UX Futures
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Investigating emerging technologies and how they can be implemented into the Wattbike ecosystem effectively

Introduction

Since its founding in 2008, Wattbike has led the way in providing a solid training platform for world class athletes at the top of their game and regular users alike (Wattbike, 2018). Their flagship product, the Wattbike is a digital stationary bike which was designed to replicate the physiological feel of outdoor road cycling (Hughes, 2021). In August of 2020, they approached Apadmi to help with the development of not only their mobile app, but also the user interface of their digital bicycle screen. They wanted to take advantage of new technologies, presenting a brand new challenge to the company. This report will be looking into two emerging technologies that may be implemented, the Internet of Things (IoT) and extended reality (XR), whilst focusing on how they could be implemented within the Wattbike ecosystem and discussing what UX considerations will need to be thought about when implementing.

Extended Reality (XR)

As described by Doolani et al. (2020), extended reality (XR) refers to a combination of a user's real and virtual environments, where using computer generated interactions helps to facilitate the interaction between a machine and a human. XR is an umbrella term encompassing all immersive technologies currently available to us: augmented reality (AR), virtual reality (VR) and mixed reality (MR), as well as those that are not currently created or available (Marr, 2019).

More specifically, this report will be focusing primarily on VR, and how it can be applied to the Wattbike experience. Although the concept of VR has been around since the 1960s, it has only been within the past 12 years that high quality VR has become more widely accessible to the general population. Companies like Meta (figure 1), Sony, HTC, and many more now boast over 170 million users worldwide (Cipresso et al., 2018; Kolmar, 2023). A study by Borrego et al. (2018) defines VR as a simulation of an environment by stimulating the user's sensory channels, helping them interact in real time.

Figure 1: The Meta Quest 3 allows users to experience the world in mixed reality, a combination of virtual reality and the real world. (Meta, 2023)

Using VR technology for health and fitness has become increasingly more popular by utilising gamification to boost pleasure for the user, and it provides a more positive impact on the users physiological, psychological, and rehabilitative outcomes; when compared to a more traditional mode of exercise (Nor et al., 2019; Qian et al., 2020). Studies have shown that tension and stress-management are improved when pairing VR with physical activity, helping to increase their enjoyment of exercise and improve their overall physical fitness (Plante et al., 2003; Chen et al., 2009; Lee et al., 2015; Azzi, 2023). Wattbike should consider utilising personalisation and gamification to help create a more appealing exercise environment for the user, which has been shown to improve engagement, increasing their overall usage time (González et al., 2018).

Similar to companies like Zwift and Holodia (figure 2), Wattbike has an opportunity to utilise VR to improve the user's experience when using their product. Studies have shown that when 360° VR with a head mounted display (HMD) is utilised, such as the Meta Quest 3, the user can accomplish greater levels of physical activity whilst perceiving it as being less intense (Zeng et al., 2022). Interestingly, Ortet et al. (2022) also showed there to be a greater benefit for older and more vulnerable individuals, providing them with an improved sense of wellbeing and independence within their physical and mental rehabilitation. Conversely, a review by Zeng et al. (2017) suggested that the evidence supporting the benefits of VR exercise in comparison to traditional therapy is insufficient when looking at the alleviation of anxiety and depression and other psychological issues. This was then corroborated by Ng et al. (2019), who found no psychological benefit when using VR intervention on physical activity levels.

Figure 2: A screenshot from Holodia's VR cycling game, where the user can collect points. (Holodia, 2023)

Although utilising VR for health and fitness has its obvious advantages, there are certain challenges that make it hard to implement for Wattbike. A quite common issue when using VR is the physical impact, specifically issues with unease, disorientation, and nausea (Sheasby, 2023). VR causes motion sickness or 'cyber sickness' by causing an individual's brain to think they are moving, when their body is static, creating a disconnect and confusion (Gavgani et al., 2018; Coles, 2021). However, these issues may be prevented due to the unique input methods of the software, in Wattbike's case it would be the static bicycle. A UX consideration that may be taken into account to try and combat this motion sickness would be implementing an anchor point for the user, such as a virtual bike which they can see underneath them. This visual anchor helps to synchronise the user between the game and the real world, and helps reduce these feelings of nausea and disorientation (Arvi VR, 2018).
A study by Bolton et al. (2014) and Arvi VR (2018) suggested that a novel input method such as a bicycle, a visual anchor, and an increased immersion when combining head mounted VR and 'exergaming', create a more natural environment for the user, which helps to reduce this motion sickness.

Internet of Things (IoT)

The Internet of Things (IoT) refers to the constantly growing network of interconnected devices that detect, capture and exchange data (Xia et al., 2012; Sarker et al., 2022). The number of everyday objects that are now considered an IoT device are constantly increasing, with a report by Hassija et al. (2019) predicting that by 2024 the machine-to-machine (M2M) connections will grow to 27 billion, with an expected revenue of $4 trillion by 2025.

When applied to exercise equipment like the Wattbike stationary bike, IoT opens up many new capabilities. Performance metrics like the user's power output and cadence can be captured, and with the utilisation of personal devices such as smart watches and chest worn heart rate monitors, as shown in figure 3, the bike can capture ECG and heart rate data and upload this to the cloud. This data can then be directly shared with a healthcare professional or coach for immediate and reliable feedback and action (Saha et al., 2017).

Figure 3: Chest heart rate monitors can be worn to connect your data to training devices (Polar, 2022)

This data may also be used to personalise the user's exercise regimes to get the most out of their sessions, without the need for a physical coach. Studies show that using personalised exercise and lifestyle advice has a significant benefit on the health and motivation of individuals (Doets et al., 2019; Lingam, 2019). Implementing an exercise recommender system which utilises personal health data to promote more personalised rides, would increase the likelihood of users accomplishing their short- and long-term goals, as well as continuing to use the equipment after their exercise plan has ended (Karami et al., 2021).

