Don’t Sweat It

Using biometrics-based modeling to recommend fluid intake for athletes

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Presenting on behalf of: Data Scientists in a Sports Analytics Firm
Intended Audience: Nix Biosensors
December 13, 2018

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Strenuous workouts and sporting events put athletes at high risk for severe dehydration.

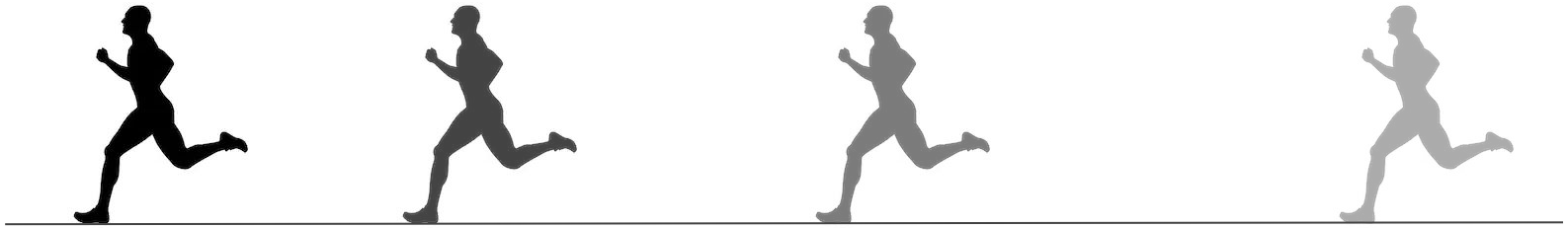
Collapsing of Dehydration Moments before the Finish Line

Alistair Brownlee assists brother and Olympian, Jonny Brownlee, to cross the finish line of a triathlon [4]

87%

of endurance athletes suffer physical impairment during workouts due to dehydration [3]

Symptoms of dehydration are subtle, and even slight levels of dehydration can drastically impact athletic performance.

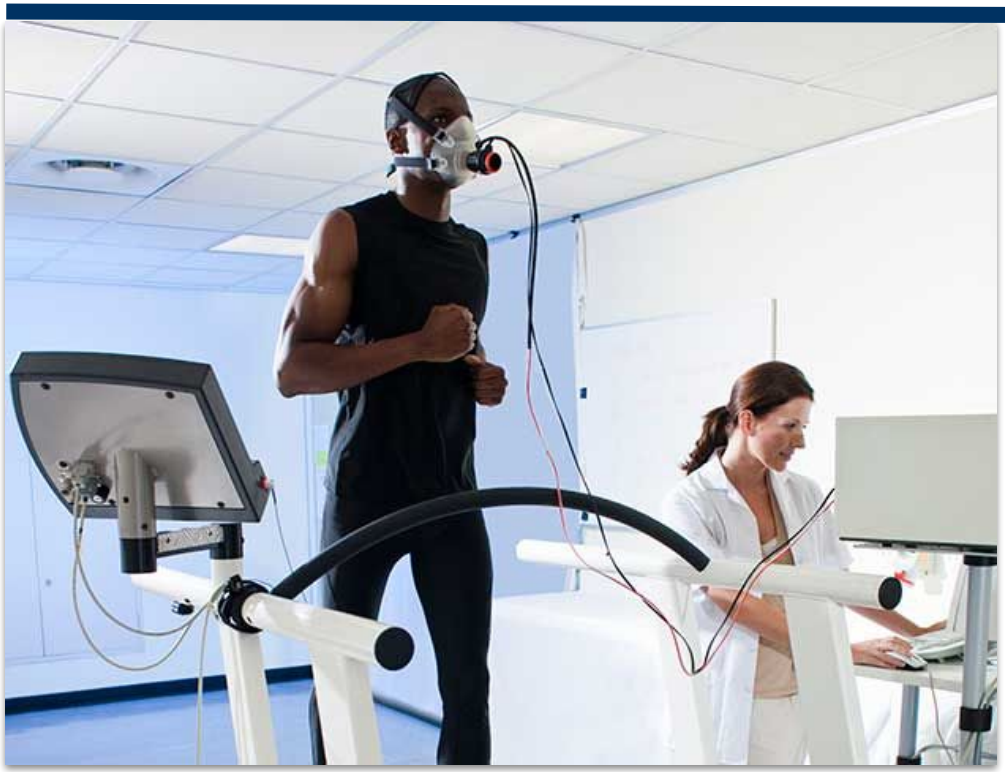


	Fully Hydrated	**1% Dehydration**	**2% Dehydration**	**3% Dehydration**
	4:45 min/mile	4:49 min/mile	4:59 min/mile	5:26 min/mile
Marathon Completion Time	**2 hrs 4 min**	**2 hrs 6 min**	**2 hrs 11 min**	**2 hrs 22 min**

In a sport where the margin between winning and losing is less than 1 minute, being 1% dehydrated is enough to jeopardize performance.

