL BE SICK. It's antisocial to wear a headset. And you can see the pixels—4K video is sorely needed. But the biggest problem with VR is that it makes users nauseous. At first, it's amazing. Then it gives you motion sickness. This is caused by a dozen factors that exacerbate the disconnect between the brain's natural sensing and the headset's visuals. Ironically, one of the reasons that watching video with a VR headset is popular is because the point of view stays put, so the motion sickness isn't as bad as it is in games.

"The first time I tried it on, I literally vomited," said Jody Medich, Singularity University VR designer.



"VR will be huge, but it will be only a small subset of AR."

—Jody Medich, Singularity University VR designer



AUGMENTED REALITY

MEANWHILE, THE GROUNDWORK FOR AR IS LAID. Pokemon Go gave the world a taste of augmented reality in a sort of 2D fashion. But sports can legitimately lay claim to the first live AR experience—the Virtual Yellow 1st & Ten Line, which has been included in NFL broadcasts since the late 1990s. Augmented reality in 2017 will make consumers familiar with three primary types of nascent AR:

• **MORE POKEMON GO-TYPE TREASURE FINDING.** Walking through Ballpark Village to a Cardinals game, fans will collect Matt Carpenter, Yadier Molina and other players. Or, to build their Ultimate team in FIFA 18, video gamers—rather than buying packs—can scoop up players outside the Emirates in North London.

• **SMARTPHONE OVERLAYS.** In 2017, you will be able to hold your smartphone up in a stadium and see player data overlaid on the live action. At a business conference, looking at people through your camera will display their LinkedIn resume.

• **WINDSHIELD "HEADS-UP DISPLAYS"**—already common in some cars—will have a wider field of view and integrate more information than map turns and speed, such as showing text messages and sports scores.

BUT A REVOLUTION HAS BEGUN. Both Meta and Magic Leap—the two best AR systems—have pledged to make their workplaces "screenless" by March 2017. Instead, employees will wear AR headsets, working on virtual screens that hang in the air above their desks. Those in the know will recognize augmented reality is everything that VR isn't—crystal clear, with no sickness.

12M VR HEADSETS SOLD IN 2016

"When you move in a game, 100% of the time, the user gets sick within five minutes."

—An AT&T engineer and VR filmmaker



2020



160 MILLION VR HEADSETS WILL HAVE BEEN SOLD BY 2020.

65 MILLION OF THOSE WILL BE SOLD IN 2020 ALONE.

BY COMPARISON:

PLAYSTATION 2 SOLD 155 MILLION UNITS

A BILLION IPHONES HAVE BEEN SOLD

1.6 BILLION HOUSEHOLDS WORLDWIDE HAVE TELEVISIONS

SO VR, DESPITE THE HYPE, IS NOT FOR EVERYONE YET IN 2020. IT'S LIKE VIDEO GAME CONSOLES—YOU MIGHT NOT HAVE ONE, BUT A FRIEND WILL.

VIRTUAL REALITY

WATCHING VR SPORTS IS NORMAL. On average, 10% of any viewing audience will wear VR headsets—higher for close-action sports like boxing. VR live streams will have graduated from raw camera feeds to incorporate storytelling devices—commentators, replays and camera toggling. The isolation factor will be somewhat moderated; viewers will be able to talk to friends and family watching the game across the country. More common will be passing around the headset at a viewing party, especially for highlights and replays.

SPORTS VIDEO GAMES EXPLODE.

Dropping back to pass in Madden 20 will never have felt so real. Batting practice against the Cy Young winner will thrill. Sports in which one key player dominates the action will come to market first; team sports where every player is equally essential (like soccer) are harder to design. The controller has long been replaced by scanners that track human movements. Players will either confine their movements to a grid, or they'll balance on curved plates and lean to sprint or cut.

VR FITNESS IS NOT A GIMMICK. Transport yourself to yoga class from your mat at home. Box against remote sparring partners while your computerized cornerman yells tips. Break away from the peloton on your exercise bike.

OPERATING SYSTEM WARS—PART 4.

First it was VHS vs. Beta. Then it was PC vs. Mac. Then Android vs. iOS. In 2020, the business press will focus on the great rivalry between Magic Leap and Meta, or whoever owns them. We'll buy the glasses—and get the phone free. Expect iPhone and Samsung sales numbers to reach over 200 million sold in 2020.

IF VR'S ANALOG IS GAME CONSOLES, AR'S ANALOG IS THE SMARTPHONE.

THE MARKET IS EVERYONE. The incorporation of long-awaited 5G hyper-connectivity will make these headsets ready for prime time. No longer will you have to be connected to a PC to get 4K graphics; no longer will you suffer a meager field of view to be untethered. New smartphones will connect by a flexible fiber-optic tether to lightweight glasses; many people will rarely check the phone itself, but will still want it there as a security blanket. For others, their phone will still be their primary device; they'll just wear the glasses while driving.

IN THE NEXT THREE YEARS, we'll stumble through several cycles of excitement and disillusionment with AR/VR. But in 2020, it will all click. AR/VR will deliver sports fans thrilling new experiences in viewing, gaming and training.

AUGMENTED REALITY

SPORTS CONSUMPTION IN AR. Every way you now use your phone to consume sports, you will also use in AR. You will bring up web pages and tap on apps—rectangular screens will float in the air. When the game is on, you can open up a live stream and either pin it off to the side or enlarge it to a 90-inch screen, front and center. Because the glasses use lasers to project the light directly onto your retina, the image will be perfect. Best of all, you can create a screen and then share it with friends. Or the party can switch into 3D mode, and the basketball game can be played in volumetric video on your coffee table as everyone sits around it.

THE STADIUM EXPERIENCE WILL BE TRANSFORMED.

Here's why:

- All the data you could possibly want can be overlaid on the live action. Let's say you're at a baseball game. The purist can turn it off. The geek can see defensive rotation stats, pitch speed and speed of the batter running to first. As a pinch hitter is warming up, his highlights are available off to the side of your view and you can tap to watch.
- You have your own personal replay device built into your glasses. Swipe left in the air to go back in time. Raise two thumbs and the highlight gets posted to social media.

NEXT-LEVEL TRAINING FOR BOTH THE PROS AND THE AMATEURS.

- Imagine you're playing tennis with AR glasses. As your opponent's backhand loads, the artificial intelligence engine is already displaying where you likely need to run to. As the opponent's shot is on its way, you're already seeing a target in the opposite court that you should aim at.
- Want to learn receiver footwork from Jerry Rice? He's stored in your helmet. He'll be there in volumetric video, on the field. First he shows you a game highlight of his. Then he breaks his route down into pieces—his three-step jab, his dig footwork, his route-tree decision making. As you run through it, you can see on the field exactly where each foot should land. A friend can even throw you darts as you break open.

65M VR HEADSETS SOLD IN 2020

5G SMARTPHONE HYPERCONNECTIVITY IS HERE

10% OF ANY VIEWING AUDIENCE WILL WEAR VR HEADSETS

2025



HEADSETS AND AR GLASSES ARE STILL SELLING AT PEAK SMARTPHONE NUMBERS—150 MILLION PER QUARTER—BECAUSE EACH YEAR, THE DEVICES IMPROVE SO RAPIDLY.

HUMANS WON'T NEED PRESCRIPTION GLASSES ANYMORE. THE AR SYSTEM CORRECTS VISION FOR YOU, TRACKING YOUR EYE MOVEMENT AND FOCAL POINT.

BATTERIES MADE FROM GRAPHENE RATHER THAN LITHIUM ION DON'T JUST DOUBLE THE CAPACITY, THEY RECHARGE IN SECONDS.

PHOTONS REPLACE ELECTRONS AS 3D PHOTONIC NANOCRYSTALS ARE INTEGRATED.

HELLO, 8K VIDEO! YOU'LL HAVE PURE 20/20 VISION OF EVERYTHING RENDERED.

AR AND VR CONVERGE, AS NEW GLASSES CAN BRING ON DARKNESS BY CANCELING LIGHT WAVES, MUCH LIKE NOISE-CANCELING HEADPHONES DO.

IN 2025, WE'LL WEAR "SMART CONTACT LENSES" THAT WILL GRADUALLY EVOLVE TO FULL AR FUNCTIONALITY.

EDUCATION will be transformed into something far more vivid. History teachers will transport their students to the beaches of Normandy or the Cu Chi tunnels of Vietnam. In biology class, the entire room will become the inside of a mammalian cell.

On home-buying shows, you'll be in the home. And in those homes of 2025, designers will set aside ever-bigger blank rooms as VR studio pods, with padding on the walls and sensors in the walls. Welcome to the new gaming room. When you call somebody, they will appear in 3D volumetric video. You can walk around them or get up close.

WATCHING SPORTS WILL BE INSANELY COOL. Sports cameras will switch from spherical video to volumetric video—allowing you to joystick your point of view to any angle during live action. You'll be able to fly up to the huddle, spin over to the linebacker during the pre-snap and close in on a receiver as the ball is in the air.