Similar to Peloton's 'Lanebreak' game (Figure 4) and 'awards' on the Apple Watch and Apple Fitness (Figure 5), Wattbike may want to consider incorporating gamification and a rewards based system in order to make the physical activity more enjoyable and therefore motivate them

to become more active and engaged (Zuckerman and Gal-Oz, 2014; Looyestyn et al., 2017; Ozdamli and Milrich, 2023). For example, using power output or cadence, users could join challenges and compete on leaderboards against other Wattbike users for top performance. Through this, badges or points earned on the bike could eventually be redeemed for discount codes or merchandise. A study by Bentvelzen et al. (2022) discussed how Zwift, another gamified exercise bicycle, has been shown to elicit new directions to help better develop engagement and wellbeing within their users. Conversely, other studies suggest that this competitive element is not likely to have an effect on engagement or performance and rather that it is context dependent (Hamari et al., 2014; Chen et al., 2019).

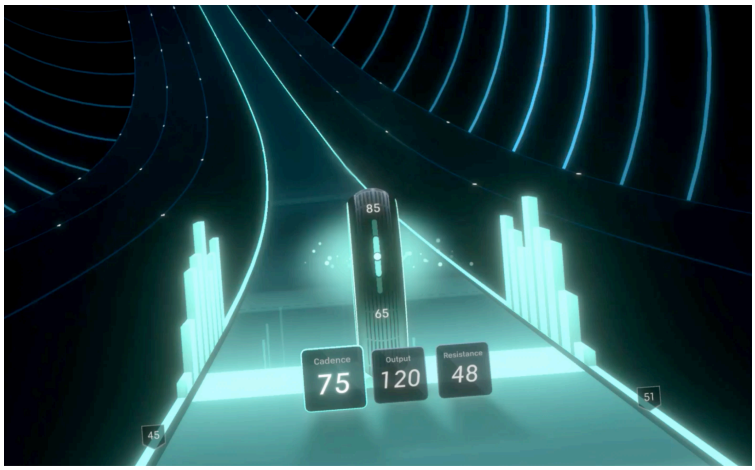

Figure 4: A still from Peloton's Lanebreak game (Peloton, 2022).

Figure 5: A screenshot from Apple Fitness' awards screen. (Apple Inc., 2023)

One of the primary issues surrounding IoT is that it introduces cyber security and privacy risks, as this sensitive personal health data is now being collected from the bike and transmitted (Griebel et al., 2015). A study by Chacko and Hayajneh (2018) also found that there was a serious concern about who owns the healthcare data from their wearable technology, mHealth, as the data was being shared with a health information governing body without the user's knowledge or consent. Studies by Xu et al. (2014) and Nebione and Calzarossa (2020) discussed how IoT presents a large potential for the spread of malicious attacks from the internet into the real world due to the lack of appropriate security services. If an individual's device is connected to their medical services, a breach and tampering of sensitive healthcare data may lead to the individual being supplied with incorrect treatment, leading to potentially fatal consequences (Seh et al., 2020).

From a UX perspective, Wattbike should consider multiple approaches when dealing with security and privacy in order to protect themselves and the user from negative repercussions. All communication on how the data is handled and distributed should be clear and transparent, whilst providing visual cues, such as lock-icons to reassure the user (Bhumi, 2017). This way the user knows their data is being cared for and Wattbike is treating it responsibly. Secondly, the user should be presented with secure authentication such as multi-factor authentication (MFA) as well as biometric options, creating an extra level of security. Due to the common use of MFA users are more likely to trust it as they will have mental models of other applications using the same thing, however a users lack of motivation to complete MFA setup may cause a usability challenge (Ometov et al., 2018; Das et al., 2019).

Expand, investigate, and reflect

Although implementing and embracing IoT within the Wattbike ecosystem brings clear positives for the user, there are quite serious negatives that need to be considered. As shown within the empathy map and experience map in figures 6 and 7*,* the users have a genuine concern over the security and privacy of their data, as it is deeply personal. The collection and sharing of the users personal health data is likely to bring a layer of mistrust to the Wattbike service, as studies show that the general public in the U.S. have a major distrust for the organisations that receive their data (Platt et al., 2018). Conversely, this sentiment is not shared within Europe, as Holm et al. (2021) suggested that there is a general trust of practitioners, hospitals, and researchers, when regarding the confidentiality of their data.

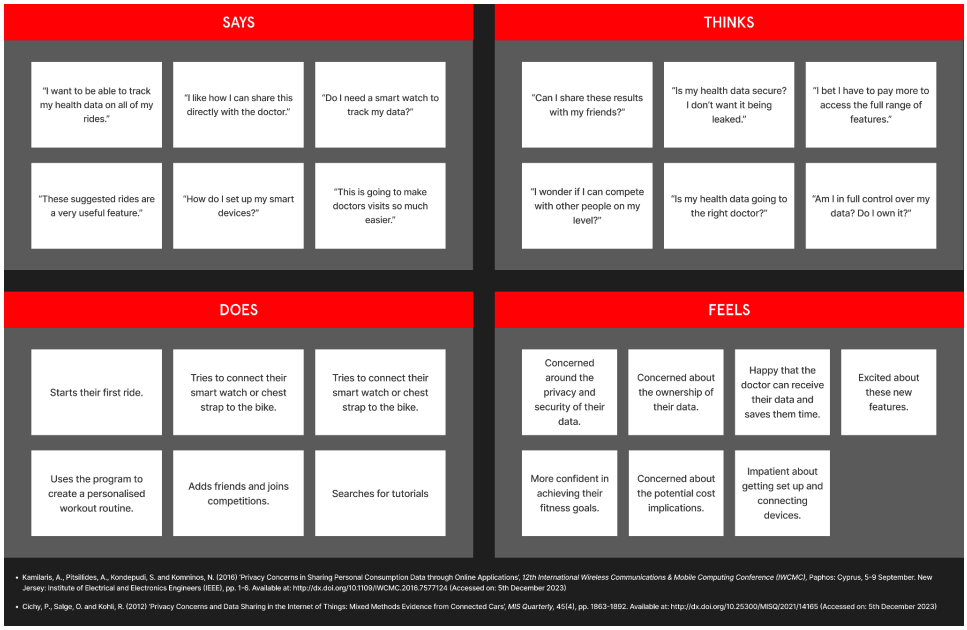

Figure 6: An empathy map showing the thoughts and feelings of potential Wattbike users.

