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WHITE PAPER

# The Quantified Leader:

## Wearables & Self-Tracking Technology for Development

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# Executive Summary

Investing in talent management with leadership development is a key need of organizations everywhere. But not all leaders can — or even want to — go through a traditional development course. Leaders increasingly want feedback and development that is personalized, continuous, and seamlessly embedded into their lives. Self-tracking technology, paired with wearables and artificial intelligence, can help organizations give their top talent the continuous, expert coaching necessary for sustained high performance, and do it in a way that is highly scalable. These systems offer just-in-time, individualized feedback that can instruct, inform, and empower growth and change outside of a classroom learning experience.

In this paper, we highlight 3 areas in which these technologies can be powerful learning solutions to optimize leader development:

- managing stress,
- improving vocal delivery, and
- dealing with fatigue.

We also share insights from our recent field tests of the latest sensors, and conclude with tips on what to consider if your organization is interested in exploring use of self-tracking devices to develop leaders.

# The Potential Benefits of Self-Tracking Systems for Development

Self-tracking systems quantify people's everyday experiences and behaviors, and offer them feedback for improvement. These tools often combine digital technologies, sensors worn on the body, artificial intelligence, and dashboards to offer personalized feedback. The widespread use of fitness trackers, smart glasses, and smartphones have made sensor-enabled wearables and tracking systems of all types commonplace. Insights gained through these technologies have helped people to lose weight, exercise more effectively, enhance sleep, monitor health, and improve moods. Why not use them for leadership development?

In 1998, Steve Jobs introduced the iMac, explaining that the "i" stood for *internet, individual, instruct, inform, and inspire*. The widespread success of Apple's iPhone and other "i" products over the last 2 decades is a testament to how much these "i"s matter to people around the world.

Humans are drawn to technology that connects us to others and to information that is personalized, teaches us new things, and inspires us to be better versions of ourselves. We believe that these 5 "i"s are also crucial to helping leaders take ownership of their personal and professional development, and that wearable and self-tracking technologies offer leaders the ability to do just that.

# The Quantified Self Movement

Recent advances in biometrics and sensor technologies have led to what is known as the "quantified-self" movement. Founded by Gary Wolf and Kevin Kelly, the movement explores tools of self-tracking and aims to improve people's quality of life by building self-knowledge through numbers.

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These technologies hold the potential to transform leader development because they move data-based assessment from the occasional event to an ongoing learning process that's seamlessly embedded into everyday work life — a change that learning and development professionals have been advocating for years.[i] Such "quantified-self" sensors and apps can help leaders learn from experience by offering individualized feedback that can instruct, inform, and inspire them. They assist learning by providing impartial observation of the self, connecting repeated practice to objective feedback, while providing support and learning materials. They make learning very personal, with easy access to relevant insight and content.

Perhaps most importantly, these tools are a great way to gain feedback on critical "intrapersonal," or self-regulation skills that are hard to measure. People who are strong intrapersonally are able to understand their innermost thoughts and sensations. They can use this information to understand why they act and react as they do. These factors can be hard to pinpoint, but make a big difference in daily life. Leadership development sometimes shrinks away from this level of information because it is hard to capture, even though intrapersonal skills are critical for the development of adaptive behaviors. Self-tracking systems allow people to explore the internal sensations associated with intrapersonal factors and learn to make modifications. True growth is possible when we understand our motivations, moods, and sensitivities.

There are other benefits as well. In contrast to other methods of assessment and feedback, digital sensors are not influenced by political motivations, or social desirability — presenting distinct advantages for operationalizing performance measurements. They are also relatively self-explanatory and low cost. You can learn from your own data without relying on experts, coaches, or bosses, making them highly scalable solutions. You can learn from behaviors whenever you want — in both leadership settings and your personal life. However, in order to fully leverage these tools, you first need to understand the applications and limitations.

 

# How Wearables & Self-Tracking Tools Can Help Address Development Goals

A primary benefit of these tools is that they offer individualized information in a way that is integrated with daily life rather than in an abstract or decontextualized situation. They combine assessment in real time with the everyday aspects of working and leading. They are unobtrusive ways to promote learning and information over the course of a normal day. The tools provide a deeper level of self-awareness, often connecting bodily sensations to external events. Additionally, the use of the devices sets up the ability to experiment with how to change. Not only do the associated apps provide tips and strategies, but they also offer inspiration for trying new approaches. Finally, they encourage reflecting on personal information in a way that is situation- and context-specific.