BUT MIXED-REALITY GAMES WILL BE EVEN COOLER. Expect old naval bases and empty warehouse districts to be the setting for intense mixed-reality games, where players throw fireballs at each other. Get hit, and everyone sees a big explosion; the player is still alive but without his powers for 30 seconds. Mini-helicopters fly overhead, sounding real. Games that evolve from today's eSports, designed for the modern age, will better take advantage of technology than sports games invented in the late 1800s. Abandoned neighborhoods of Rust Belt cities will become the new eSports complexes where youth clubs train three times a week, hoping to become professional eAthletes who play in football stadiums and basketball arenas.

BY 2025 the distinctions between AR and VR will be insignificant; the devices will converge and be multifunctional. Their vast capabilities to blend natural and synthetic vision will cause us to rethink everything—from the social norms of human interaction to how private and public spaces are designed and navigated. New sports will inevitably emerge that will be designed to test athletes' performance across the spectrum of mixed reality.

eSPORTS WILL BEGIN TO POACH ATHLETIC TALENT

Because these new games will actually require speed, strength and endurance, they'll reward real athleticism. And sports fans will finally start to respect eAthletes as more than controller-jockeys. Game designers will build games demanding freak athleticism in essential moments to unlock defenses.

01 RUSHING

Need someone who can run a 4.3-second 40-yard dash while engaged in hand-to-hand combat? Draft a college receiver.

02 SCALING

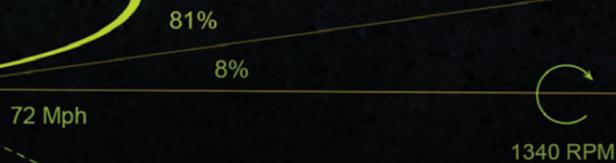
Need someone who can scale a 50-foot wall in 6 seconds? Recruit the best rock climbers.

03 ENDURANCE

Need someone who can run end to end for the full 90 minutes? Sign a soccer player.

04 MANEUVERABILITY

Need someone who can avoid laser shots in open space then flip over a 9-foot wall into a crouch? A gymnast can do a double salto into a double layout with half twist.



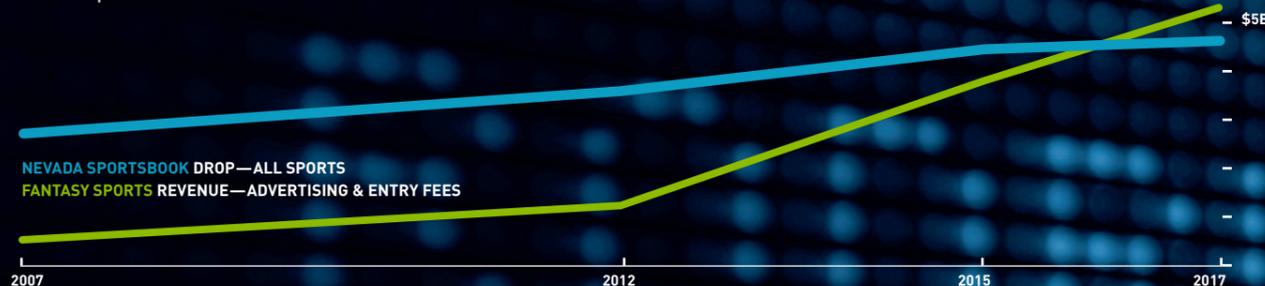
150M VR HEADSETS SELL PER QUARTER

8K VIDEO IS THE NORM

FOR THE TYPICAL AMERICAN SPORTS FAN, FANTASY SPORTS plays the role that sports betting does in the rest of the world—making the drama of winning and losing very personal. As the world flattens, technology is making it ever easier for Americans to join the party. An estimated \$95 billion is wagered on sports in the US—less than 10% of that legally.

BETTING/FANTASY CONVERGENCE

SO WILL SPORTS BETTING inevitably replace fantasy sports? Or could it be the other way around—that DraftKings and FanDuel fantasy sports, for money, comes to dominate the sportsbook?



FORCES DRIVING CONVERGENCE

01 VEGAS

More people are going to Vegas than ever in history. And they are spending more than ever in history. But fewer of them are betting. Instead, they're going to Vegas for the shows, parties, conventions, clubs and restaurants. With gaming revenue flattening, casinos are looking to innovate—and angling to attract tourists who love fantasy sports to their sportsbooks.

02 FANTASY

Fantasy has to (and will) change. Daily fantasy's legality will be resolved by creating protections for newbies so they aren't suckered into the games only to be slaughtered by high-volume experts. Is daily fantasy a skill? In fact, it's so much a skill that the highly skilled have it in the bag. Your odds of winning at daily fantasy are similar to your odds of beating Steph Curry in a free throw contest.

03 STATES

States want the revenue. Lawmakers have woken up to the way their citizens travel out of state to gamble, and many states have licensed new casinos to keep the money in state. On top of that, illegal gambling costs the states hundreds of millions in lost tax revenue, which instead funds organized crime.

04 GLOBALIZATION

Globalization brings us into regular contact with the other model, used by many other countries: licensed sportsbooks contribute taxes that fund regulators who protect consumers and the integrity of sport.

05 LEGALITY

For leagues to get a piece of the action, it has to be legal. In Europe, pro teams get significant jersey sponsorship deals from betting operators—Real Madrid was being paid \$20 million a year by BWIN. In Korea, nationalized sports betting funds the country's sports programs and even builds their stadiums. In the US, leagues get zilch.

57.4M FANTASY PLAYERS IN NORTH AMERICA, 2016

\$85B ESTIMATED ILLEGAL SPORTS BETS BY AMERICANS, 2016

HOW FANTASY GOT IN TROUBLE

Fantasy grew rapidly into a \$1.1 BILLION industry mostly on advertising revenue. Then it upped the game by offering "prizes" and the market tripled. A race for market share ensued.

A "lottery effect" distorted the market. Fantasy sites found that new players flocked to whoever advertised the biggest prize pools (not the best odds). In order to increase their prize pools the fastest, fantasy sites had to allow players to enter more than once. (If everyone played twice, that would double the prize pool.)

Wall Street traders and poker pros didn't just play twice—assisted by computer scripts and optimization software, these high-volume sharks created as many as 1,000 lineups a day, putting over \$100,000 on the line regularly. The scripts allowed them to make last-minute adjustments to their lineups to take advantage of gameday breaking news.

Officially, the odds of winning were always 50%. Finish in the top half of players and take home your share! But the reality couldn't be more different. In MLB fantasy, **91% OF THE PRIZE MONEY WAS BEING WON BY ONLY 1.3% OF THE PLAYERS.** DraftKings data showed that over 89% of players lost money.

SHARKS IN ACTION

SAAHIL HILSUD reacts to news on Twitter that Channing Frye is getting an unexpected start for the Orlando Magic. Computer scripts enable him to add Frye to 400 of his lineups. Hilsud wins 1st place in a DraftKings prize—and also 3rd, 4th and 7th, taking home hundreds of thousands in one night, adding to the \$3 million he won during the year.

NEW SHARK REPELLENT

"We will be heavily promoting a variety of ways to protect the casual player, including Beginner Contests, the capacity to challenge a friend in a direct Head-to-Head, and the ability to play in a pool with your Facebook friends. You won't be getting matched up against anonymous multi-bettors anymore. We're also regulating and approving the scripts in use."

—Rick Cordella, FanDuel board member

NFL Week 16—**ERIC HAFNER** pays over \$30,000 in entry fees on 20 lineups. After the morning games, in good position, he switches his lineups to favorites to protect his lead. When the afternoon games end, he downloads the entire DraftKings database to analyze his competition's positions. Hafner wins \$1.6 million.

Since their regulatory showdown in New York, DraftKings and its competitors are introducing fair-play features aimed at both bringing back casual players and appeasing the regulators.

Entry fees now as low as \$2 successfully entice free players to convert. In 2010, 74% of players played for free. Now it's inverted—70% pay entry fees.

The Friend or Foe question has been soundly answered. Fantasy is not a replacement for being a fan, it's additive. Data shows that fantasy players consume 40% more sports content after becoming players.

SPORTSBOOK IN THE SPOTLIGHT

THE CHANGING CASINO SPORTSBOOK ECOSYSTEM

A typical big Strip casino in Vegas (there are 23 of them) accepts about \$60 million in bets at their sportsbooks annually, profiting \$3.2 million. There are 197 sportsbooks in all.

Of the \$4.3 billion bet on sports last year in Nevada, 37% was on football, 28% on basketball and 17% on baseball.

The growth is solid—it's doubled since 2003.

But this is still peanuts compared to slot machines, which bring in 30 times the revenue and profit.

And slot machines' popularity has never recovered to its 2007 highs.