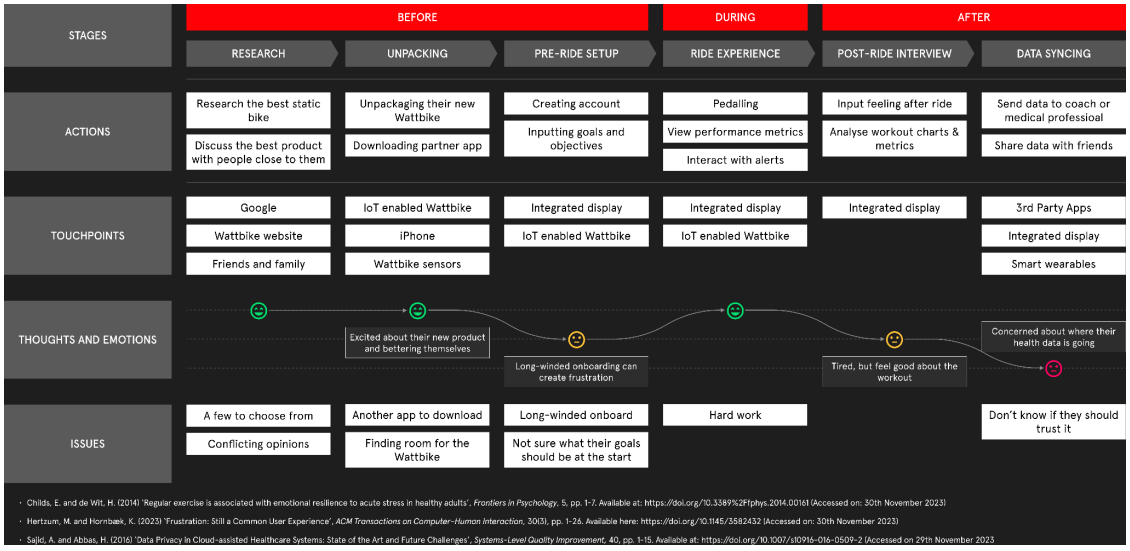

Figure 7: An experience map visually representing what the user does, thinks and feels.

This same study showed that 92.7% of patients feel they should have full control of their information and data, so by giving the user full control of what data the Wattbike collects, how it is collected, and who this data may be shared with can help to alleviate these concerns (Holm et al., 2021). This may be implemented as shown in figures 8 and 9. Upon onboarding, the user should be presented with a checklist of the data the Wattbike may be able to collect, and the user can select what data they prefer to share, and with whom. The user should also be clearly made aware of the benefits of sharing their exercise and health data. A study by Chandrasekaran et al. (2021) explained that due to the advances in IoT and health data analytics, the quality of life and health of older users is improved, therefore if this is

communicated clearly to the user, then an element of trust may be achieved. Houdek VonHoltz et al. (2015) also suggested that patients should be given follow-up care if they have medical issues or specific goals. This can be applied within Wattbike to maximise the benefit the users get from the product, allowing coaches or medical professionals to assign exercise routines and provide relevant feedback. As impldmented in figures 10 and 11**,** clear presentation of feedback is likely to help increase the user's training performance and support effective behaviour (Bosse et al., 2015; Hardavella et al., 2017)

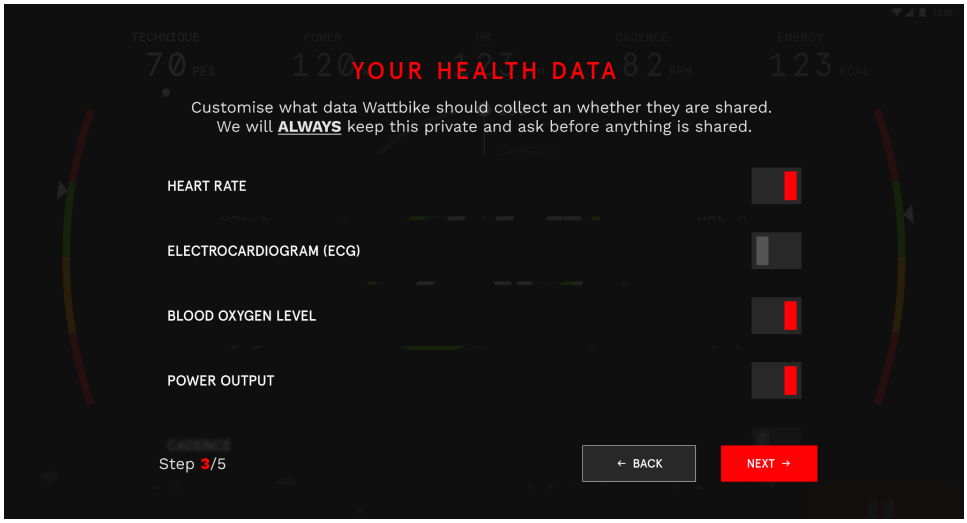

Figure 8: An example of how, during the registration process, the user can select which data they want Wattbike to capture and potentially share.

