Dia Sensor **Feb 17 2024**

Source	Denis Cranstoun Shahn Christian Andersen 18 month relationship
Relationship with founder/team	Founder was a PNR member before moving; Denis has been a friend and advisor through PNR]
Deal sharing approval	**Yes**
Recommendation (By PNR)	[Pass, Hold/Monitor, Pursue] *To be filled out by PNR IR*
Founder Thesis	Jacob Kiplimo broke the half-marathon world record by 48 seconds. All news outlets - from World Athletics to NPR cannot stop talking about the "huge" margin to the previous record. Less than a minute has the world losing its mind. That is because at the top level, the .1% matters. Elite performers measure and control all aspects of their lives to be the best. However, while heart rate straps and power meters have provided professional & tactical athletes with the data needed to assess their workouts, the tools and data available to measure recovery are shockingly inaccurate and inadequate. In order to truly optimize human performance, coaches & athletes need a real-time measure of their internal biochemistry. If we have been measuring glucose at-home since the 1990s, it is past time that we expand to daily, real-time measurements of other biomarkers of human health and performance.
Website / Deck / Data room	https://www.diasensor.com/ https://dia.docsend.com/view/s/h4thfrv425m7gtxm
One-Liner	DIA makes a handheld device that measures cortisol - "the stress hormone" - in 2 drops of saliva in 10 minutes with results available on a smartphone.
Pain	I was training for my first half Ironman when I was hit by a car while on my bike, resulting in 3 broken vertebrae, a broken leg and diagnosis of PTSD. On my 23rd birthday, I was wheeled out of the hospital. The next two months were spent on bed rest, and I ultimately had to withdraw from my PhD program due to the uncertainty surrounding my healing process. I spent years trying to get my life back because I did not have an objective way to measure how my body was responding to the mental and physical stress of my injuries. My experience is unfortunately not a rare one. Over 34% of professional athletes and over 50% of active-duty military members suffer from injuries each year, many of which are caused or have delayed or incomplete healing due to a lack of objective data on how their bodies are recovering. Between direct medical costs and limited or lost working & playing time, these injuries equate to billions of dollars lost.
Differentiation	DIA's primary technology objectives is to accurately measure biomarkers non-invasively at the point-of-need at a price that makes this innovation accessible, and we have built the only commercial platform that can deliver on these objectives: 1. Operational in Sports/Military-Relevant Environments: This technology objective encompasses two advantages of DIA's technology: a. Non-Invasive Sample Collection: Continuous glucose monitors (CGMs) typically attach to skin using a microneedle patch. This causes some pain on application, but, more importantly, poses an on-going infection risk and a risk of greater injury to the user from the sensor being ripped out. Biomarker test kits usually use finger pricks to collect capillary blood. Capillary blood often has ruptured blood cells and interstitial fluid that can cause anomalous readings. Blood collection is also invasive, meaning that user adherence to regular testing will likely be lower and less