ONLY 4% OF FIRST-TIME VISITORS TO LAS VEGAS SAY THEIR PRIMARY REASON FOR COMING IS TO GAMBLE.

ORGANIZED CRIME IS AT THE CENTER OF THE DEBATE OVER THE LEGALIZATION OF SPORTS BETTING.

PRO

ORGANIZED CRIME'S REVENUE STREAM CAN BE CUT OFF BY CHANNELING SPORTS BETTING TO LEGAL, LICENSED OPERATORS.

IN THE UK, FANS BET \$12.3 BILLION LEGALLY IN 2015, CONTRIBUTING \$2.2 BILLION TO GOVERNMENT COFFERS.

CON

LEGAL BETTING HABITUATES THE FANS TO GAMBLING, THEN ILLEGAL OPERATORS RECRUIT THE BETTORS WITH IMPROVED ODDS OR SPREADS. IN ITS MOST RECENT CRACKDOWN ON ILLEGAL GAMBLING DENS, INTERPOL CONDUCTED 4,000 RAIDS, ARRESTING 4,100 PEOPLE IN 11 COUNTRIES ACROSS EUROPE AND ASIA.

MATCH-FIXING SCANDALS

Few Americans are aware of how prevalent match-fixing scandals are.

68 different match-fixing scandals have been discovered in the last three years, some of which are single-game scandals (a Wimbledon player declaring a bribe attempt), others of which were more pervasive—affecting 15 soccer games in Korea, 19 in Turkey.

An ongoing Europol investigation into a syndicate out of Singapore has revealed bribes in 15 different countries on soccer—including a Champions League game played in England, and qualifiers for both the World Cup and Euros. 700 games are under investigation. 50 people have been arrested; 425 additional team officials, referees and players are under suspicion.

Because bets are placed in one country on games played in another country, the most globalized sports are the most vulnerable—soccer, cricket, tennis and soon, basketball.

PRO LEAGUES' NEW PARTNERS

Preparing for the era of convergence, pro leagues are making investments and cementing relationships with technology companies that play a role in the betting ecosystem.

NBA & NUMBERFIRE, which uses algorithms to make recommended bets on pro sports.

NFL & SPORTSRADAR, which provides real-time statistics to bookmakers.

MLB & SPORTIM, whose parent company provides software for bookmakers.

HOW SPORTS BETTING COULD BECOME LEGAL IN THE US

Sports betting gets legalized by transforming into something that looks and feels a lot more like fantasy sports.

STEP 1 Daily fantasy plays the role in the process that medical marijuana did, softening people's preconceptions of betting as a black-market business.

STEP 2 States already run lotteries; in many other countries, sports betting is nationalized. The most common form is **sports toto**, in which you have to pick all the winners on any given day or weekend—a hybrid of fantasy, gambling and the lottery.

STEP 3 Savvy politicians who don't want sports teams leaving town will realize that a sports toto game can fund construction of a new stadium. Much like with marijuana, the legality changes state by state.

WHY FANTASY COULD TAKE OVER GLOBALLY

TO END MATCH-FIXING. Because fantasy results are always based on performance statistics from an array of players, it's invulnerable to match-fixing bribes and scandals. The fantasy format is ranked the lowest risk to the integrity of sports by world bodies. As match-fixing endures worldwide, and possibly accelerates with globalization, fantasy could emerge as the answer, socially and politically.

THE KIDS PREFER IT. 32% of all American teens have played fantasy (vs. 18% of adults). American teens have long stamped their print on world trends. Then consider that even where sports betting is legal, you have to be 18 years old to bet. So most teens will start with free fantasy, then at age 18 start paying entry fees rather than switch to traditional sportsbook betting.

IT'S A BETTER FAN EXPERIENCE. Fantasy sports is intellectually and emotionally engaging. It's far more complex than betting on single games, and it puts fans in the more empowered role of coach or GM. It makes fans care about all the teams and all the players, not just their favorite team.

MAKE NO MISTAKE: TRADITIONAL PROFESSIONAL SPORTS ARE AT RISK OF LOSING A SIGNIFICANT PORTION OF THEIR FUTURE AUDIENCE. Millions of post-millennials around the world are growing up idolizing eSports champions like Lee “Faker” Sang-hyeok of South Korea and Enrique “xPeke” Martinez of Spain. They’re not rooting for the Vikings or the Packers or the Yankees—they’re rooting for Evil Geniuses and Virtus.pro. For them, the biggest sports upset story in recent memory is not Leicester City FC taking the Premier League title—it’s CDEC Gaming taking \$2.8 million at The International 2015 Dota 2 Championship.

THE EPIC BATTLE

vSPORTS

FIFA AND PES | MADDEN | NBA 2K | NHL | MLB THE SHOW | UFC

vSPORTS—video game versions of traditional sports—have been proven to create new fans for the stick-and-ball sports they depict. Now the race for the Gen Y and Z fanbases is on, and every sport, league and franchise must step up its vSports game or face long-term irrelevance.

FEMALE GAMERS

Contrary to stereotype, women make up nearly half of gamers, thanks to gaming on smartphones and social media.



When FIFA added women’s national teams to console play, it took just 16 days for American striker Alex Morgan’s in-game alter ego to score 1 million goals.



GAMERGATE harassment online is keeping female participation down in eSports.

UNINTERRUPTED FIFA

The EA FIFA franchise is vSports’ big star thus far. With 2.3 million Interactive World Cup worldwide qualifiers in 2016, FIFA is the largest eSports competition in the world. Nine million games are played every day. And in-game purchasing is fairly evolved, with 2016 sales reaching \$650 million. In the first 16 days after its release, 1.5 billion hours of FIFA 16 were played online.



Genuine competition from Pro Evolution Soccer keeps FIFA quality high.

IN-GAME ADVERTISING

Advertising real brands inside eSports fantasy games destroys the narrative. But advertising and sponsorship is part and parcel of sports games; it makes them more legitimate and real.



Advertising inside sports games is expected to spike dramatically.

The traditional sports industry can’t assume these kids will just come around eventually. eSports has the Cool Factor. It’s truly global in a way that only soccer can rival. Its athletes are drug-tested. And it has a massive head start.

eSPORTS



GLOBAL REACH

Sports like volleyball and field hockey, which are among the most popular participatory sports in the world, lack successful video game editions.

Madden, the undisputed leader in the USA (4.6M units sold), sells only 11% outside the US.

Sales of NBA 2K leapt 28% in Europe when EA added 25 Euroleague basketball teams. NBA 2K is now the 8th most popular video game in China.

BETTING

Sites like Vulcun, Unikrn and AlphaDraft have several million eSports fans betting on eSports results and creating eSports fantasy teams.



“We’re never doing sports video games. Never. It’s not what our community wants. We don’t consider sports video games to be true eSports.”

—Rahul Sood, CEO and cofounder of Unikrn, a leading eSports betting platform

eSPORTS FOR ALL SEASONS

There is no such thing as League of Legends 2017—the game just **updates automatically**, and everyone in the world is playing the same game. vSports’ reliance on up-front sales and annual editions means gamers are segmented. Half the audience for any sport is playing versions that are often two years old or more.

MORTAL CONSOLES

Most eSports are played on PCs, which can be kept current (i.e., today’s hardware). They run on dedicated **servers**, so the signal quality (“ping”) is not limited by your opponent’s hardware.

vSports are played on **consoles** that last around five years. Current 8th gen consoles, PS4 and Xbox One, are 2013 hardware, with only occasional firmware updates. Consoles use peer-to-peer technology for players to connect.

LEVEL PLAYING FIELD

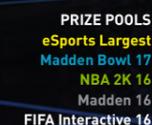
eSports fans laugh with disgust that vSports games are secretly engineered to make it easier for a losing opponent to catch up late in a game. They don’t consider vSports to be “real” games at all—merely **“sports simulations.”**

PRIZE MONEY

The prize for winning FIFA Interactive 16 was only \$20,000. Madden 16 offered \$50,000. These were tiny fractions of the prize pool in eSports.

Realizing the importance of bigger prize money, NBA 2K 16’s “Road to the Finals” awarded the winners \$250,000.

Madden Bowl 17 announced a \$1 million prize pool, which still would rank only 23rd in the biggest eSports prize pools ever.



JUST AS COLLEGE IS WHERE WE INCUBATE the next generation of athletes, college sports will become the incubator for the intersection of new technologies and sports fandom. The era when college sports tried its best to mimic the look and feel of professional sports is over. Increasingly, the tables will be turned—it'll be pro sports leagues that need to keep an eye on how college sports are being played, produced and consumed.

COLLEGE MEGABUSINESS

INNOVATION ON CAMPUS

Snapchat started at a Stanford frat house. Reddit was founded by University of Virginia roommates. Facebook emerged from the Harvard campus social scene. Dropbox was created by MIT students. There's a long tradition of tomorrow's companies being hatched by a few students, and sometimes an encouraging professor, solving a problem that the rest of the world didn't even realize it had. From finding an endaround to skip lines to enter a stadium and clear security, to making low-cost video production look better, there's a good chance someone on a college campus will contribute to the solution.