 

# 3 Examples of How Personal Tracking Can Develop Leaders

There are many possibilities for how personal tracking can be used to develop leaders, and with new technologies being developed every day, there are likely to be even more in the near future. However, the sensors of today can be particularly helpful in managing stress, improving vocal delivery, and dealing with fatigue. The technologies for each of these areas are well-developed, and the connection to leadership needs are clear.

## I. Using Monitors to Manage Stress

**The Problem.** 64% of Americans say work is a significant source of stress;[ii] and job stress is often cited as one of the most persistent challenges of leaders today.[iii] A multitude of research has shown that stress can cause real damage to health — increasing rates of illnesses such as heart disease, physical aches, anxiety, and depression. Once stress grabs hold of you, it can be very hard to control. As most people can attest, simply thinking or being told not to "stress out" rarely does the trick.

**The Technology.** Self-tracking offers a way for leaders to get more in tune with their physical stress responses. The experience of stress corresponds with two clear physiological signals: heart rate variability and ectodermal skin response. Understanding personal information related to these signals can be helpful in monitoring stress levels.

*Heart rate variability* (HRV) measures the beat-to-beat changes in heart rate[1] and is considered an accurate measure of the activation of the autonomic nervous system. Generally, low HRV (or less variability in heartbeats) indicates that the body is under stress, while a higher HRV indicates better emotion regulation abilities.[iv] HRV patterns can be measured through a variety of heart rate monitors and are typically presented on a dashboard associated with the sensor.

*The ectodermal skin* response refers to the amount of sweat produced by the body. When the sympathetic nervous system is aroused in a "fight or flight" situation, sweat glands are activated, which increases skin conductance. This can be measured through an *Ectodermal Activity (EDA)*[2] sensor. EDA rises in response to environmental threats such as fear or unfairness.[v] EDA sensors have a long history of being used in psychological research and biofeedback devices.[vi] Modern devices often require pressing a fingertip against a sensor, as the extremities are a good place to measure skin conductance. Although they work differently, both HRV and EDA sensors assess physiological signals associated with stress.

> ***64% of Americans say work is a significant source of stress.[ii]***

[1] Note that *heart rate* refers to the average heart beats per minute, while h*eart rate variability* (HRV) measures the specific changes in timing (or variability) between successive heartbeats.
[2] Over the years, the terminology used to describe ectodermal activity has changed moving from a variety of specific terms such as galvanic skin response (GSR) to the more general EDA.

 

**Opportunity for Development.** By tracking your heart rate and sweat activity, these technologies can help you identify exactly when you begin to feel stressed, and by offering early warning signs of stress, these tools can help you do something about your stress responses, before you get ill. This is especially important in the workplace, where the body's default responses may not be effective for leadership purposes (for instance, "fight or flight" is rarely a good option during a stressful meeting). Because skin conductance and heart rate variability are not controlled consciously, they offer insights into subconscious physiological responses and emotional experiences.

With practice, wearable devices that include measures of HRV or EDA can be used to teach self-regulation strategies. Often, the sensors are associated with smartphone apps providing guidance on how to regulate responses. The apps may teach mindfulness or provide guidance on relaxing breathing practices. Both HRV and EDA readings can be associated with meditative states, making it possible to use these tools to facilitate contemplative practices, which in turn, may lead to more effective reactions to stress. Most of the apps suggest that repeated use of the intended training can promote resilience. When you notice your physical stress response increasing, take the time to meditate, or do some other relaxing activity. Remember that the point of using these sensors is to catch stress early, so don't ignore their feedback!

## II. Using Analytics to Voice Your Leadership

**The Problem.** As a leader, you need to be a skilled communicator — able to persuade high-level stakeholders or rally underperforming troops. Yet anxiety around public speaking is common, affecting 15 to 30% of adults and even interfering with work responsibilities.[vii] Strong vocal delivery has been linked to positive leadership characteristics, including charisma[viii] and credibility. Vocal cues have also been shown to predict perceived promotability.[x]

**The Technology.** Recent advances in voice analytics offer objective acoustic measurements — using voice analysis algorithms to identify the different features of voice. Speeches and pitches can be recorded and then analyzed using special software and digital applications. Vocal characteristics typically analyzed include pitch, pitch variability, pausing, pace, disfluencies, and volume variability. These features are then converted to outcome data, which can be used to understand vocal capabilities. Training with such tools can help speakers gain insights, confidence, and control over their voice in order to improve performance.