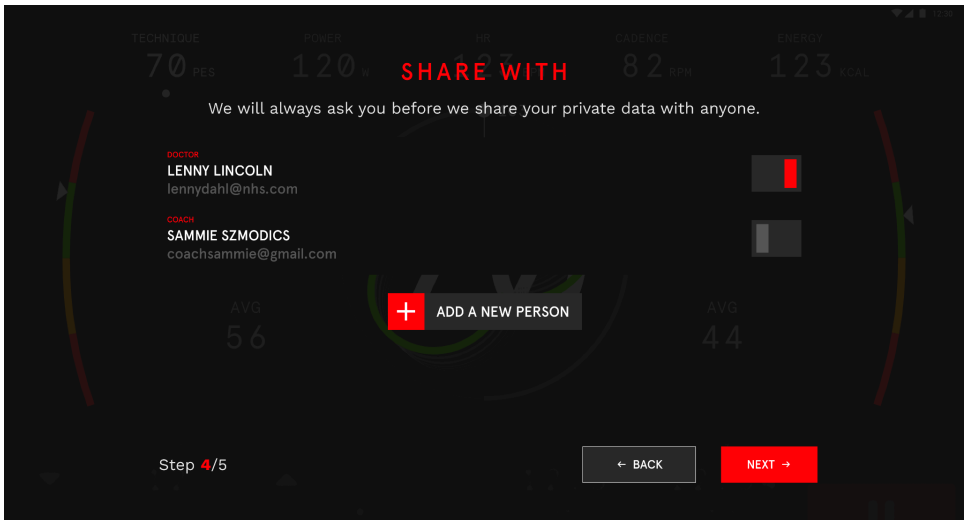

Figure 9: An example of how, during the registration process, the user can select who they would like their data shared with.

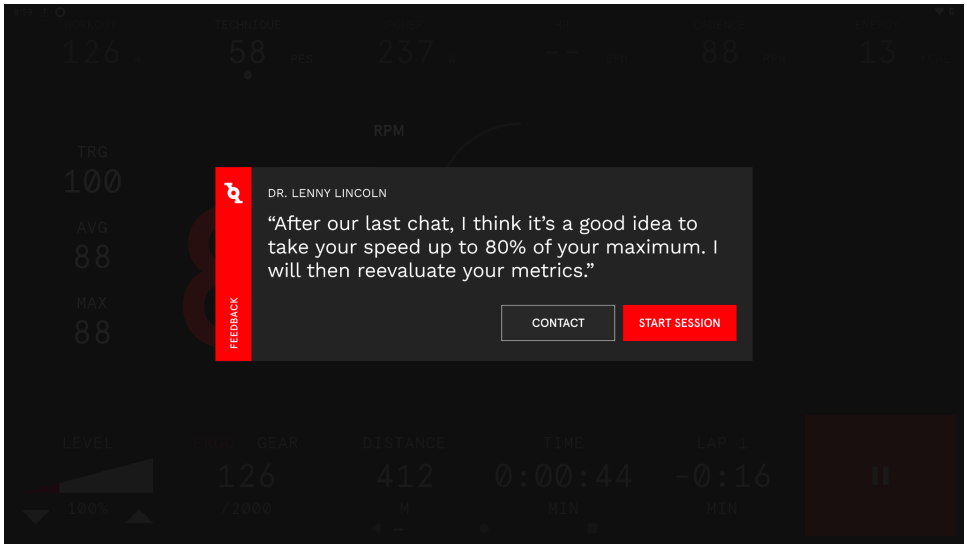

Figure 10: A design of how a Doctor may provide feedback to their client, the Wattbike user.

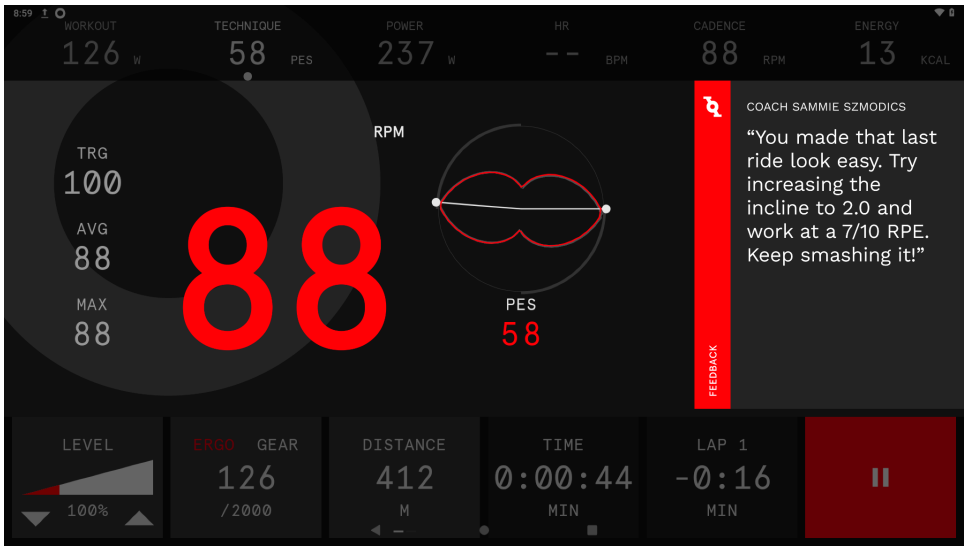

Figure 11: An example of how a coach may provide constant feedback throughout the user’s training session.

Conclusion 217

In conclusion, from the two technologies discussed, integrating both XR and IoT connectivity into the Wattbike ecosystem has substantial upsides, provided that key user concerns are addressed. Considering the position of Wattbike, IoT is more readily available to implement and therefore less of a risk to the business. The Wattbike static bicycle can capture and transmit performance metrics and biometrics and share these with the necessary people, as long as the user allows them permissions. This functionality also opens up the ability for personalised

training regimes, gamification through competitive leaderboards, and real-time feedback from coaches and medical professionals, to help better achieve their goals. However, in order to mitigate apprehension around the privacy and security of their data, the collection and distribution should be fully transparent, and the user requires full control. Multifactor security provisions including biometric authentication are equally important. Overall, the very nature of IoT introduces cyber risks that must be reduced in order to gain full user trust in the Wattbike. Given its innovation history, Wattbike is well-positioned to implement IoT responsibly. This will help the organisation lead the way within the industry against their rivals, whilst future-proofing the business. Consequently, IoT connectivity is the logical next step in Wattbike's evolution if providing athletes with the best and most user-centred product remains the goal.