CATS STATS

DAVIDSON SPORTS ANALYTICS

In 2010, a March Madness bracket created by Davidson math professor Dr. Tim Chartiers and his students at Davidson beat 99.9% of more than 5 million brackets nationally by successfully predicting Cinderella upsets. In 2013, Chartiers and his math students began advising the Davidson Wildcats basketball team on strategy. The next year, when the university left the Southern Conference for the much more challenging Atlantic 10, the Wildcats were predicted to finish 12th. Instead, they won—with Chartiers' students running all the analytics. Cats Stats has now consulted for the NBA, ESPN and various fantasy sites, and they created the NBA's popular new "Hustle Stat" used during the 2016 playoffs.

2010 DAVIDSON SPORTS ANALYTICS



STRIVR

A partnership at Stanford between the football team's former kicker, Derek Belch, and virtual reality professor Jeremy Bailenson has emerged as the first VR training system that's already making money and altering the outcome of games. STRIVR is now working with more than a dozen NCAA teams and seven NFL teams.

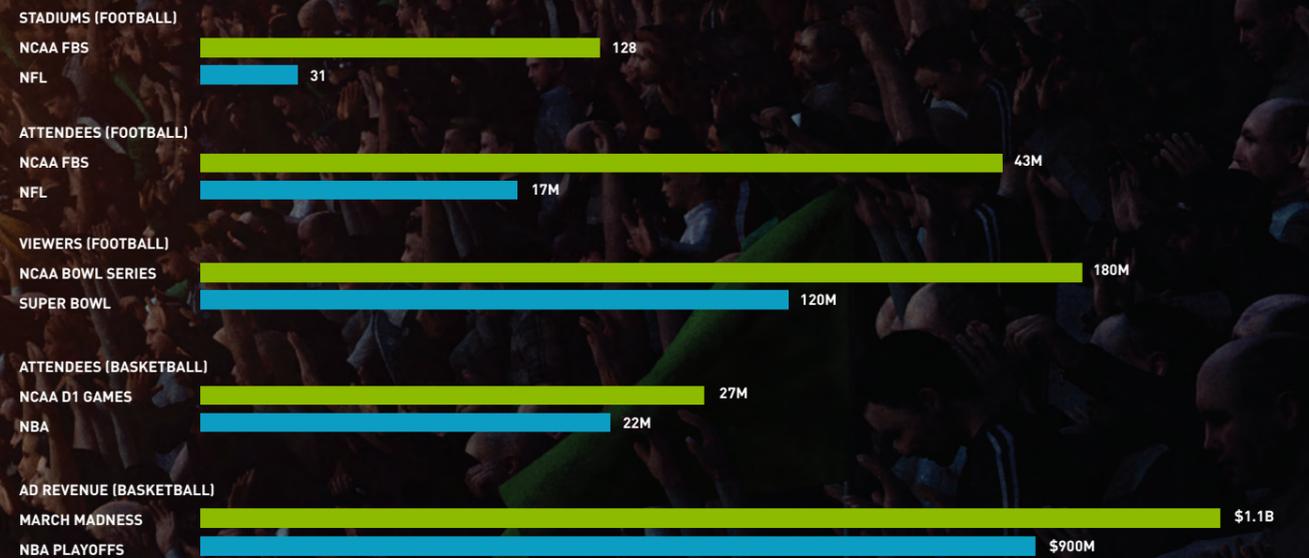
RECIPE FOR SUCCESS

- All the necessary ingredients for this innovation leapfrog already exist on university campuses:
- CHEAP (FREE) SKILLED LABOR • PROFESSORS AND STUDENTS COINVENTING NEW COMMUNICATIONS TECHNOLOGY •
 - A BUILT-IN FANBASE WITH A GENUINE ROOTING INTEREST • TOP-OF-THE-LINE HARDWARE AND SUPERFAST INTERNET •
 - TELEVISION NETWORKS EAGER FOR CONTENT • AN ARRAY OF TEAMS DESPERATE FOR A LARGER AUDIENCE •
 - APPETITE FOR DISRUPTION—A MANDATE TO INNOVATE •
 - INTIMATE UNDERSTANDING OF HOW THE NEXT GENERATION CONSUMES SPORTS

ONLY THE PLAYERS ARE AMATEUR

The biggest misconception about collegiate athletics is that it's not a professional industry—that it's somehow amateur hour just because the athletes are not paid. Some call it a sleeping giant—but it's not sleeping, and it's already a giant.

COLLEGE VS. PRO



"All the work is done by students. Data is never the transformative element. It's the insight that creates the value of data."

—Dr. Tim Chartiers, Davidson University, professor of mathematics

"We have scary stats. We have stats that show that quarterback watched that blitz package 19 times the night before the game—and during the game, he spotted the blitz and it led to a gain of 35 yards."

—Derek Belch, CEO, STRIVR

\$2.7M AUBURN'S COST TO SEND 370 PEOPLE TO THE 2014 BCS NATIONAL CHAMPIONSHIP

\$2.6M PAYOUT TO AUBURN FOR MAKING IT TO THE GAME

\$6.3B*

COMBINED REVENUE, ATHLETIC DEPARTMENTS, POWER 5 CONFERENCES

* DOUBLED OVER LAST DECADE

\$280M

UCLA'S APPAREL LICENSING DEAL WITH UNDER ARMOUR

\$100M

ANNUAL BUDGET, EACH, 24 ATHLETIC DEPARTMENTS

HELLO? OVER HERE!

Sure, college football is huge. And March Madness deserves its nickname. But many of the more niche sports also play a key role in cementing the relationship between schools and their alumni (and their money). While most other sports do need a subsidy, that doesn't mean some of them aren't packing in crowds. Here's our list of where it's happening in college's "other sports."

All around the country, sports fans are discovering what they're looking for in college's other sports. This is how it starts, and slowly, quietly, out of the limelight, it grows. Women's college D1 basketball this past season was attended by over 8 million fans.

UTAH GYMNASTICS averages **14,682 fans** in attendance at Utah's Huntsman Center, which seats 15,000. (Women's gymnastics meets are the third-most viewed events on the Pac-12 Network.)

MINNESOTA HOCKEY The Golden Gophers get over **11,000 fans** per game.

LSU BASEBALL The Tigers average **10,726** at the gate, and that's for 34 games. The College World Series is also a standout, bringing in over 23,000 per game and over 350,000 for the series.

IOWA WRESTLING averages over **8,300 fans** per dual meet. For the 2015 season opener against Oklahoma State, they moved the meet to Kinnick Football Stadium. 42,287 fans watched their Hawkeyes win.

TRACK & FIELD at Oregon gets **7,500 fans** to dual meets. But the big numbers are at the multi-school relays. The Texas Relays and Drake Relays attract 15,000 fans per day, while the Penn Relays had 45,000 fans on the final day and over 100,000 in total.

HAWAII VOLLEYBALL The Rainbow Wahine are can't-miss entertainment in Honolulu. The women's team has led the nation in attendance for two decades—averaging over **6,800 fans** now. Top-ranked volleyball teams all over the country are regularly drawing over 5,000 fans to important games.

SOCCER IN PORTLAND AND LOUISVILLE The women's team in Portland and the men's team in Louisville lead the nation in attendance, both with over 3,000 fans on average—but the game of the season is always on the coast of California, when UCSB plays Cal Poly in front of **14,000 fans**.

NAVY LACROSSE pulls in over **3,800 fans** per game.

ALABAMA SOFTBALL averages over **3,000 fans**. The College Softball World Series sells over 75,000 tickets.

TCU TENNIS Over **2,000 fans**.

IS FOOTBALL WORTH IT?

Academics on campus frequently question whether so much money should be spent on college football programs. For the most part, these catcalls from faculty are rhetorical. Should a coach really be the state's highest-paid employee? Is a state-of-the-art locker room going to help any student study? No need to respond.

But when UC Berkeley professor Michael Anderson and the National Bureau of Economic Research analyzed NCAA win-loss probability ratios to determine performance metrics of all Division I football universities, they discovered the math does not condemn the investment in football. In fact, it's the other way around. Having a winning program—and every additional win per season, from 5.9 wins per year upward—increases donations to the university by \$100,000. It's not that more alumni give; it's that the same alumni donate more.

\$100K PER-WIN INCREASE IN UNIVERSITY DONATIONS OVER 5.9 WINS/YEAR

But what's most surprising is the connection between success on the football field and a college's academic metrics. Every additional win on the field leads to:

- An increase in applicants, which allows the college to be more selective
- A higher average SAT score for incoming freshmen
- A boost in the school's "Academic Reputation," which is a measure based on polling of university presidents around the country

SO WHILE FOOTBALL PLAYERS MAY OR MANY NOT SUCCEED IN THE CLASSROOM, WINNING FOOTBALL GAMES WILL DRIVE UP THE ACADEMIC STANDARD FOR THE STUDENT BODY AS A WHOLE.