	effective. b. Sensor Robustness: Some soon-to-be-available wearable cortisol sensors rely on aptamers, which are more prone to degradation than DIA's polymer-based technology and are very fragile in enzyme-rich biological fluids such as sweat and saliva, making them impracticable for real-world or military use. Another sensor relies on optical readings, meaning that in light-variable environments or at night, it will lack accuracy. 2. Real-time measurement: Biomarker test kits take 5-7 days to get results back, making the data less actionable and applicable to the user's actual state of health and performance. 3. Data Accuracy: HRV data gathered using wrist or optical sensors has been shown to be inconsistent and inaccurate. Troublingly, the inaccuracy is more pronounced on individuals with darker skin tones due to the absorption of the green light emitted by the optical sensor used to gather the data in these wearables. 4. Price: At scale, our inkjet-printed electrodes can be produced for <$1/electrode. While users will need to purchase the potentiostat, one potentiostat unit can be shared among many users on a team or unit, keeping the overall cost of the system low.
Business Overview	DIA is aiming to build a platform technology that uses non-invasive devices to measure key biomarkers of human health & performance at the point-of-need, in real-time. The booming success of consumer wellness focused companies, such as Whoop, OURA, Thorne, and InsideTracker show an increasing appetite for personalized, real-time health data. Perhaps the most high profile example of this trend is Dexcom releasing a version of their CGM over-the-counter, with no prescription needed. While we recognize that our technology could have a huge market in healthcare, DIA will establish our technology in the wellness and performance space because it allows us to go to market faster, while still innovating and improving our sensors with minimal regulation. Fundamentally, our technology is most similar to a CGM. However, we do not merely want to match the technological achievements of glucose monitors; DIA aims to exceed them. Blood testing is on borrowed time. Humans do not like hurting themselves, and even microneedle patches to collect interstitial fluid will have a difficult time getting widespread adoption (as seen in the failure of SuperSapiens) because of potential pain in application. DIA has built our technology on an advanced polymer material that can withstand corrosive biofluids like sweat and saliva that can be collected truly non-invasively. In the future, just as every athlete wakes up and steps on their smart scale or reaches for their electrolyte drink, they will also take a single salivary sample for their DIA Sensor to track a panel of hormones, metabolites, and even neurotransmitters every day. We also will have a line of wearable sensors that continuously measure analytes through sweat. The advantage of our sensing modality - molecularly imprinted polymers (MIPs) - is that it allows us to use the same fundamental R&D to develop both salivary and sweat sensors. The benefit of working in two different biofluids is that different analytes will be available and/or make more logical sense to measure in either sweat or saliva. We have already seen this advantage through our partnerships with the U.S. military. The Air Force has provided us with $1.25M in non-dilutive funding to develop the salivary sensor because pilots cannot wear wearables while they fly, while the U.S. Army has given $2.1M to develop the wearable.
Team	**CEO:** Sloane Tilley - Sloane was trained as a systems biologist at UNC-Chapel Hill and then discovered her love of start-ups as the 2nd full-time employee at a robotics start-up. She launched two hardtech products there and traveled the world presenting at conferences and selling & installing instruments. After six years, she left and got her MBA from Duke University

	during which she was introduced to Julio through mutual friends and they started DIA together. Sloane is also a professional triathlete with a strong network in the endurance sports world. **Chief Scientific Officer:** Julio Fredin Ortiz - Julio has a PhD in Nanotechnology, jointly awarded from Tec de Monterrey and Indiana University-Purdue University Indianapolis where his field of research focused on advanced material electrochemical sensors Julio is the inventor on two of DIA's patents. **Fernando Webb:** Electronics Engineer: Fernando holds a BS in Mechatronics Engineering from Universidad Regiomontana. Fernando is an experienced engineer, having worked in backend development and quality control for 6 years. He has previously built a novel miniaturized insulin pump and worked in both the internet of things (IoT) and backend development. **Reed Smith:** Research Scientist at DIA. Reed earned a B.A. in Chemistry from Duke University and then spent 4 years as an Analytical Chemist specializing in HPLC validation of chemical biomarkers. Reed joined DIA in January 2024 to lead our HPLC validation efforts. **Rishabh Bansal:** Research Scientist at DIA. Rishabh earned his PhD at Arizona State University where his research focused in R&D of conductive polymer electrochemical sensors. Rishabh joined DIA in September to help improve our current cortisol sensor. **Nikhil Kshirsagar (starting March 2025):** Research Scientist at DIA. Nikhil graduated from UC San Diego with a MS in Bioengineering where his work focused on developing wearable electrochemical biomarker sensors. Since then, he has worked on scaling graphene-based bioassays and is excited to bring his combination of bioengineering and electrochemistry to DIA.
Product	DIA has successfully run two unpaid pilots using our Gen1 salivary cortisol sensor - (1) with a professional cycling team at their 10-day team camp to monitor cumulative fatigue and (2) with a non-profit organization for veterans with severe mental, physical or moral trauma throughout a 3-week intervention program. We were able to detect cortisol changes and trends that provided insight for the cycling coaches and program coordinators, respectively. We have also built and internally tested our Gen1 wearable prototype for cortisol sensing in sweat. Both the salivary sensor and sweat sensor have accompanying functioning Android smartphone applications that display and graph the cortisol measurements in real time, as well as send the data to our AWS backend. We have enabled the set-up of user logins to the AWS backend to accommodate our early users to access team-level data. Our early KPIs are successful cortisol measurements using our sensors when compared to the gold standard of cortisol measurements - HPLC-MS/MS. We have logged over 1000 successful tests so far. The next key milestones that will be achieved following our raise are: 1. Building our autonomous sensor-strip production line to allow us to fulfill our first commercial contracts and scale to $1.25M in revenue in the next 18 months. 2. A collaboration study with the 711th Human Performance Wing in pilots of the 59th Test & Evaluation Squadron to perform over 40,000 salivary cortisol tests. 3. Development of Gen2 of the cortisol wearable sensor incorporating a microfluidic hydrogel layer that will extend the lifespan of the sensor strip (funded by a Sequential Phase II SBIR grant from the Army). 4. Testing of the Gen2 wearable sensor with the DEVCOM Soldier Center with a minimum of 15 operational hours of testing at the Soldier and Squad Performance Research Institute. 5. Development of a DIA Sensor electrode for salivary glutathione measurements to be