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Appendix

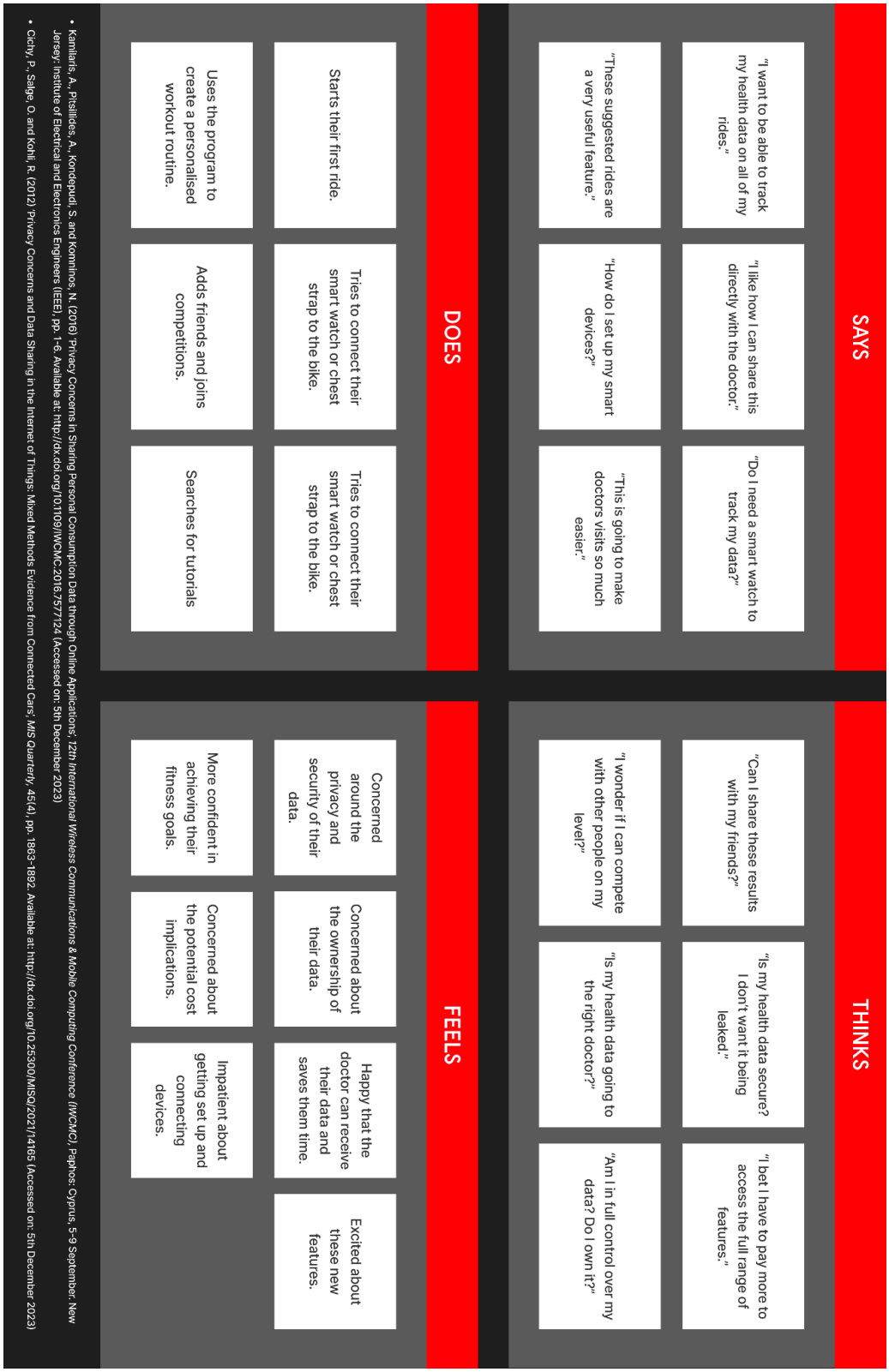

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Figure 6: An empathy map showing the thoughts and feelings of potential Wattbike users.