"The data suggests the relationship [between winning football games and total college academic standards] is robust and twice as strong as in any previous study."

—Michael Anderson, UC Berkeley

WILL SPORTS SAVE COLLEGE?

PUNDITS WILL ALWAYS MAKE THE CASE THAT COLLEGE SPORTS WON'T LAST IN AMERICA—we'll become like the rest of the world, where athletes develop in sport-specific youth academies and professional minor leagues. Meanwhile, the future of college education is increasingly uncertain in the face of online learning; even Goldman Sachs has warned that the cost of college is becoming unjustifiable, as it takes an average of 10 years post-college to reap the return.

WHO ARE THEY KIDDING? Study after study has found convincing evidence that athletic participation at college goes hand in hand with academic progress and career success. So far, the accessibility of online learning has actually increased the demand for spots at four-year colleges. Online learning is simply the gateway, the on-ramp—and the bigger the on-ramp, the rowdier the crowd. Sports are an essential component of college. Both playing for your college team—and rooting for your college team—are highly correlated with long-term satisfaction with the collegiate experience.

DON'T JUST TREAT INJURIES. PREDICT THEM—AND AVOID THEM ALTOGETHER. Machine-learning software systems have been turned loose on the avalanche of athlete performance data coming from new sensors that are wearable, implantable or ingestible. Not only will overuse injuries be avoided—so will contact injuries that were previously considered random accidents.

MACHINE MEDICINE

Historically, sensor data has been used to monitor workload during training weeks to pinpoint fitness levels. Players first wore vests, then chest straps. In two quick years, the technology has shrunk from wristbands to waist clips to sensors no bigger than a band-aid. **Now a sensor can be attached as a temporary tattoo, and soon they will be commonly implanted under the skin.**

But more important than the sensor size is the increasingly accurate and complex data that is being harvested. Finding once-hidden biometric patterns in individual athletes has become possible. Some players get injured when they train too hard. They have a steady slope pattern. Other players push through an upper limit, and only by training very intensely do they reach a zone where they don't break down. They have a roller-coaster pattern. **Every athlete has her own equivalent of a pitch count.** With new technology, coaches can learn how hard to train an individual athlete—without overtraining.

Even “freak” injuries are avoidable. A majority of contact injuries have been considered random. Who could predict an opponent would fall in front of your player and cause him to hyperextend a knee? It turns out that fatigue significantly affects reaction time, reducing peripheral vision and increasing the odds of injury. Tired athletes incur a much higher rate of contact injuries than fit, well-rested athletes, who spot impending contact and make adjustments to avoid it.

The connection between lost dollars and lost games is quantifiable. For every \$2.3 million in salary cap dedicated to players on the disabled list, the average NFL team will lose one additional game. Salary wasted on injured players accounts for as much as 89% of the variance in NFL teams' win-loss records.

A TALE OF TWO SEASONS

Five professional teams used Kitman Labs' machine-learning injury-prediction system during their 2015 seasons to identify warning signs of potential injuries.

| YEAR 1 | YEAR 2 | | |
|---|--|---|--|
| Teams averaged 143 injuries each—58% slight and 15% severe or season-ending. Injuries lasted an average of 31 days. | 22% FEWER SLIGHT INJURIES | 41% DECREASE IN TOTAL DAYS UNAVAILABLE DUE TO INJURY | |
| | 31% DROP IN SEVERE INJURIES LASTING A MONTH OR LONGER | 65% DECLINE IN SEASON-ENDING INJURIES | |

RFID TAGS on clothing and equipment can track the movements and speeds of whole teams of players, providing coaches with new data for training and player selection.

FIBER HEART RATE monitors in clothing will send information about your heart rate to an app, eliminating the need for an extra bulky device.

RIBBONS Sensors printed on thin ribbons of plastic that will attach to any part of the body to continuously sense the health of the wearer, including monitoring glucose levels or biomarkers for stress, fatigue or disease.

IMPLANTABLE sensors will be able to communicate blood data and they'll never have to be charged. Researchers at North Carolina State University have developed a prototype of a flexible thermoelectric generator that harvests up to 50 microwatts of electricity using body heat.

SWEAT Monitors measure chemistry of sweat, including levels of glucose, lactate, sodium and potassium.

WRISTBANDS that can measure movement and heartbeat have become nearly required gear for even casual athletes.

MOUTHGUARDS like the FitGuard gauge the level of force when athletes experience impact during play, to quickly determine the risk of concussion and whether they should be allowed to keep playing.

SALIVA Fluid-sensor mouthguards can detect the levels of lactate buildup in saliva to let athletes or coaches know when they are approaching muscle fatigue.

3D MOTION CAPTURING technology can scan an athlete's movements and determine the alignment and strength of muscles.

SMART SHOES / SOCKS can measure impact and monitor cadence of your strides. Sensoria Smart Socks, for example, employ sensors in the sole and ankle that communicate with an app on your phone to provide real-time feedback to help you maximize your pace and form. Similarly, Stridalzyer insoles assess the location and level of your impact on your feet and send data to an app about potential injuries.

SENSOR KEY | **CURRENT** motion and heartbeat | **NEXT GENERATION** chemical | **FUTURE** on / inside the body

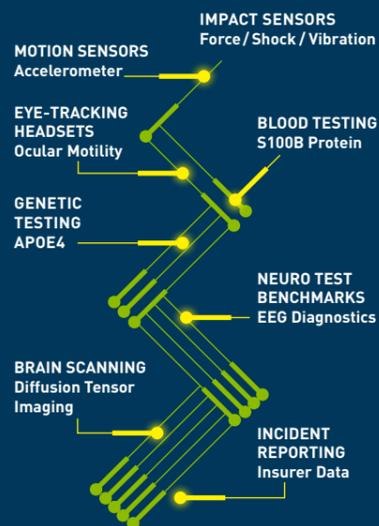
EVERY YEAR 10%–30% OF PLAYER SALARIES ARE WASTED DUE TO INJURIES



CONCUSSION-FACTOR ANALYSIS

Boxing at the Rio Olympics eliminated headgear, due to a counterintuitive finding from the International Boxing Association: headgear was correlated with more concussions, not fewer. Not only does the soft padding not stop blunt force hits, but the bigger target leads to more head whips from blows. Concussion research is about to take huge strides as data is aggregated from an array of new sources. Motion and impact sensors on helmets, mouthguards and headbands are just part of it. Eye-tracking headsets have jumped from the labs to the sidelines to test athletes' brain function immediately after any blow. Blood tests can now spot concussive trauma through elevated levels of the S100B protein. Every high school is requiring preseason benchmark neurological tests; insurers of youth leagues are now mandating head trauma incident reporting. All this data will be crossed with genetic testing for the APOE4 variant, which has been linked to concussions, and artificial intelligence will discover patterns heretofore unseen. Should helmets be hard and super-slippery to deflect impact? Or should they crush like car bumpers to absorb impact? We're about to find out.

CONCUSSION ANALYSIS



DATA IMPLEMENTATION

So much data is being collected, in so many novel ways, that we can be distracted from the real question: what are we going to do with it?

IN-GAME PERFORMANCE DECISIONS.

The data can tell you the starter runs 20 mph in practice, while the second-stringer runs 19 mph. On game day, sensors will alert the coaches that the starter has dropped to 17 mph with fatigue, and it's time to sub in the bench player.

PUBERTAL STATUS CALIBRATION IN YOUTH SPORTS.

Forever, youth sports talent identification has famously favored older athletes within a given age bracket who are more mature. But late-blooming 15-year-olds can't really be fairly compared to 13-year-olds, either. Sensors and machine learning

will finally solve this conundrum, factoring skeletal age and hormone escalation into player experience and performance metrics to make sure the players with the most potential are picked over the players who merely hit puberty early.