> ***Anxiety around public speaking is common, affecting 15 to 30% of adults and even interfering with work responsibilities.[vii]***

 

**Opportunity for Development.** Both research and practice show that training can help speakers gain conscious control over their voices. Margaret Thatcher famously took vocal lessons from the Royal National Theatre in the 1970s to transform her voice from being "shrill" to one that could command her audience. But this type of coaching has not been available for most…until now. Voice analytic technologies often come with detailed feedback on dashboards to give insights into the features of speech that can be developed. Many also offer written advice and tips for improving your vocal delivery. The easy, repeated use of such tools allows for practice and implementation of improved techniques.

## III. Using Sensors to Get a Good Night's Sleep

**The Problem.** In today's "always on" work culture of travel and 24/7 accessibility, sleep is perhaps leaders' most important personal resource. Lack of sleep lowers performance, impairs memory and problem solving, and increases the risk of errors and accidents.[xi] In fact, in the United States, 23% of employees report being too sleepy to function.[xii] But despite the solid scientific evidence, many leaders don't get enough sleep. A Center for Creative Leadership survey found that 42% of leaders get fewer than 6 hours of sleep a night — a far cry from the recommended level of 8 hours.[xiii] Critically, research shows that leaders often don't realize when their performance is being impacted by fatigue, because lack of sleep lowers the very self-awareness needed to notice slipping performance! Using wearable devices to track the quality of sleep and fatigue levels is one way that leaders can overcome this critical blind spot.

> ***In the United States, 23% of employees report being too sleepy to function.[xii]***

 

**The Technology.** Monitoring sleep and fatigue have become a recent trend in medicine, athletics, and the military. At present, *actimetry sensors* are the most popular and promising tools for tracking. Generally worn on the wrist like a watch, they measure gross motor activity and can be used to calculate variables such as total sleep time, sleep efficacy, sleep onset latency, and wakefulness after sleep onset. There are many types of actimetry sensors, and they differ in their sophistication.

**Opportunity for Development.** Like the tools for monitoring responses to stress, actimetry sensors can help you become more aware of your habits, analyze them, and work on self-improvement. The data and associated dashboards can help you explore your sleep habits, understand measures associated with sleep deprivation, and get relevant advice to help motivate you to enact change. For instance, you can use data you gain about your circadian rhythms the way military personnel and athletes do: to strategize when to do challenging tasks and when to avoid dangerous or high-risk situations.

**Leaders often don't realize when their performance is being impacted by fatigue, because lack of sleep lowers the very self-awareness needed to notice slipping performance!**

 

# Key Recommendations for Using Self-Tracking for Leader Development

In our research, we tested a variety of self-monitoring sensors claiming to provide assistance with stress management, sleep/energy management, and vocal delivery. To better understand self-tracking tools, we wanted to see how these tools worked in practice. We restricted our testing to tools that appeared appropriate for augmenting leadership talents. We used a multi-stage process to examine the instruments. Each phase had a series of checkpoints that had to be reviewed to get to the next phase. We tested the tools first with ourselves and our colleagues, and then with leaders who expressed interest in testing innovative technologies. We looked for tools that:

- Appeared appropriate for use with leaders in learning settings;
- Included information about the scientific basis for metrics;
- Cost within a modest price range;
- Were designed based on solid theory and evidence; and
- Offered evidence-based recommendations for activities, experiences, and information to improve scores.

Since the technology is changing rapidly, we do not offer detailed descriptions of specific tools, but rather discuss the general themes and concerns that emerged. We learned that the devices have promise for leadership development and that they are generally valued by leaders. However, of the 8 devices we tested, only 2 got consistently good reviews from users and leadership developers. Many of the tools were difficult to use. Some gave false alarms (for instance, whisking an egg triggered an indicator of possible epilepsy). Others worked for some body types (e.g., young men), but not others (older women).[xiv]

For 2 of the most promising tools, we did find relationships with aspects important to leadership. We tested an HRV sensor and found that use of it was related to increases in resilience. Our tests of the voice analytic tool confirm that vocal characteristics are associated with emergence as a leader.[xv]

 

# **Our Advice:** Proceed, But with Caution

Based on our field tests, we believe these tools have the potential to become a meaningful and powerful part of the future of leadership development. However, like all new approaches, there are still many questions and much work left to be done. Until there is solid research on sensors and self-tracking programs specifically designed for leaders, consider the following if you are looking for a device to supplement your leader development curriculum.

- ☐ **Don't overlook the importance of individual commitment.** One important lesson from our field tests was that finding the right device is not enough — human motivation and support also need to be taken into consideration. Just as with the success of any other tool for development, there must be a commitment to using the tool and processing the feedback. For example, in our HRV field tests, we noticed that one or two participants ignored the biofeedback on the screen completely, and used the time to check emails and other apps. In such cases, the quality of data matters little if leaders lack intrinsic motivation or allow themselves to become distracted. As with most efforts to change personal habits, intention to change matters.[xvi] Self-tracking tools raise consciousness and can reinforce new behaviors, but they cannot make someone who is resistant to or skeptical of different habits try something new.
- ☐ **Consider spending more for sensors with better accuracy.** In our explorations, we found that some of the sensors were not as accurate as they should be for use in leadership development. Both the EDA and HRV monitors were confused by too much movement. The voice analytic tool's success was limited by extraneous sounds. Even the sleep monitor occasionally confused watching television with sleeping. Other reviews of these technologies have come to similar conclusions.[xvii] Sensors are becoming more accurate each year, and in the future, this might not be an issue. But until then, we recommend running field tests for accuracy, and when possible, opting for medical-grade sensors over the widely available but lower quality ones.
- ☐ **Ensure the data the tool provides is actually relevant.** Every tool we examined promised to provide insights through data, but the data provided was not always useful for personal development. For instance, several devices simply offered basic metadata such as location, date, or amount of time used. Look for data that will actually help with your organization's learning objectives and challenge your leaders. The data should be specific enough that an individual could answer the question "*What slight adjustments do I need to make to improve?*"
- ☐ **Consider the ethical and privacy issues first.** At this point, there are some major issues about data privacy and security with these tools. For instance, a 2015 study of 79 health apps found that 2/3 of apps certified as safe and trustworthy by the UK NHS Health Apps Library still sent identifying information over the internet without encryption, and 20% did not have a privacy policy.[xviii] A related issue is ownership of data. Is self-tracking data strictly the property of the individual? Does the company selling the device own it? If an organization or coach pays for the tools, do they have rights to see the data? These are currently ethical and legal questions that are being debated globally. Organizations should clearly communicate expectations around privacy and ensure that data is secure. As a new learning solution, the ethical issues need consideration.

 

# Conclusion

Self-tracking devices hold tremendous promise for the future development of leaders by offering a new level of feedback for modifying behavior. The tools enable people to take an iterative and individualized approach to learning, connecting ongoing monitoring to development, and offering feedback that is specific and operational. This aligns nicely with the emerging trend to promote continuous learning in organizations, making work and development seamless and available on demand.

The tools discussed here are just the beginning. New developments are happening constantly. Self-tracking tools are getting smaller, faster, more accurate, and more lightweight. "Smart" clothing is being tested. Virtual reality technology may create new opportunities for feedback and behavior change. At the same time that these tools are becoming more popular, the environment is growing more demanding of leaders, making development even more important.

We do not expect these technologies to replace traditional ingredients of leader development solutions such as 360-degree assessments, training programs, coaching, networking, and mentoring. They fall short in teaching the strategic, relational, or contextual elements of leadership. However, that is not their goal and other methods are able to address those needs. The real promise of self-tracking tools is that they offer learners a data-based insight into the self in a way that motivates and provides guidance for a personalized pathway to acting in a leader-like way. However just as with any other method of development, it is not the tool that makes the difference, but the user. Just as people don't change by simply talking with a coach, simply downloading an app and wearing a tracker won't change your leaders. However, these emerging technologies can help instruct, inform, and inspire individualized plans for growth and development at relatively low cost — and that is a potential worth exploring.

 

# Ready to Take the Next Step?

Ready to try self-tracking technology? First, consider how this could help with your development goals. Obviously, a device that tracks your steps, heart rate, or swim strokes may not be the best for leadership development purposes.

- ***If you want a device to help you better assess and respond to your stress levels***, make sure you select one that tracks heart rate variability (not just heart rate) or ectodermal skin response. It also should have guided meditations or breathing exercises in the app (or consider pairing it with a separate meditation app).
- ***If you're hoping to improve your sleep hygiene***, look for a sleep tracker device that is medical grade or as close to that as you can afford. The sleep trackers we tried worked better for some body types than others, so read the reviews carefully.
- ***If you're looking for voice analytics software to help you improve your public speaking skills***, choose something that gives you lots of data about how you vary things like pitch, volume, and pace when you speak.

In all situations, spend as much time examining the associated app(s) as you do the device itself. Feedback and data dashboards should be easy to understand, advice provided should be robust and grounded in evidence, and you should feel comfortable that your personal data will be kept secure and private.

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