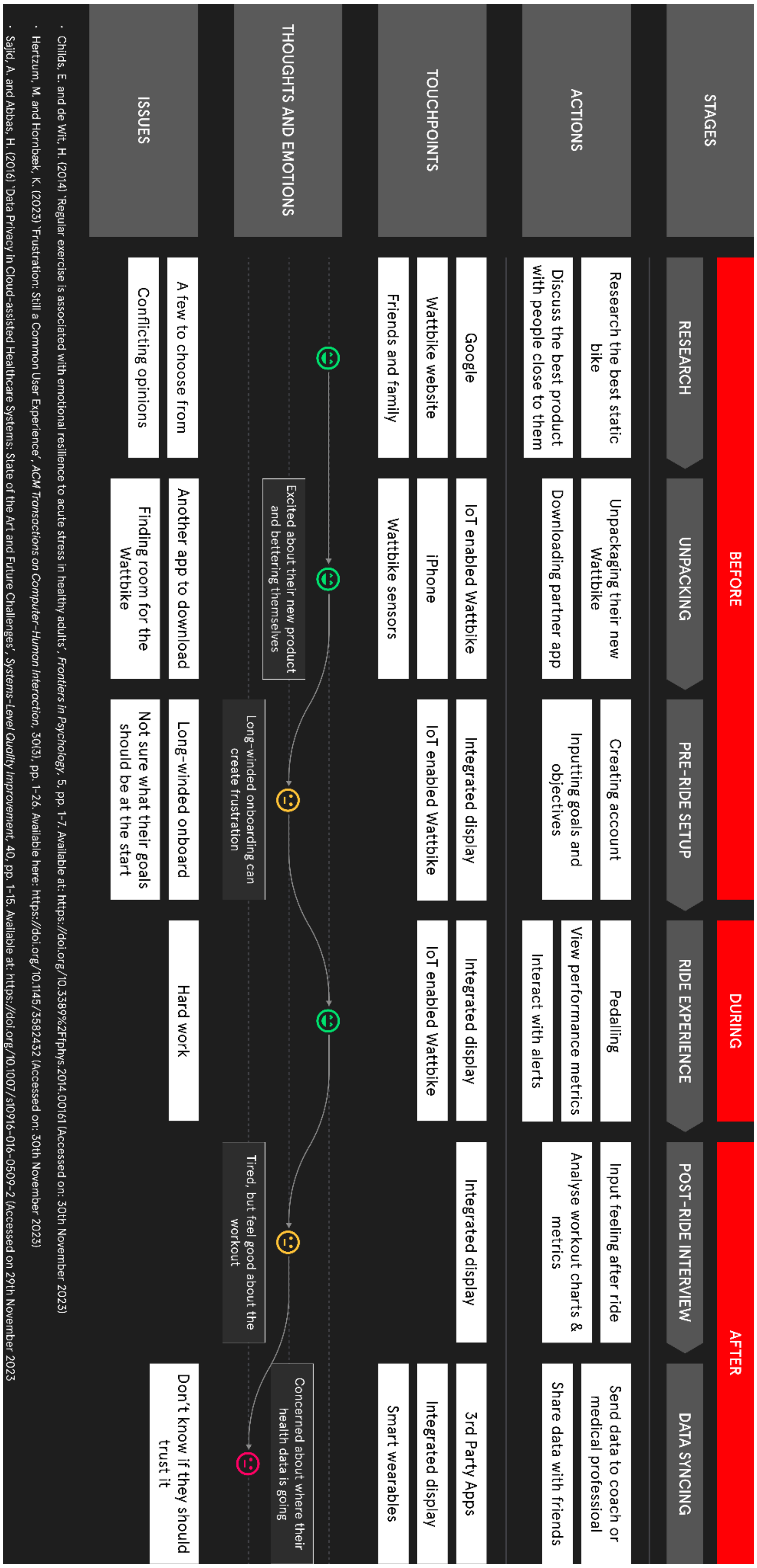

Figure 7: An experience map visually representing what the user does, thinks and feels.

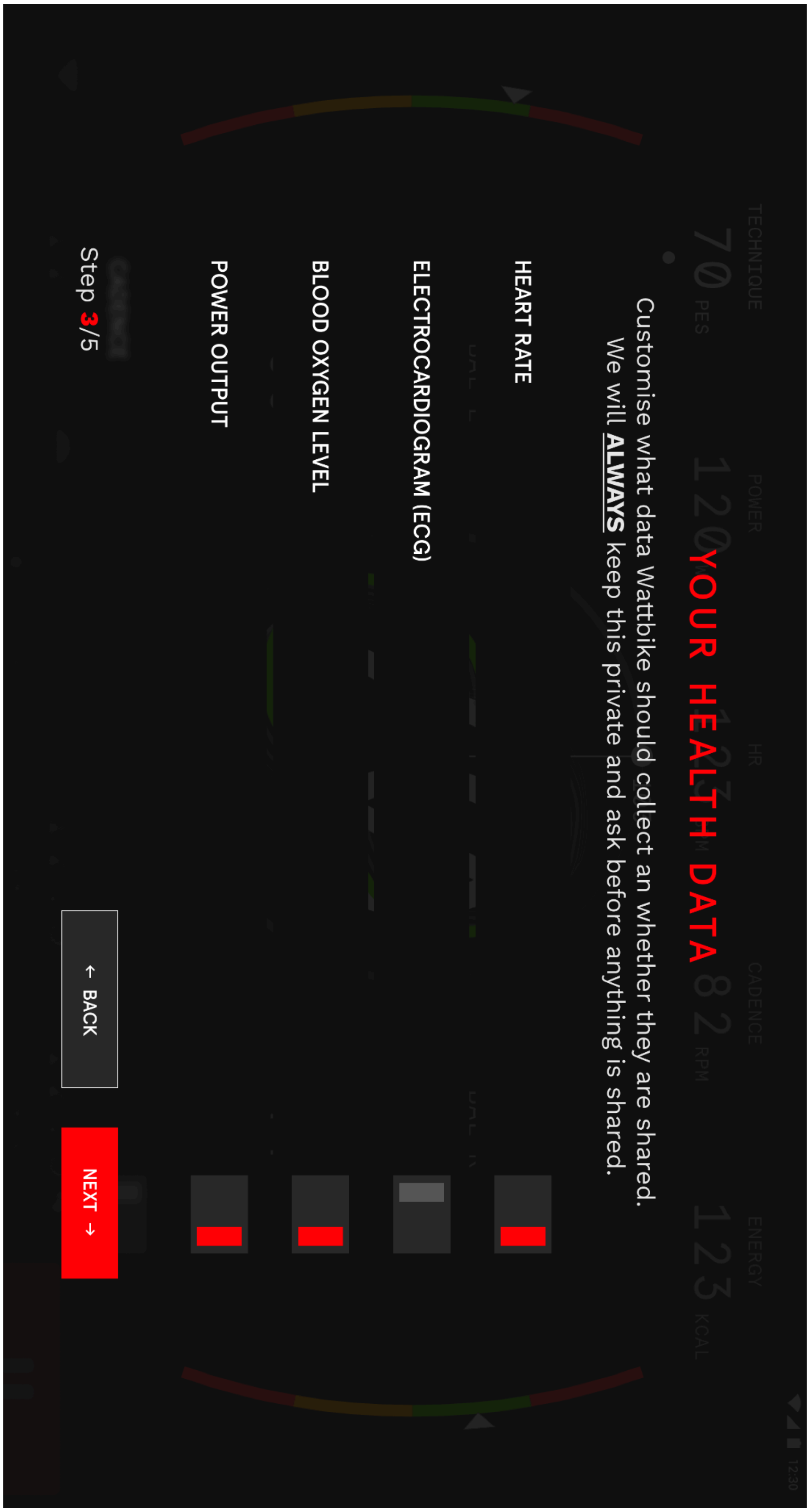

Figure 8: An example of how, during the registration process, the user can select which data they want Wattbike to capture and potentially share.