Time estimates from: http://nixbiosensors.com/hydration/dehydration/

Training for sporting events is increasingly data driven.



Analytics in Practice

Intense monitoring of vitals

Detailed nutrition plans ($45B global industry by 2022) [6]

Sports Analytics to understand competition

There is a large appetite in the sports training to use data to ensure athletes are performing at their best.

Image from: http://www.menshealth.co.uk/fitness/running/how-to-test-your-vo2-max

Where biosensors come into play...

Sweat Production Levels

Sweat Electrolyte concentration

Body Temperature

We need to combine biosensor information with performance and environmental factors to make this predictive and practical

Athlete Image from: https://www.kisspng.com/png-running-woman-png-image-26235/preview.html

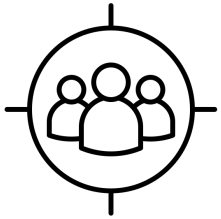
Research Questions

How can we leverage biometric data to predict and optimize hydration recommendations for individual athletes?

➔ What are the determinants of pre-exercise fluid intake?

➔ How can we develop robust hydration models to maximize athletic performance?

Intended Audience

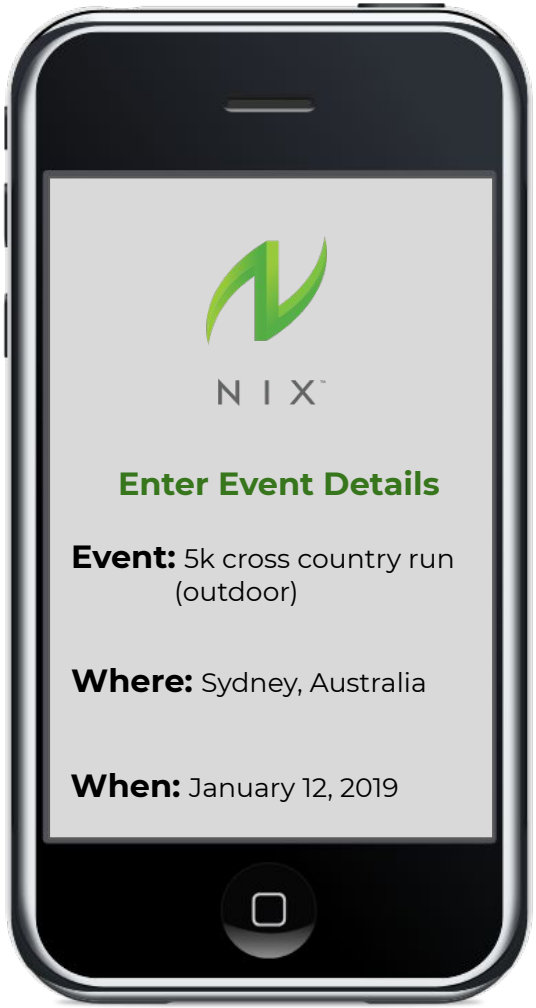


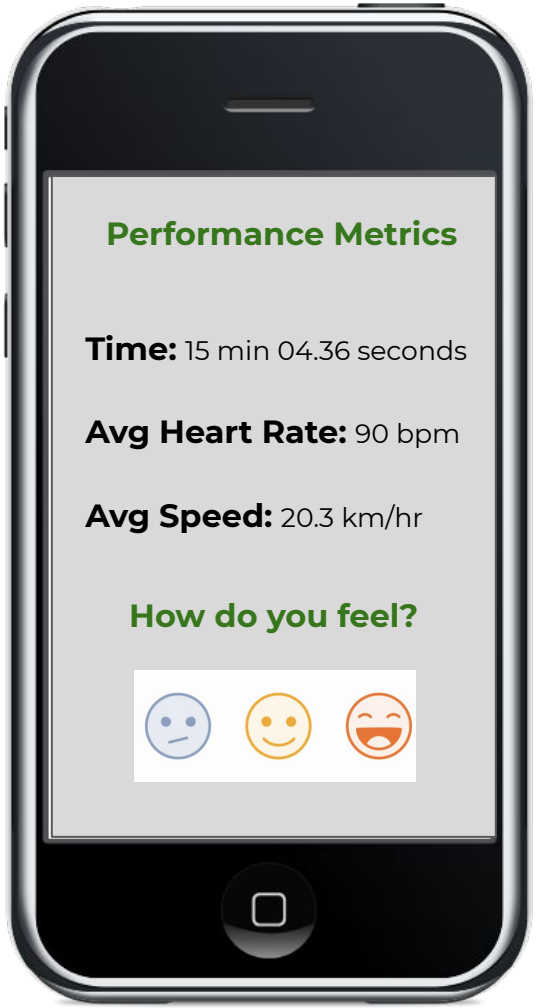
Stakeholder
Nix Biosensors

End Users
Collegiate & Professional Athletes
Nutritionists & Trainers

Potential Investors
Sports Associations
(EPL, NFL, NHL, MLB, NCAA)

Our Product Experience - customized hydration strategies





Tying biological, physical and external factors with athletic success

Proposed Data Inputs

Biometrics
sweat production, sodium / calcium content
weight, gender, age etc.