	used for prognostic indication of traumatic brain injuries in collaboration with the U.S. Air Force.
Competition & Defensibility	Currently, the only commercial technology able to continuously measure a chemical biomarker in real-time are CGMs. However, it is well known that the major players in that field, including Abbott Laboratories, Medtronic, and DexCom are interested in developing their CGM technology to also measure other biomarkers, but they are primarily focusing on the metabolic health market (lactate & ketones). There are also several smaller, start-up companies such as Level Zero Health, PointFit, Kiele Health, EnLiSense and EliHealth that are developing salivary or wearable real-time hormone sensing technology. Biomarker test kit companies such as SiPhox, InsideTracker, and Thorne send a biomarker test kit to a client's home and deliver results 4-7 days later. Then, there are wearable technologies, such as Whoop, Garmin, and FitBit that use biometric measurements such as heart rate and HRV to approximate stress status without taking a chemical measurement. The core innovation that allows us to use a non-invasive sample type that can combine the convenience of wearables with the data accuracy of biomarker testing technologies is our use of molecularly imprinted polymers (MIPs) as our sensing modality. Using MIPs gives us a further competitive advantage over traditional players, such as Abbott & Medtronic who use expensive and difficult to develop inorganic and enzymatic based sensing elements, as well as over other smaller start-ups such as Kiele Health and Level Zero who use aptamers or antibody-based sensing elements. This is because MIPs are much more stable than antibody or aptamer-based sensors used by emerging start-ups, which forces them to use microneedle patches that (1) are heavily patented by Dexcom and (2) will face adoption resistance due to pain at application. MIPs are also inexpensive to manufacture and ship, while also being adaptable to many additional analytes of interest, making our technology scalable while other players are not. So far, we have filed two full U.S. patents and have two provisional patents pending. Three of these patents protect the core chemistry of our unique electrode stack focused around using MIPs to sense biomarkers. The other other is for an environment-controlled potentiostat. In addition to patents, we have several trade secrets in our manufacturing process that put us several years ahead of any competitors hoping to make a MIP cortisol sensor.
Monetization	**Private Market:** Beginning in 2025, DIA will offer our real-time salivary cortisol sensor for purchase to professional sports teams and other organizations focused on elite physical and mental performance. The salivary DIA Sensor is sold in a razor/razor-blade model. A single sensor is sold for $4,800, lasts for approximately 3 years and can support approximately 10 users. Salivary sensor strips are single use and sold in packs of 100 at a current sale price of $4-6/strip. DIA currently has 3 signed contracts to generate revenue in Q3 of 2025 for our real-time salivary cortisol sensor. Each contract will likely yield ~$25,000 worth of revenue in the calendar year. Two of these contracts can be viewed in our VDR- one is with BIOPAC Systems, Inc., a maker of physiological monitoring equipment who is interested in becoming an OEM of DIA's salivary cortisol sensor. The other contract is with Premier Sports Psychology, who is not only interested in purchasing the technology for use within their clinical practice, but also provides avenues for direct purchases with several of the professional and national teams with whom they work. **Pathways to Revenue:** There are 3 primary types of customers that we can reliably generate revenue from in 2025 and 2026. These are: 1.Professional Sports Teams – We have already signed 1 US professional sports team and have had early conversations with 2 MLB teams, the UFC, and multiple US National Teams. We

anticipate that we can sign 30 professional/national teams over the next 18 months, generating $1,250,000 in revenue.

2.NCAA Collegiate Sports – We are in early conversations with the Rutgers and St. John's men's basketball programs for initial trials for them purchasing and using our salivary cortisol sensor for the 2025-2026 season. We have contacts at several other large men's basketball and football programs that we will leverage once we are prepared to scale the product. These contracts will likely yield lower revenue due to less frequent testing (lower consumables) and shorter seasons for about ~$10,000/contract. We anticipate signing 20 programs (10 basketball and 10 football), representing about 80 salivary cortisol units and $200,000 in revenue in the next 18 months.