CAREER EXTENSION. We don't really know whether aging athletes, in order to compete, need to put in double the training load or if they need to emphasize getting rest between workouts. The science of career extension is not really a science yet—mainly hunches and anecdotes. "Recovery" will become an accurately measurable event, parsed through tangible factors. Expect to be surprised; much of the "wisdom" we take for granted will be overturned.

| WHAT EVERY COACH KNOWS | WHAT SCIENCE HAS FOUND |
|---|---|
| MUSCLES PRODUCE LACTIC ACID AS A BY-PRODUCT WHEN THE BODY SHIFTS FROM AEROBIC TO ANAEROBIC EXERCISE. | AS MUSCLES FATIGUE, THEY DEPOLARIZE LIKE WORN-DOWN BATTERIES, LOSING POWER. LACTATE COUNTERACTS THIS DEPOLARIZATION. |
| LACTIC ACID CAUSES SORENESS AND NEEDS TO BE CLEARED IN ORDER TO PERFORM AGAIN. | SORENESS IS MUSCLE FIBER DAMAGE AND INFLAMMATION. LACTATE TRIGGERS CELLS TO PRODUCE MORE MITOCHONDRIA, THE FACTORIES OF ENERGY. |
| HIGH-PERFORMANCE ATHLETES PRODUCE LESS; IT'S A WASTE PRODUCT AND NOT USED FOR FUEL BY THE BODY. | HIGH-PERFORMANCE ATHLETES BURN IT UP BETTER; 75% OF LACTATE IS USED AS FUEL FOR MUSCLE CONTRACTIONS. |

"We aren't quite to the stage where we can scan you with a tricorder like the ones they use on 'Star Trek' and diagnose your medical condition, but we're getting there."

—James Watkins, professor of polymer science and director of the Center for Hierarchical Manufacturing

DATA PRIVACY

Controversies between players, teams and leagues over data privacy are inevitable.

Players want to keep their biometric data private. Teams will want to share the biometrics to engineer trades. Leagues will want to sell the data as streams, either to apps that visualize the data to enhance storytelling or to fantasy players who want a leg up on their competition. ("Don't play Johnson today—his hematocrit ratio is low.")

EXPECT CLASS-ACTION LAWSUITS, likely from players or from media. Much like MLB's legal battles a decade ago with fantasy sites over statistical data, courts will be asked to rule on whether specialized data is "historical news," and therefore can't be owned. Courts will also decide whether players have rights to the data measuring their performance, even if it's collected and held by the teams. Likely, biometric/health data will be viewed differently by the courts than performance data.

Contracts today include performance bonuses and body-weight clauses. **THE CONTRACTS OF THE FUTURE WILL CONTAIN SPEED AND STRENGTH STANDARDS TO MAINTAIN**—and biometric marker levels to meet. Just as today's players

hire private trainers, professional athletes of the future will hire their own experts not only to acquire health and performance data, but also to analyze those metrics.

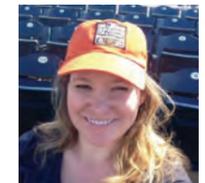
EVERYONE INVOLVED WILL WORRY WHETHER THE DATA HAS BEEN TAMPERED WITH. How do we know a statistician hasn't altered the numbers to make a player more attractive?

THE ANSWER LIES IN BLOCKCHAIN TECHNOLOGY like Tierion, which can:

- Guarantee that data is time-stamped and unaltered.
- Require passcodes to view the data.
- Track data wherever it goes on the internet, making sure the rights holders are paid.

"Many of these technologies, such as wearables and video, are still new and the data can be inaccurate. We have seen wearables giving wrong data as often as 30% of the time. Numbers also tend to be calibrated for male rather than female athletes. If we're making health and safety decisions with the wrong data, we're putting our athletes at greater risk and diminishing trust in the technology hype. Improving data accuracy is critical as the industry moves forward."

—Jane Gideon, CEO, WellPlayed Sports



"The players don't get the data, it's fed to the coaches right after practice. And in the locker room, **there is definitely fear among the players about all the data being collected.** We're afraid we're going to get cut, because the data will be able to spot a decline in our performance that can't be spotted with the naked eye."

—Doug Baldwin, Seattle Seahawks wide receiver



Photo by Kevin C. Cox/Getty Images

\$14.9B 2021 SPORTS & FITNESS PERFORMANCE WEARABLES MARKET

ALT-ATHLETES HAVE LITTLE INTEREST IN SITTING IN THE STANDS AND ROOTING FOR A TRADITIONAL PROFESSIONAL SPORTS TEAM. They don't want to watch—they want to play. While the Alt-Athlete may not be clearly identifiable by the team logo they wear on a jersey or hat, they are the fastest-growing market—76% of all regular exercisers are millennials—with a thirst for new products and technological advances that help them reach that next goal.

ALT-ATHLETES

Alt-Athletics aren't just about exercise, they are about finding meaning, identity and belonging. Climbers and surfers look for experiences that connect them with natural environments. Yoga and Tai Chi devotees seek cross-cultural spiritual transcendence. For runners, the ultimate prize is not just a faster time, it's triggering the body's endogenous chemicals to reach the Zone.

42% of the US health club market is now composed of studios catering to specific Alt-Athletics like yoga, pilates, Brazilian jiu-jitsu, dance, rock climbing, CrossFit, etc. These sport-specific chains have been adding new studios at a rate of 450% per year since 2010. At this rate, alt-athlete gyms that cater to specific activities will very soon outnumber the traditional gym.

SPORT-SPECIFIC FITNESS STUDIOS

42%
OF ALL US
HEALTH CLUBS

450%
MARKET GROWTH
SINCE 2010

THE VIRTUOUS CIRCLE OF THE CASUAL AND HARD-CORE ALT-ATHLETE

| CASUAL | HARD CORE |
|--|---|
| Usually engages in several different alt-athletic pursuits in a month. Identifies very much as an active person, if not a sport-specific athlete. They find fellow enthusiasts on social media. Major market for general Alt-Athlete gear such as GoPro, outdoor clothing, sunglasses and camping gear. Hires the hard-core Alt-Athlete as a trainer, a guide or a guru. As gear and shared information continue to make sports more accessible, the garage will continue to fill up, and the calendar will always be full of activities and adventures. As the casual Alt-Athlete ages, she will adapt to doing less extreme versions of her sports, and she will look for accommodations that allow her to keep going at a safer and less intense level. | Often sponsored (with products, money or free travel) by a half dozen or more clothing or gear brands. Early in life, competed at the highest level; as they age, they find work as a coach, trainer or guide. The hard core have old-school legitimacy, and they guard and preserve the lore and ethics of the sport. Hard-core Alt-Athletes will be the ones to drive their sports to the next level of public engagement. Some will launch companies making specialized gear or authentic apparel. Others will leverage their status to become commentators for burgeoning media channels, and they'll become consultants for the growing number of events and competitions. |

"These individuals are often interested in fitness, but they're also interested in some kind of self-realization, self-verification; that they have a special talent or a special individual characteristic that they can be known for. Add to that technology, and then stir with social media."

—T. Bettina Cornwell, professor of marketing
Lundquist College of Business at University of Oregon

WE ARE IN THE EARLY DAYS OF A SOCIAL TECHNOLOGY REVOLUTION THAT IS TRANSFORMING SOLO ACTIVITY INTO TEAM FITNESS. Once fiercely individualistic, the Alt-Athletes are banding together around shared achievement. Networked by smartphones and social media, they crave connection with their fellow enthusiasts. Video channels featuring Alt-Athletics draw millions of views and make individual athletes famous. New competitions and events are selling more tickets and packing in rowdier crowds. The sweaty sports fringe is going mass-market.

ALT-ATHLETICS IS MASH-UP CULTURE

Alt-Athletes have reenergized ancient activities like yoga, rock climbing and distance running. They have also created wholly new enthusiasms like parkour, skateboarding and bungee jumping. Perhaps even more interesting, millennial Alt-Athletes have begun to mine the activities of their youth with traditional sports to create new games. Snowboarding is a combination of surfing and skiing. Disc golf is a mash-up of Frisbee and golf, while Ultimate combines Frisbee with soccer. Kite windsurfing is a hybrid of surfing, sailing and parachuting. Dodgeball has been reinvented on trampolines. Paddleboarding is a mash-up of mucking around in a canoe and paddling big wave surfboards over to breaks. Everything old is made new again and the combinations are endless—there are no rules like in other sports. So as soon as underwater foils were invented, they spread virally from sailboats to windsurfing to surfing.



"What we really think about is what we see in our community, and when we hold a mirror up, we see people who are striving. They're trying to find their personal best, they're trying to find another level for themselves and are unlocking their potential through the power of sport."

—Andrew Vontz, global brand manager and head of communications, Strava

\$8.5M ACTION CAMERAS SHIPPED WORLDWIDE IN 2015

\$27B AMERICAN SPENDING PER YEAR ON YOGA CLOTHING, CLASSES AND PRODUCTS

19M AMERICANS WHO FINISHED RUNNING A RACE IN 2015

ENDLESSLY INVENTIVE, WHAT'S NEXT?



01 APPAREL

Polyethylene, the most common plastic, seems to have no limits on how it's fabricated. Long-molecular chain Dyneema cloth is 15 times more **RESISTANT TO ABRASION** than carbon steel; its bike shorts and tights have already saved the thighs of several Tour de France riders. Fabrics with **BUILT-IN SENSORS**, like from Athos, can measure not just how your limbs move, but how each muscle group is engaged, providing immediate feedback on your form. Fabrics are also being made out of **ACTIVE PARTICLES** that can improve on the body's natural process to disperse heat. The active particles absorb the body's infrared energy, heat up, and attract sweat off the body through electrostatic force, speeding evaporation. Soon athletes will wear **SELF-HEALING TEXTILES** based on the science of biomimicry—engineering inspired by the natural world. For instance, self-healing polyelectrolyte polymers (now in industrial use) are modeled after squid ring-teeth proteins.