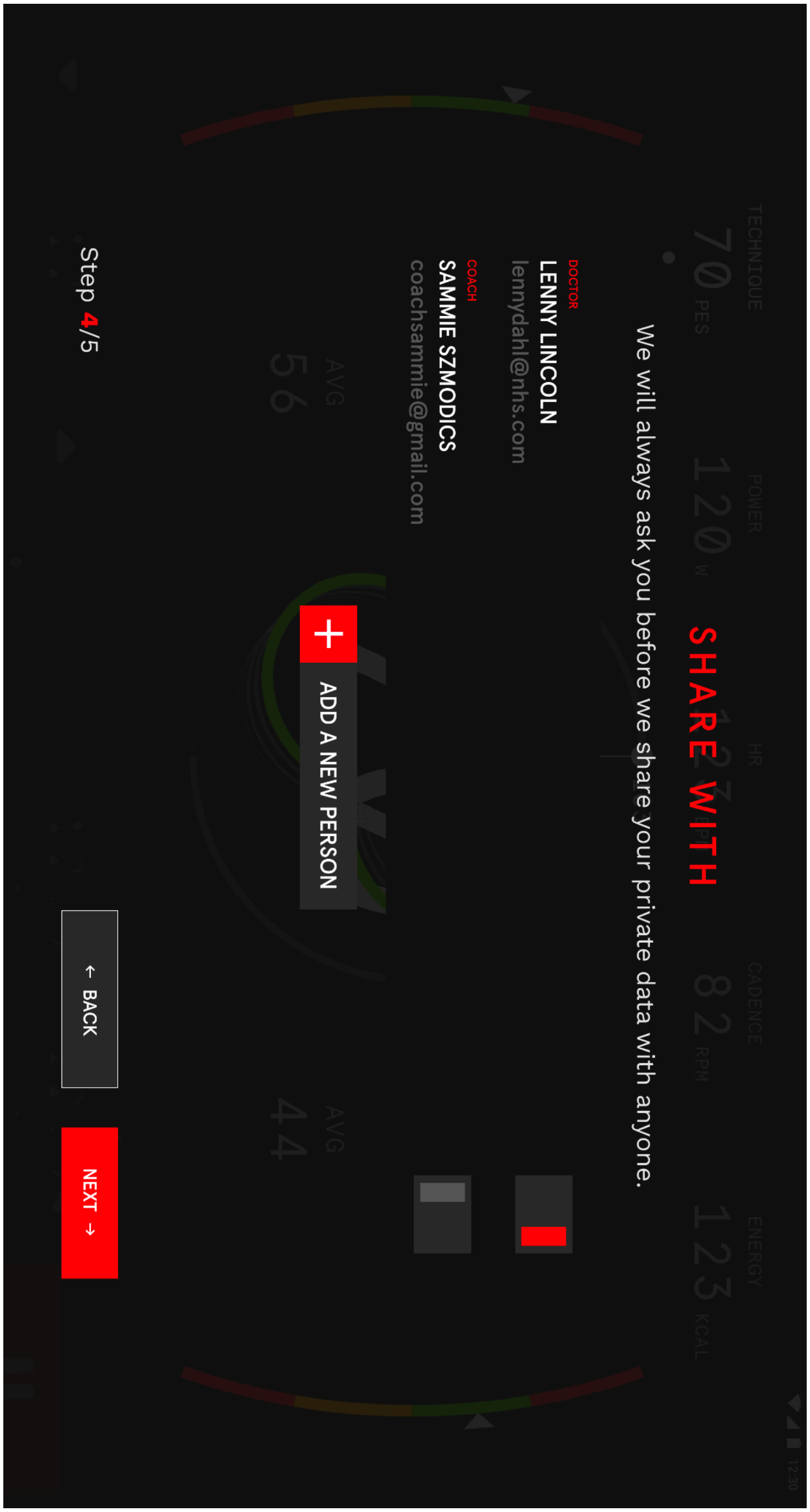

Figure 9: An example of how, during the registration process, the user can select who they would like their data shared with.

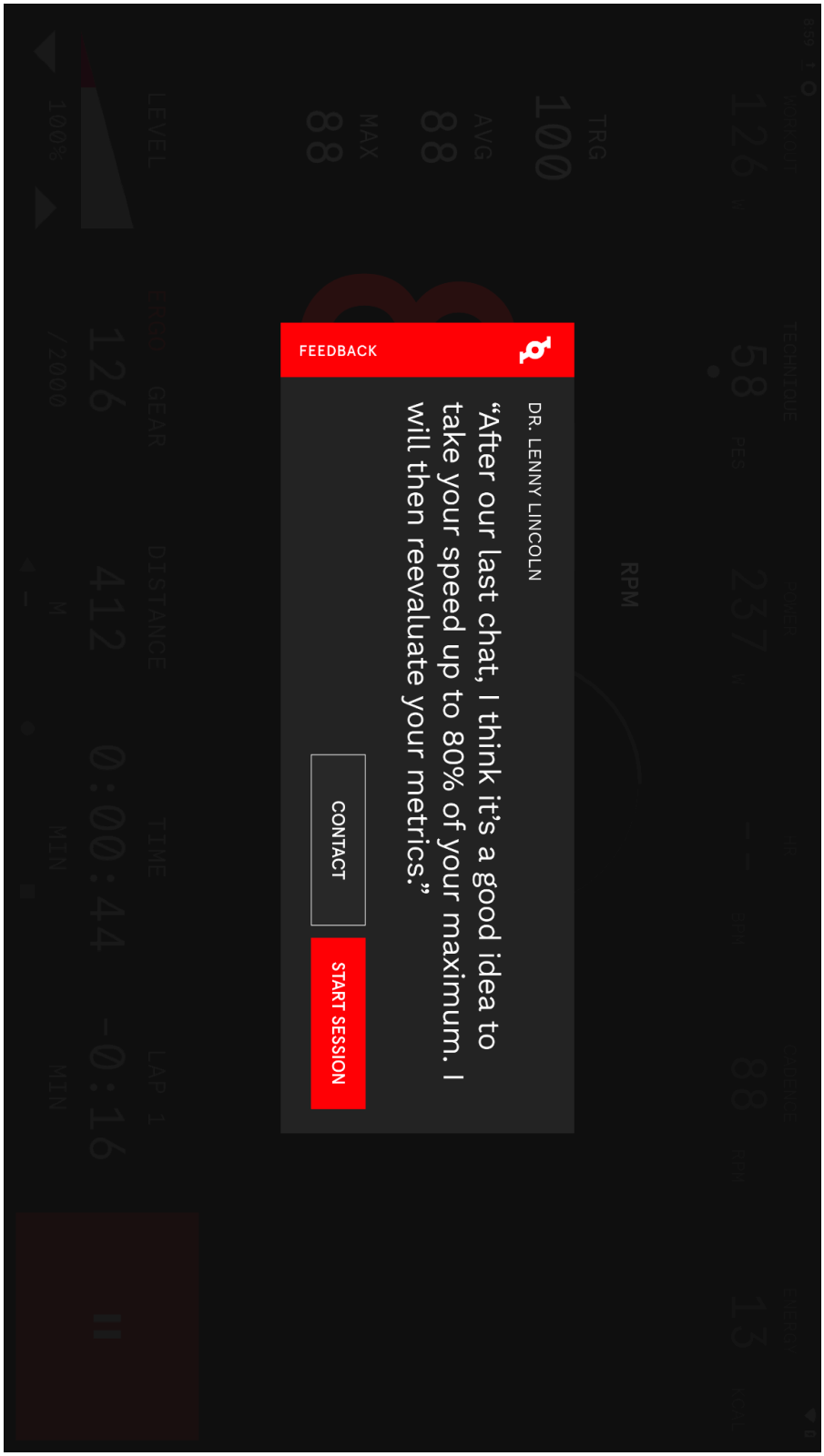

Figure 10: A design of how a Doctor may provide feedback to their client, the user.

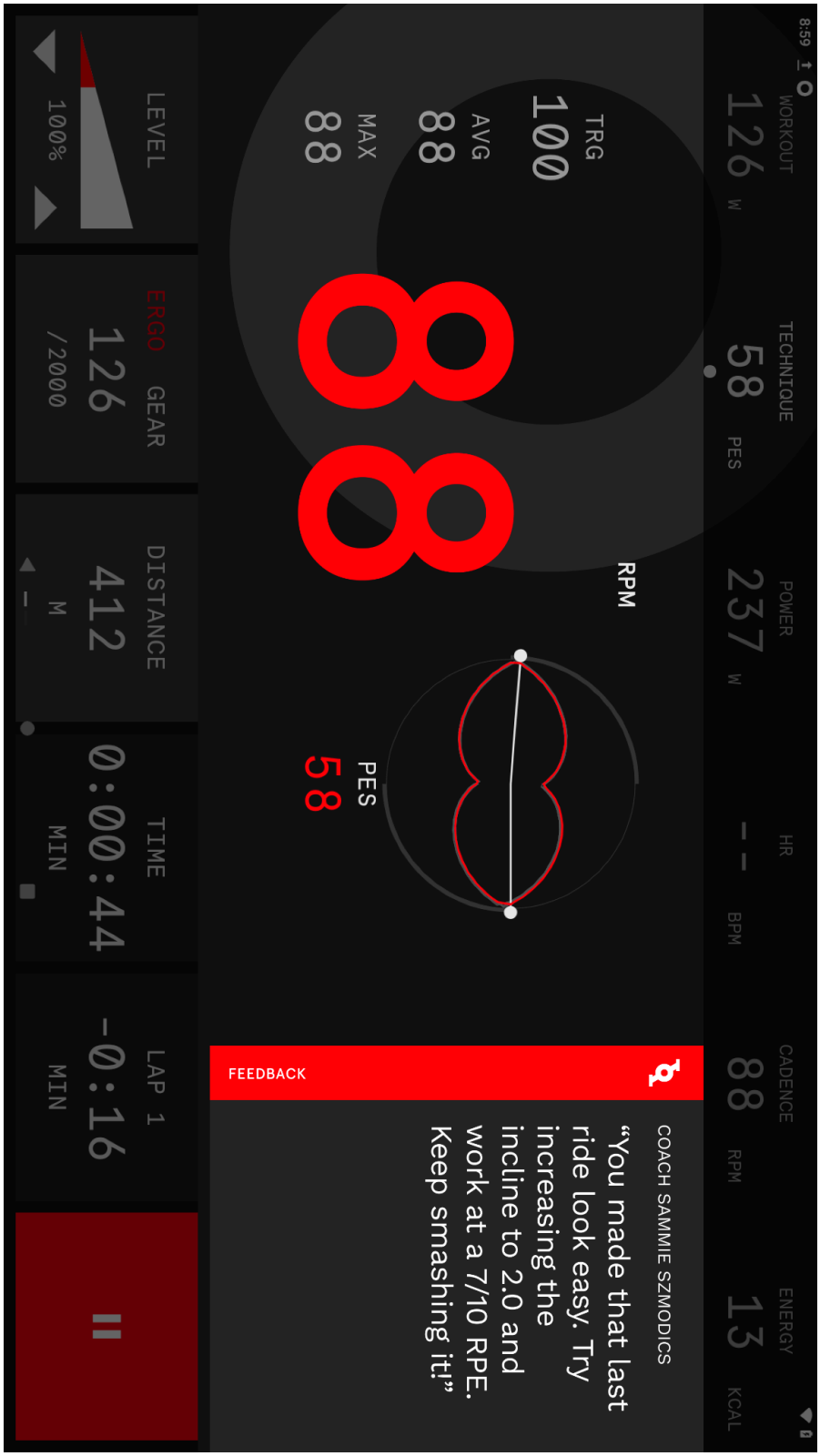

Figure 11: An example of how a coach may provide constant feedback throughout the user’s training session.