3.Clinical Research Trials – We have also seen early market traction with researchers focused on addiction science and psychology who want to use the DIA Sensor to add salivary cortisol measurements 3-6x/day of the course of 1-3 month studies. Pharmaceutical companies running clinical trials for new treatments for conditions where cortisol is known to play an important role, including chronic kidney disease, heart disease, depression, anxiety, and PTSD, also represent a class of potential first customers. By being able to assess cortisol levels non-invasively and in study participants' homes, they can dramatically lower the cost of adding cortisol as an additional intermediate and final endpoint to provide better data for their FDA application.

Government Market: DIA's technology has received significant interest from the Department of Defense not only for assessing soldier readiness and optimizing warfighters' performance but also for use in brain health and traumatic brain injury (TBI) initiatives which are currently major focus areas across the entire joint force.

To date, DIA has been awarded $3.25 million non-dilutive in SBIR grants (1 SBIR Phase I and 1 SBIR Phase II from the Department of the Army's Immersive and Wearables program which is housed in the Army Research Lab and 1 Direct to Phase II [D2P2] from AFWERX). Our **end customer** for our SBIR Phase II is the 3rd OSG of US Army Special Forces Command (USASOC) at Fort Bragg, NC. We used this funding to build our Gen1 wearable cortisol sensor and anticipate being on contract for another $1.9M Sequential Phase II grant to continue the development of the wearable by March 2025. Our D2P2 grant with the Air Force focuses on making our salivary sensor operational in rugged and diverse environments by providing temperature and humidity control. Our end customer for the AFWERX D2P2 is the 59th Test and Evaluation Squadron of the ACC at Nellis AFB.

Pathways to Revenue: While SBIR grant funding is advantageous for early-stage R&D, DIA anticipates the US military being a significant source of revenue. To achieve that goal, DIA will have to cross what is often referred to as the "valley of death" for small businesses that pursue doing business with the federal government. We have identified 2 valid methods to do so:

1.Use the Army CATALYST Program to transition to a Program of Record in PEO Soldier. Army CATALYST is a new program that offers small businesses who have an existing Phase II SBIR contract to receive up to an additional $14 million in non-dilutive funding. This funding is specifically designated to take the prototype produced at the end of the Sequential Phase II effort with a single end customer and scale the solution so it can support hundreds of units. We have identified strong Integrators such as TwoSixTwo Technologies and OURA to sign on to this effort. However, we have determined, based on feedback from potential Army Transition Partners, that more basic R&D on the DIA Sensor is required before we are ready for the CATALYST program. Specifically, we have received feedback that our current TRL (4) would need to progress to around an 8 to be of interest to larger Army Transition Partners, such as PEO Soldier. Reaching TRL 8 is the focus of our Sequential Phase II.

2.DIA and our partners at Nellis AFB and the AMC will pursue TACFI funding from the Air Force in January 2025. TACFI funding is another avenue for small businesses to cross the "valley of death"