02 NATURAL & ENERGY FOODS

Thirty years after the launch of the PowerBar, energy bars will hit the \$9 billion revenue mark in 2017. Gone is the pervasive brown rice syrup in every bar, replaced with **SUPERFOODS** like chia, moringa and carrageenans, or sweeteners like beets and natural erythritol. But the bars of the future will be engineered for more than nourishment, triggering specific metabolic pathways—inspired by the **KETOGENIC DIETS** of extreme athletes who trick the fuel systems in their bodies to burn fat rather than glucose for energy. Next-generation bars and drinks will also be **PERSONALIZED**, based on genomic tests and food-reactivity tests.

03 GEAR

Wearable integrations of technology have been surging, but **3D PRINTING IS TAKING OVER**. Expect customized shoe insoles to be printed in store. Sunglasses frames and bike helmets will be perfectly molded to fit skull shape. Once we can print titanium, every piece of gear can be customized for fit and performance. This effectively demolishes the notion of a product life cycle and all it entails—inventory, shipping, design fatigue. As soon as a new creation has been tested, its 3D blueprints can be distributed, and custom builds can be sold immediately. **NEXT-LEVEL SAFETY** gear becomes increasingly important, as Alt-Athletes pursue their passions in evermore dangerous geography. Beacon technology allows families to know where their adventurers are at all times.



04 HEALTH CLUBS

The \$80 billion health club industry is rapidly evolving to attract Alt-Athletes indoors. There are now over 11,000 CrossFit gyms just in the US. Both encouragement and competition are enhanced by technology, resulting in greater motivation, harder workouts and regular consistency. **GLOBALIZATION** has also driven widespread change. Just five years ago, the Latin American health club market was half the size of the North American market; now it's 30% bigger. The Asia-Pacific market is in the middle of making the same jump. Once-regional activities are bounding onto the world stage. Zumba comes from Colombia, yoga from India, parkour/free running from France. China gave the West Tai Chi, and in return, they have taken up bodybuilding in record numbers, recovering from the communist government's 30-year ban on the sport.

05 THE VIEWING AUDIENCE

If you love baseball, you catch your highlights on MLB Tonight. But if you love running, is there a television show for you? There is now—it's called **Run Junkie**, produced by FloSports out of Austin. Tough Mudder has a network TV show. CrossFit is on ESPN. The Dutch channel INSIGHT features alt-sports shows like **Running the World**, following a parkour-crazed duo around the globe in 360-degree ultra-high definition. The two Ultimate leagues merged and produced their first superstar. With **GROWING SPORTS BROADCAST NETWORKS**, every alt sport has a chance to jump off **YOUTUBE** and gain an audience. You may not know who teen phenom climber Ashima Shiraishi is, but millions of climbing devotees do. Equipped with ever-higher-quality cameras, the Alt-Athlete with the most **INSTAGRAM** followers may not be the best athlete, but he is the best at capturing the spirit, Zeitgeist and aesthetic of the sport.



06 TOURNAMENTS, CIRCUITS & TOURS

In some ways, formal competitions run counter to the free-spirit ethos. In competition, climbers ascend prescribed routes and mountain bikers stay on the path. But in other ways, these new events hew very much to the Alt-Athlete ethos. Ticket holders at **ALT-SPORTS EVENTS** don't like to see themselves as spectators but as participants who regard the top people in their sports less as heroes and more as teachers. These new events are changing the definition of "sports venue"—and are pulling increasingly large crowds and media attention. The US Open of Surfing attracts 600,000 to Huntington Beach; the CrossFit Games packed 50,000 into the StubHub Center for the finale, using the soccer and tennis stadiums as well as the velodrome. This evolution signals a huge opportunity for both venue owners and sponsors to reach new audiences.



"Marketing to this sector is dialing back superstardom and dialing up the realness. There has been a shift to profiling the normal human being who's a lot like me. And that's quite different from the traditional view of superstars who are way out of our league."

—Michael Goldman, professor of sport management, University of San Francisco



50K

ATTENDANCE: CROSSFIT GAMES, STUBHUB CENTER SOCCER STADIUM, TENNIS STADIUM and VELODROME



600K

ATTENDANCE: US OPEN OF SURFING, HUNTINGTON BEACH, CA

THE HIGH-PRESSURE COMMERCIALIZATION OF THE YOUTH SPORTS PIPELINE KNOWS NO BOUNDS.

Costs are skyrocketing, rankings are an obsession, and every contest is a judgment on some kid's future. Lost is the spirit of playing for now. Every year, parents pull their kids out of sports in protest. And every year, even more new families step forward, willing to play the game.

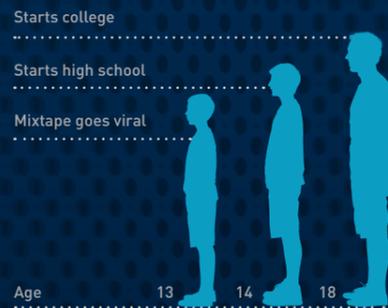
YOUTH SPORTS REFORM

BUT THERE IS HOPE. Aided by data-gathering platforms, governing bodies at the local, regional and national levels can crack down on exploitation of eager athletes and their ambitious parents. Performance-sensor data tracking will inject desperately needed realism, laying bare the snake oil dreams sold by youth sports profiteers.

GROWING UP ON CAMERA

A 6'2" point guard from Columbia, South Carolina, named Seventh Woods recently committed to the University of North Carolina. But that was not his coming-out party. That happened years ago—when he was 14 years old, and the YouTube channel Hoop-MixTape released his highlight clips. His mixtape was viewed 14 million times. Andrew Wiggins was only 13 when he hit fame. Forget waiting until they reach college to declare the next superstar—the internet doesn't even wait until a kid hits high school.

NEW PATH TO STARDOM

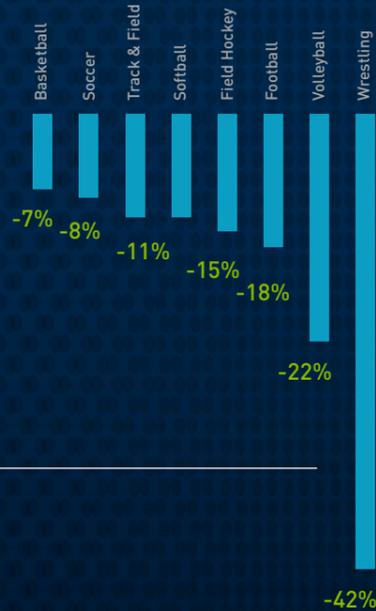


14M VIEWS OF MIDDLE SCHOOLER SEVENTH WOODS' HIGHLIGHTS MIXTAPE

THE DEATH OF SECOND SPORTS

Almost every sport in America is losing youth players, even though the percentage of US teens playing some form of high school sports is holding steady at 75%. How can that be? Under pressure to specialize in one sport earlier, kids increasingly have stopped playing their second sport—despite clear science that shows kids who focus on one sport are the most likely to quit.

PARTICIPANTS IN YOUTH SPORTS OVER THE LAST 5 YEARS



“The more parents spent, the more the kids seemed to feel the pressure of doing well for Mom and Dad.”

—Dr. Travis Dorsch, Utah State University professor and former NFL player who conducted a study showing that the more parents pay for club sports, the more the kids perceive it as pressure.

DOPING RATES

PERCENT OF SCHOOL-AGE ATHLETES USING ANABOLIC STEROIDS & HGH



OVERUSE INJURY

In a study of 1,200 youth athletes, Dr. Neeru Jayanthi of Loyola University found that specialization in a sport is one of the strongest predictors of injury.

83% MORE LIKELY TO BE INJURED

Single-sport athletes
Multisport athletes



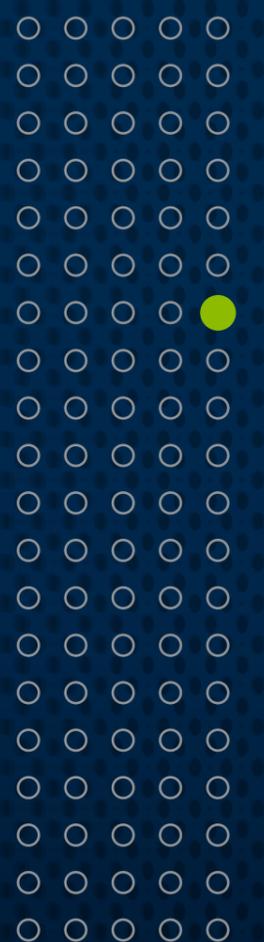
RIPE FOR CORRUPTION

Over 30 million kids. Over 14,000 youth leagues and clubs. It adds up to over \$9 billion annually. Most of that money is flowing through sleepy nonprofits overseen by volunteer parents with lax controls. Most of the money ends up in the pockets of youth club coaches—who are financially incentivized to preach to parents that Johnny's got potential.

The *New York Times* reports that prosecutions for **embezzlement** have become increasingly common, citing examples of hundreds of thousands of dollars being stolen in Washington, Minnesota, New Jersey, Michigan, Maine, Wisconsin and Vermont by youth club treasurers and officers.

Where there's money, there are **lawsuits**. A mom in Virginia sued her daughter's volleyball club after her daughter was benched. When his son was cut from the track team, a dad in Philadelphia sued—for \$40 million. And a Dallas-area dad filed racketeering charges against local lacrosse coaches, accusing them of using their leverage to force players to attend expensive camps.

PREMIER LEAGUE YOUTH ACADEMY PLAYER SUCCESS RATE



“It institutionalizes mass rejection of young people.”

—Chris Green, British soccer journalist and author of *Every Boy's Dream*
An estimated 10,000 players are in the Premier League's youth academies, signed as early as age 8. Only 1 out of 100 will make it.

TECHNOLOGY

IS TECHNOLOGY SOLVING OR FEEDING THE PROBLEM?

Costs of playing are ever rising—between specialized coaches and tournament travel—and the newest expense parents feel they have to fork over for is the video library of your child’s highlights. It starts with the absurd rankings of every competitive youth team, from age 10 and up. By age 12, websites are tracking individual players, purporting to spot the stars of the future. Sites like Max-Preps, Hudl and Top Drawer just feed the fear that you’re falling behind if you’re not yet visible.

EXHIBIT A JOSH MCKENZIE, NEW JERSEY

At a cost of **\$15,000**, worked with 10 specialized trainers—a mind-set coach, an isokinetic performance trainer, a nutritionist, 3 sprinting specialists and a powerlifting guru.

Even though he had straight A’s and a 98.72 average, Josh repeated 8th grade to engineer an advantage in high school.

Hangs on inversion table at night to increase his height—because he is 3 inches short of 6 feet.

Records every crumb of food he consumes. Eats exactly 4,500 calories and 175 grams of protein each day.

Ranked #1 in the nation as both football player and wrestler in middle school. Rushed for 35 touchdowns en route to middle school national semifinals in Orlando.

Makes the 90-minute commute to Bergen Catholic High School daily.

HOW IT GETS BETTER

In 20 years, when we look back at how the slide into society-wide youth sports obsession, burnout and malaise was averted, the story will be something like this:

PROTECTIONS

BY GOVERNING BODIES

Regional, national and international sports’ governing bodies will follow the lead of gymnastics, figure skating and tennis, which have enacted strict rules protecting underage players.

Charged to protect young athletes’ bones, bodies and minds from the mental stress and pressure of competing, in 1997 the Olympic Games raised the minimum age for gymnasts to 16. At the next Summer Games, Dong Fangxiao (People’s Republic of China) won the bronze medal, but her medal was revoked and her records expunged after it was discovered she was only 14 at the time.

In 1990, when she was just 13, tennis phenom Jennifer Capriati made the finals of a WTA event. By the age of 14, she was ranked #6 in the world and seemed well on her way to becoming the next great American female player. But by age 17, Capriati had burned out and dropped out. Tennis had learned its lesson. Ever since, rules restrict the number of events teens can play in. Studies since then have shown that **AGE LIMITS HAVE PAID OFF IN REAL TERMS, EXTENDING FEMALE TENNIS PLAYERS’ CAREERS BY 24%.**

ACCOUNTABILITY

FOR YOUTH TRAFFICKING

European Soccer—the worst offender—has stopped trafficking in children. Barcelona and Real Madrid were made to pay.

In 2001, FIFA began regulations for the protections of minors. At first, players under age 16 were forbidden from being sold—but it wasn’t enforced as long as both clubs were mutually agreeable. Stories of kids being signed at ages 7 to 11 were rampant. But a few years ago, FIFA’s subcommittee finally put teeth to the rule. Players in Europe could transfer at age 16. Elsewhere, it was forbidden until age 18. First **BARCELONA, THEN REAL MADRID, WERE HANDED TRANSFER BANS; AND OVER A DOZEN YOUTH PLAYERS THEY HAD SIGNED FROM ASIA, AFRICA AND THE AMERICAS—INCLUDING TWO BOYS FROM CALIFORNIA—WERE FORBIDDEN TO PLAY FOR THE SPANISH CLUBS’ YOUTH ACADEMIES.** Most boys eventually returned home.

There is a way around the rule—secure citizenship in the desired country, often through family heritage, such as the USMNT’s 17-year-old striker Christian Pulisic—but, by and large, the era of buying and selling of youth players across national borders has ended.

TIME LIMITS

WITH VIOLATION CONSEQUENCES

High schools and colleges will impose strict time limits on practicing and playing, with serious consequences for violations.

San Diego State, Ball State and Michigan are among the universities penalized for going over the 20-hours-a-week college time limit. **TEAMS HAVE BEEN PLACED ON PROBATION AND COMPLIANCE STAFF HAVE BEEN FIRED FOR FAILING TO ENFORCE THE RESTRICTIONS.**

High school athletes are generally limited to 18 hours a week—including practices and games. However, the enforcement mechanisms are still weak at this level.

These limits are consistent with the hourly training counts that swimmers, cyclists and youth soccer academies hold to. Only ballet dancers radically exceed them (25 hours/week).



“With the best will in the world, I wouldn’t know if a 6-, 7- or 8-year-old is going to play in the Premier League in 10 or 12 years’ time. It’s ludicrous.”

—Bryan Jones, Aston Villa Youth Academy director

Photo by Blake Little/Getty Images

THE TOOLS

OF ENFORCEMENT ARE IN A PHASE OF RAPID DEVELOPMENT.

Over the next decade, organizations at every level—professional leagues, player associations, the NCAA and national sports federations that oversee youth sports—will pass stricter rules to protect young athletes. Ubiquitous sensor-fed training apps will enable regulators to efficiently monitor young athletes’ activity levels at a scale never before possible. At the same time, technology will elevate the level of youth sports performance across the board in two important ways:

01 Thanks to sensor-generated performance data and analytics once available only to elite athletes, previously undetected diamonds in the rough will rise through the youth ranks on the strength of their abilities instead of the persuasive powers of pushy parents.



02 The tsunami of sports video captured on mobile devices and shared on YouTube will continue to drive the accelerating feedback cycle where developing athletes view, process and emulate the world’s best performances 24-7.



THE FINAL WORD

WHEN YOU'VE SEEN A GLIMPSE OF THE FUTURE, IT STICKS WITH YOU. It can keep you up at night. We don't claim to have a lock on precision forecasting, but it's not tenable to ignore the new challenges we face or hope that things will stay the same. One of the best ways to prepare for the future is to engage in a lively and spirited dialogue about the changes to come. We trust that this new edition of **The Future of Sports** will continue to drive that conversation.

THINK ABOUT THIS: Just a decade ago, owning a flip phone meant you were on the cutting edge of technology and smartphones were a distant innovation on the horizon. HD televisions were making their way into homes, but they cost \$6,000. YouTube was in the testing stage and Facebook had only expanded to 21 colleges. Neither Tumblr, Snapchat nor Instagram existed yet, and the newest rage was the Nintendo Wii. We thought fantasy sports were huge, when in fact they were in their infancy. Only one out of 10 people in China were online.

The pace of change has been stunning, and it is not slowing down. It's time that we take a hard look at the generation currently coming into adulthood, because they represent our future fanbases.

We know that they love sports, but they have an entirely different approach to engaging with games. For example, members of Generation Z are increasingly becoming fans of a sport or a franchise through playing video games or fantasy sports—attending a live game is no longer the default gateway to fandom. They will be the first generation to fully embrace the new worlds of virtual and augmented reality. They are tech savvy, hyper-connected and easily bored. To stay relevant, legacy sports organizations must understand the tastes and motivations of this growing group of millennials.

New technology will change not only how we interact with our newest fans, but also nearly every aspect of running a professional sports franchise.

Advances in machine learning, where computers autonomously harvest mountains of data to find hidden patterns, are already helping predict and avoid season-ending injuries. These same advances will undoubtedly change the way owners and coaches make decisions, from recruitment to on-field strategy. Sports professionals have always been interested in data, and the amount of data we collect on teams and on the performance and health of individual athletes is growing exponentially. Machine learning will allow us to analyze all that information and act on it effectively.

It's a lot to think about, we know. And we're certainly not suggesting that you try to find an answer for everything in these pages. That simply wouldn't be possible. But we hope that this publication has piqued your curiosity just enough that you'll continue the conversation. Let us know what you think.



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