Environmental Data
Temperature, altitude, humidity, air quality

Performance Data
Fitbit integration to provide race times

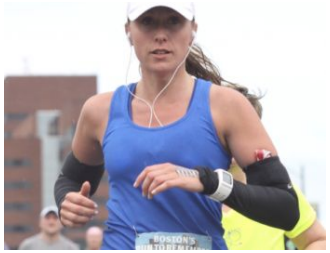
User Feedback
Activity descriptions, satisfaction ratings

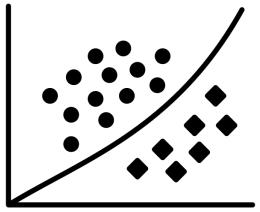
Iterated Machine Learning provides increasingly accurate hydration strategy recommendations

Collecting Biometric / Environmental Data

Predicting Hydration Needs

Hydration Strategies via a Mobile App





Feedback & Iteration

Data Gathering Phase → Training / Estimation Phase → Recommendation

Challenges

- Characterizing Qualitative Results
- Rapid Personalization
- Compliance

Athlete image from: http://nixbiosensors.com/team/

Mixed Approach Product Evaluation

	Quantitative	Qualitative
GOAL	Confirm product improves athlete performance	Develop best-in-class, user-first product
METHOD	Performance experiment comparing athletes given: (1) ML hydration prescription (2) status quo prescription (3) no hydration prescription	Collect product feedback from user with: (1) in app mini surveys (2) user and trainer interviews

Conveying findings and product to client

Findings

Experiment Results	Athlete Testimonials
	
Share results of experiment comparing performance of 3 groups: (1) ML prescription (2) status quo prescription (3) no prescription	Share athlete testimonials about their experience

Product

Need	Benefit
	
Convey need to use ML prescription to match competition	Describe benefit of using ML prescription to overall health for athlete

Addressing Counter Arguments

Biometric data security — **this data is sensitive, particularly for pro athletes**! Will it be protected? What if that gets into the wrong hands?

Cloud-based data storage with the top encryption and firewall technology

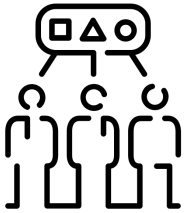
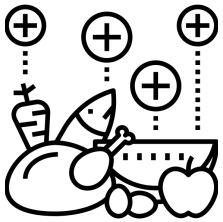
Liability — athletes who don't meet their performance expectations or get injured using this product could seek legal restitution.

Acknowledgment of limited liability + trainer approval recommendation

This technology is **too invasive** — athletes won't want to be plugged into sensors all the time or reporting how they feel.

Technology is minimally invasive and designed for athletes who want to perform at the top of their game

Further Opportunities

Expand Hydration Strategy to Public	Optimize Patient Fluid Intake	Design Nutritional Strategy	Monitor Doping for Fair Play
			
Going beyond the sports industry to bring value to the general public.	Exploring healthcare applications for fluid intake optimization, particularly for IVs.	Building out nutritional plans for professional athletes with use of more sensitive biosensing capabilities.	Preventing cheating in sports by monitoring athlete doping in real-time.

Sources

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[2] Li, Chunxiao, et al. “Predicting Athletes’ Pre-Exercise Fluid Intake: A Theoretical Integration Approach.” Nutrients, vol. 10, no. 5, 2018, p. 646., doi:10.3390/nu10050646.

[3] Nix Corporation. “Consequences of Dehydration | Mild Dehydration Symptoms.” Consequences of Dehydration, Nix, 2018, nixbiosensors.com/hydration/dehydration/.

[4] Paley, Tony. “He Ain't Heavy: Triathlon Star Alistair Brownlee Helps Sibling Jonny over the Line.” The Guardian, Guardian News and Media, 19 Sept. 2016, www.theguardian.com/sport/2016/sep/20/he-aint-heavy-triathlon-star-alistair-brownlee-helps-sibling-jonny-over-the-line.

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[6] Zion Market Research. “Global Sports Nutrition Market Could Exceed $45 Billion by 2022.” Nutraceuticals World, Zion Market Research, 30 Jan. 2017, www.nutraceuticalsworld.com/contents/view_breaking-news/2017-01-30/global-sports-nutrition-market-could-exceed-45-billion-by-2022/50216.