	by providing 1:1 matching SBIR dollars: Private Funding up to $2M in Private Funding to total 4M. TACFI applications that are properly submitted have an 85% of being selected for matching funding. In order to further increase our chances, DIA is getting letters of support from the Human Performance Test and Evaluation Squadron (59th TES OT) and the 711th Human Performance Wing. The focus of our TACFI effort would be testing our salivary unit in Airmen of the 59th TES OT. With TACFI funding, DIA would not only conduct a live study in an operational environment, but we would also set up our initial production facility to produce our salivary cortisol test strips at scale. This would allow us to begin supporting dual-use customers like pro sports teams in 2025 as well. At the end of the TACFI effort (18 month PoP), we would have a validated salivary product that we can manufacture at scale at a cost that will allow us to deliver our measurement device and packages of 100 test strips without a Unique Item Identifier (UII), as both will be priced below $5,000. The CATALYST funding would provide a similar pathway to DoD and private revenue by validating and scaling our wearable product. Beginning in the Holistic Health and Fitness program (H2F), DIA's technology could be used by 111 brigades by 2027. By 2032, H2F Performance Teams are expected to be integrated into 100% of Army brigades.
Metrics / Financials / Traction	Current Sale Price of DIA Sensor: $4,800 Current Cost of DIA Sensor: $880 Scale Sale Price of DIA Sensor: $500 Scale Cost of DIA Sensor: $250 Current Sale Price of DIA Electrode Strip: $4-6 Current Cost of DIA Electrode Strip: $5 Scale Sale Price of DIA Electrode Strip: $2 Scale Cost of DIA Electrode Strip: $1 Signed Letters of Intent to Purchase: BIOPAC Systems, Premier Sports Psychology, NBA Team Military Partnerships: 711th Human Performance Wing, 59th Test & Evaluation Human Performance Squadron, 3rd OSG US Army Special Operations Command, DEVCOM Army Research Lab
Market	The total addressable market for non-invasive cortisol sensing, including healthcare applications exceeds $40B. If we take out healthcare and restrict our focus to markets we can access without FDA approval, we still have a $10B market, and the global health and wellness market is growing at an annual rate of 7%. Mainstream trends, including an obsession with marathon running, widespread interest in sober-curious lifestyles, and longevity, have primed the market for personalized, real-time biomarker measurements. On the heels of a life-changing pandemic, there is a renewed focus on mental health and burnout along with a keen familiarity of testing our own biofluids at home. However, doing real-time, non-invasive biomarker measurements outside of a lab is chemistry that previously has not been done. The company that succeeds will be laser-focused on building and scaling the hardware to ensure the highest quality control and accuracy of their sensors. No biomarker sensing company is going to escape comparisons to Elizabeth Homes and Theranos, so the data and sensor itself need to be beyond reproach. That means going B2B in order to (1) control who is running the tests to guarantee accuracy and (2) control who is seeing, interpreting and using the data. The initial customers of the DIA Sensor are **not** the athletes or special operation soldiers. Our first customers are their coaches, nutritionists, and commanders. This GTM approach prevents DIA from falling into a trap that many other hardtech wellness companies have of trying and failing to answer the "so what" question. There are at least 11 software companies that could take our data stream and integrate it into their model of holistic health or training prediction. In talking to early customers in both the private

	and government sectors, they don't need another software product; they know how to write algorithms to integrate streams of data. What they need are better and new forms of data to power their models. DIA understands that we add value by building accurate, easy-to-use biomarker sensors for key analytes that health and fitness focused companies and organizations already understand and can act on. As we build trust and recognition in the fitness and wellness industry, we can expand into the massive healthcare market, especially since we will have existing relationships with military and sports-related hospitals for potential clinical trials. We can also use our broad sensor platform to measure a variety of analytes in liquid matrices. For example, we have already done proof of concept work that shows a MIP sensor can detect PFOS down to 6.5 part per trillion (ppt) in tap water. Real-time, point-of-need chemical sensing has applications in agriculture, quality control and environmental monitoring.
Fundraising - Current round & History and Terms	Previously 01/23 raised Pre-Seed $0.27M at $2M valuation cap $3.25 in non-dilutive funding from Department of Defense SBIR Awards Currently raising $2M Seed at $24M post-money valuation 25% Committed this round from Academy Investors Network
Risks	• What value does the data offer? • Can DIA manufacture and ship 1000s of electrodes each week within quality standards? • Can DIA successfully transition to selling to the U.S. military? Any experts we should talk to about the industry to learn more? • Jenny Regan - Founder of KeyTech, Inc. which specializes in the building and initial scaling of hardtech health devices (jregan20817@gmail.com) • Dr. Chris Myers - Air Force Human Performance Expert (christopher.myers.50@us.af.mil) • Arturo Ybarra (Air Force Special Ops, +1 (512) 638-3183)
Summary	Founding year: 2023 Team: • Founder Domain Expertise: Significant • Repeat Founders: First-time founders • Founder Pedigree: Very strong • Headcount: 6 Product: • Product Stage: MVP with paid pilots (signed but waiting to execute) • Product-Market Fit: Achieved and looking to scale Monetisation: • Business Model: Other: B2B & B2G • Revenue / Traction Stage: Pre-traction, pre-revenue. Market: • Market Sizing - SOM in units (if possible): 85,000 • Market Sizing - SOM in $: 500M • GTM: High-visibility early pilots (NBA/Olympic Teams & U.S. Military Special Forces) • Market Timing: Mid cycle • Substitutes: Moderately crowded • Defensibility: Patents & Military Traction

	Investors: ● Current Investors: HAX SOSV, Duke University ● Prior Investors: None ● Capital Filled in current round: 25% filled

Add comments from Champion on why they are advancing this deal:

Q&A below:

IC Call Q&A below:

Diligence Q&A below: