

PROMOTING HEALTHY ENERGETIC CYCLES

A message from Jessica Corbin, CEO of SORCE:

As you review this research, I wanted to highlight three key takeaways that research firm psyML uncovered during this study.

First, psyML's research validates HRV (Heart Rate Variability) as an effective biomarker for stress. Their analysis also illuminates that an ideal cycle for our Recover/Maintain/Push metric breaks down to about 20%/50%/30%. Lastly, we observed that those with a consistently high HRV more quickly cycle through the Recovery and Maintain states, giving them more days with a higher level of capacity to perform. Our findings affirm that it is healthy and normal to experience a cross section of RMP states over time. By understanding and working with these states, we can sustainably maintain performance in the workplace and employee wellness.

The science and the data support that SORCE will bring a positive impact to your team. Please read on to learn more.

The core of the SORCE platform is to empower individuals, teams, and organizations to harness and regenerate human energy to combat the burnout that plagues so many otherwise strong people today. While our leadership team's decades of experience in health, wellness, and psychology offered us insight into the value of tapping into the body's natural cycles as a means to better understand daily readiness, we knew our plans had to be backed up with clinical research and data.

Working with our embedded research partner, psyML, we've assembled compelling insight from academic studies and data from our early adopters to show that **a healthy cycle of Recover, Maintain, and Push (RMP) days** leads to stronger performance and increases in HRV that will make employees more resilient, productive, and driven to perform at the highest levels.

Tracking HRV to Understand Stress Levels

Scientifically, we know that cycling between periods of high and low performance is necessary for balancing stress and performance. The SORCE platform measures HRV as a proxy for stress and human energy reserves. While HRV activity is not directly related to cortisol (the stress hormone) activity, review of the neurobiological literature suggests that HRV is impacted by stress and "supports [HRV's] use for the objective assessment of psychological health and stress" (Kim, et al., 2018).

Quick Note: SORCE tracks HRV as a proxy for understanding your stress and energy levels.

There are many contributors to variation in HRV, including biological and psychological variables — even menstruation impacts HRV (Kayacan, et al., 2020). Stressors can be both mental and physical. Across several studies, lower HRV scores are associated with heightened occupational stress (Järvelin-Pasanen, et al., 2018).

Recovery is a Natural Part of a Productive Cycle

Stress, whether mental or physical, will impact one's reserves and ability to perform. A Recover recommendation from the SORCE platform usually follows either a period of high stress or performance at work or recovery from physical illness. Whatever the source, when human energy reserves are depleted from either mental, psychological or physical exertion, they must be replenished through rest. This is why cycling is both healthy and necessary. Even without a recovery period, the body can sustain performance in a heightened stress state for a considerable amount of time. However, not allowing for recovery time degrades performance, impacts well-being, and affects our health - typically leading to burnout. The old adage that one should 'push through the pain' is more of a problem than even it sounds.

QUICK NOTE: SORCE helps employees understand their natural energetic level so they can make the right decision about how much they push themselves each day.

Research shows that it is normal and healthy to cycle through periods of high performance, rest and regular performance. One cannot give "110%" all the time and it is not very sustainable to go back and forth between high performance states and crashing hard. In fact, the US Military has closely studied the balance between work-rest cycles and sustained performance. Research in this realm indicates that soldiers can maintain unbalanced high-work, low rest schedules for a few weeks but a balanced work-rest schedules can be maintained for long periods without eventual detriment to performance.

Additionally, while some individuals are more adaptable this kind of imbalance, this type of schedule deplete one's reserves such that all individuals are susceptible to degraded performance in emergency situations, like those imposed by sleep loss (Alluisi and Chiles, 1967).

Managing Stress

In the workplace, managers can work with employees to manage mental stressors; outside the workplace, employees can strive to ameliorate physical stressors through lifestyle and wellness practices as well as work to manage additional sources of mental stress in their lives. While it is important to be aware of and manage stress, it is equally important to remember that stress can also be beneficial to performance.

The Yerkes-Dodson Law describes an inverse U-shaped relationship between stress and performance (Figure 1). When we are relaxed and in a state of low stress and arousal, motivation is

low and performance suffers. As stress increases, motivation also increases, and performance improves. However, after a certain point, stress and arousal are too high and performance suffers, especially for creative tasks that require a lot of mental effort.

QUICK NOTE: Stress isn't all bad - sometimes we need it to keep us going. SORCE empowers your employees with everyday tools and strategies to combat stress before it becomes overwhelming.

Our daily HRV affects the baseline with which we face stressors and, therefore, our ability to cope. When that baseline sets us up for a high-stress state, we can still perform well at mundane tasks. This means that with knowledge of our HRV, we are not only better prepared to push ourselves to complete high-performance tasks, we also understand the kinds of tasks that won't suffer as much from baseline high stress and low reserves. Together, this balance allows us to understand and work with our stress and energy levels to produce sustainable performance.

The Yerkes-Dodson Law

How anxiety affects performance.

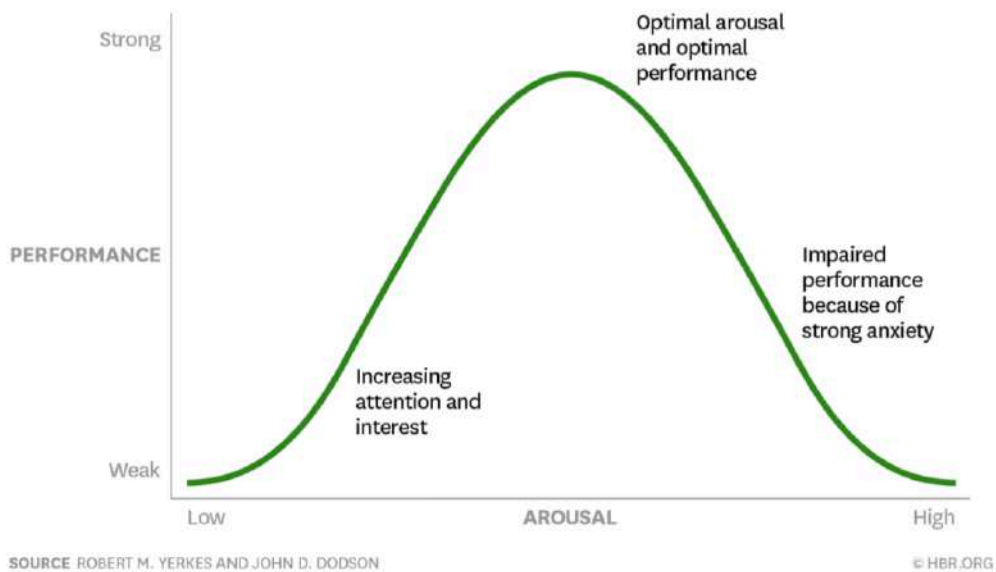


Figure 1. Inverse U-shaped curve describes the relationship between stress and performance.

Our findings affirm that it is healthy and normal to experience a cross section of RMP states over time. By understanding and working with these states, we can sustainably maintain performance in the workplace and employee wellness.

To help individual workers better understand, plan for and work with their RMP tendencies, the individual RMP metric we describe below (ranging from -1 to 1) is useful. If an employee has a stronger negative score, they may need to address sources of stress and depletion in their lives; in

the office, they need to carefully plan for steady progress on high-effort tasks so that they are not overwhelmed by last-minute deadlines and demands. Meanwhile, employees with stronger positive scores tend to have more Push days available to them and can use those days to their advantage, while being mindful of taking care to recharge regularly. All employees should prepare for ample Maintain days and be flexible and proactive to maintain productivity as they ebb and flow between states.

QUICK NOTE: Monitoring your RMP cycle is a healthy way to ensure you are listening to your body and responding with the right level of activity each day.

Using Psychometrics to Improve Communication

With regard to communication, prompts encouraging users to work with their fluctuating RMP cycles benefit from being tailored to the personality of that user. Certain personalities will respond to recommendations to accommodate signs of biological stress (i.e., to slow down) differently, so nudges are adapted appropriately. For example, a high Openness user may be highly receptive to RMP coaching, while a high Conscientious user may struggle to let their RMP levels interfere with their work plans. In this case, the high Conscientious user can be reminded that it's important to step back for a day or two and focus on clearing their plate of low-energy, mundane tasks so that they'll be ready to hit the ground running when their energy levels are higher.

QUICK NOTE: SORCE uses a brief survey when an employee sets up their account to understand how best to provide them actionable insight each day.

What Our Data Shows

SORCE has been in use by a number of early adopters for the last eighteen months. As a result, we've compiled anonymous usage data that supports what we found in our research. Our review of preliminary SORCE user data supports the validity that RMP cycling occurs regularly among SORCE users. Moreover, we found that most users stop at the Maintain state when cycling between Recover and Push periods. In fact, SORCE users tended to spend more time in Maintain and Push states than in Recover.

Method

1. First, the database was queried and the data filtered for duration and completeness of participation.
 - i. As of June 22, there were 237 unique IDs in the database
 - ii. Of those, 91 subjects had at least 14 data points and a 70% completion rate.
 - a. 14 data points were selected to give a view of at least two weeks' activity. If we choose to focus on those with 75 or more data points, there are 24 subjects available (Figure 2).

- b. A minimum completion rate of 70% (5 days per week) was chosen due to a bump in participation around that threshold (Figure 3).
- c. All further analyses focus on those 91 subjects.

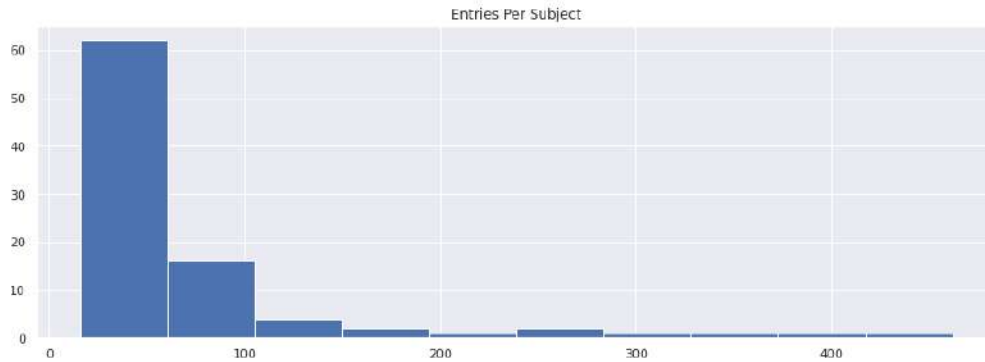


Figure 2. Number of data points available for included subjects.

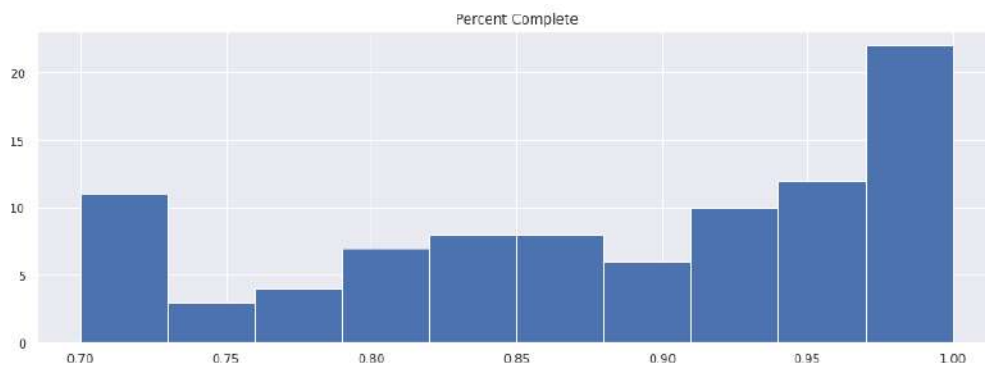


Figure 3: Completion rate of included subjects.

Once the dataset was filtered, the proportion of time spent in each of the RMP states was investigated. We observed a bias to spend the greatest proportion of time in the Maintain state (Figure 3, median proportion = 0.446), which makes sense from a biological standpoint. This was followed by the Push state (Figure 4, median proportion = 0.333) and then the Recover state (Figure 5, median proportion = 0.211). These latter two proportions indicate either that (1) the algorithm is biased towards assigning the Push state over the Recover state or (2) that most Sorce users do not tend to deplete their reserves and are usually either in a Maintain or Push state, or a combination of both of these explanatory factors.

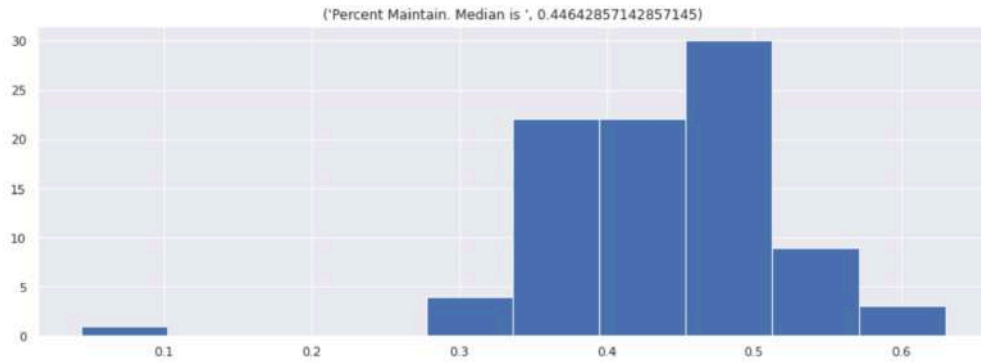


Figure 4. Distribution of proportion of time spent in Maintain state.

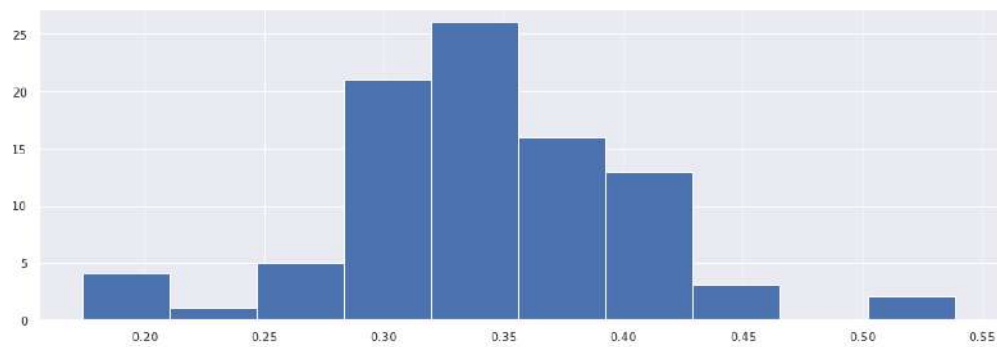


Figure 5. Distribution of proportion of time spent in Push state.

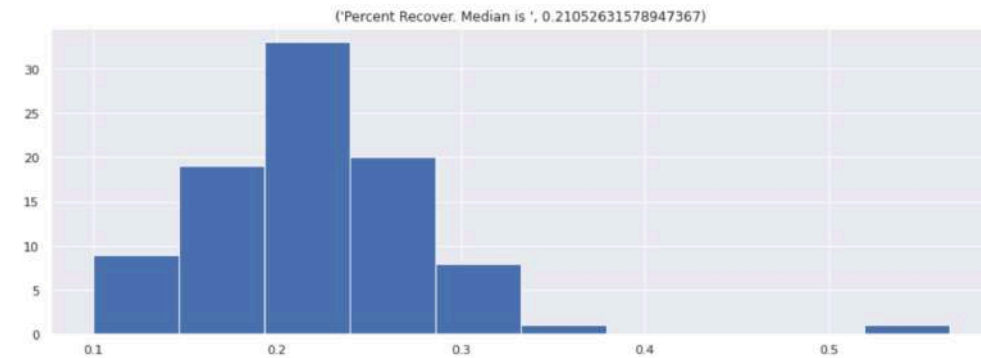


Figure 6. Distribution of proportion of time spent in Recover state.

We also observed an outlier in both the Recover and Maintain distributions. This was the same subject, 622, who had an unusually low number of Maintain assignments and high proportion of Push assignments (Figure 5). Algorithm performance will be evaluated to assure this cannot happen spuriously.

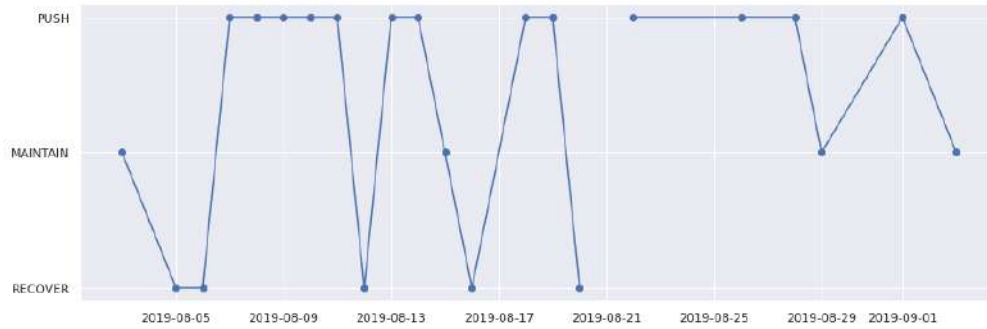


Figure 7. Outlier subject 622, number (top) and time series (bottom) of assignments.

In order to capture individual subjects' RMP distribution in a single number, Recover assignments were assigned a score of -1, Maintain a score of 0, and Push a score of 1. Then, for each subject, the average score of these scores was calculated and used to represent relative frequency and strength of time spent near or far from a neutral Recover state. Scores close to zero indicate that when not in the Maintain state, subjects spent even amounts of time in both the Recover and Push states. These subjects are classified as "Even" or "Balanced". Meanwhile, negative scores indicate a bias to be in the Recover state (subjects classified as "Recover"). By the same logic, subjects with positive scores are classified as "Push" and those with especially high positive scores classified as "High Push".

Classification cutoffs currently used are described in Table 1, although they will be further evaluated as our sample size increases. They were selected to reflect the right-bias of the population of RMP scores (Figure 8). It is noteworthy that most subjects were Even or Push. Evidence of cycling in these subjects will be most typical, but it is important to be aware of the patterns that may be observed in Recover and High Push subjects.

QUICK NOTE: Data from our early users supports our vision of a healthy cycle of RMP, with most users ending this sample period with a stronger HRV.

Table 1. Categorization cut-offs and number of subjects for RMP score ranges.

Categorization	Score Range	Number of Subjects
Recover	Score <= -0.05	3
Even/Balanced	-0.05 < Score < 0.1	30
Push	0.1 <= Score < 0.25	52
High Push	0.25 <= Score	6

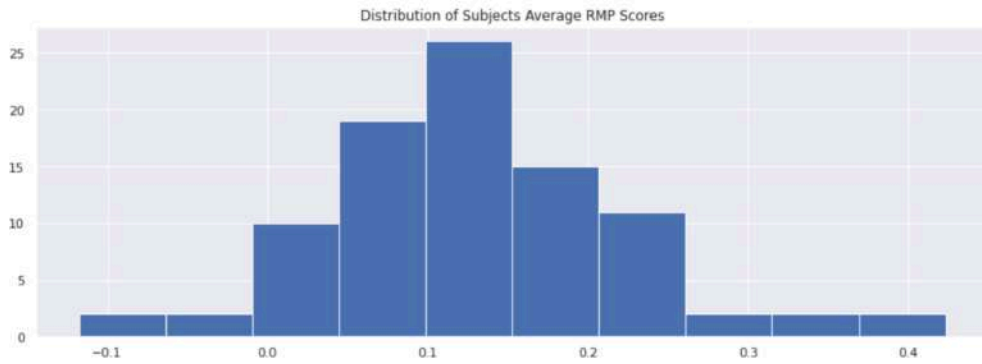


Figure 8: Distribution of RMP scores.

After categorizing subjects according to their RMP scores, it was possible to group subjects according to their Recover, Even, Push or High Push status and visualize their RMP time series to look for cycling patterns.

Among Even subjects (Figure 9), we see that subjects tend to stop to pause in the Maintain state while cycling between Recovery and Push states. Looking at the subject with less data (bottom panel), it is clear that subjects tend toward the Recover or Push state for a while before cycling back.

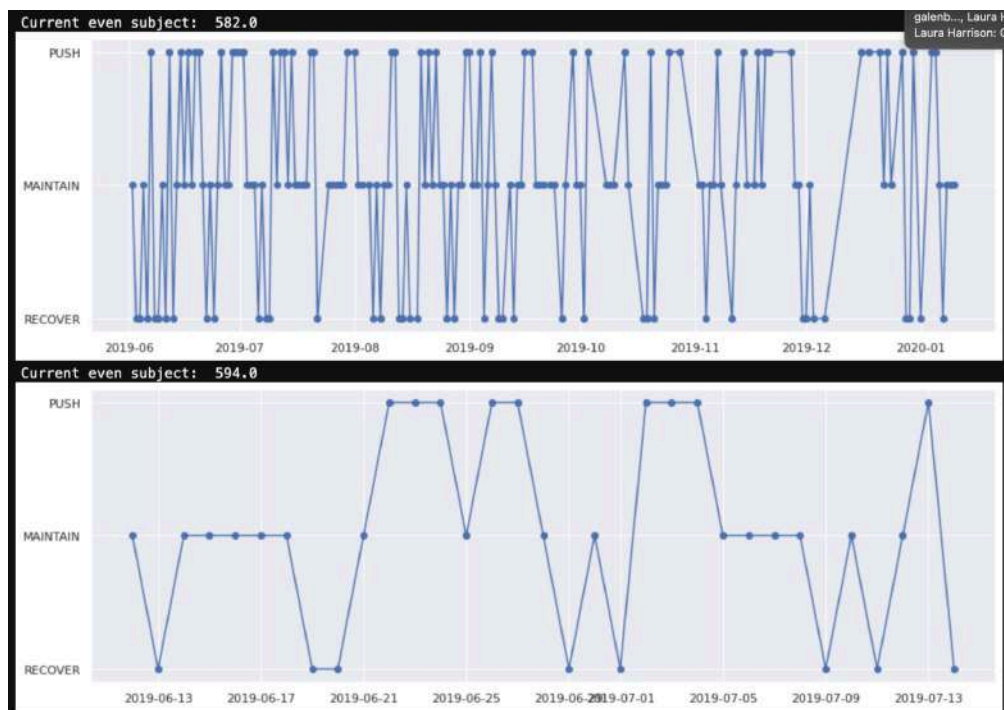


Figure 9. Sample Even subjects.

The Recover type was very rare (only 3 observed out of 91). A sample subject (Figure 10) shows that this type is visually similar to the Even type, with a slightly higher incidence of Recover points. This is consistent with our previous observation that the HRV score distribution is biased toward neutral or positive scores (Figure 8). As the dataset grows, we will watch for subjects who may get stuck in Recovery for an extended period of time, as this may trigger an intervention event. We will also continue to explore if our HRV algorithm may be misclassifying some who are truly in a Recovery state.

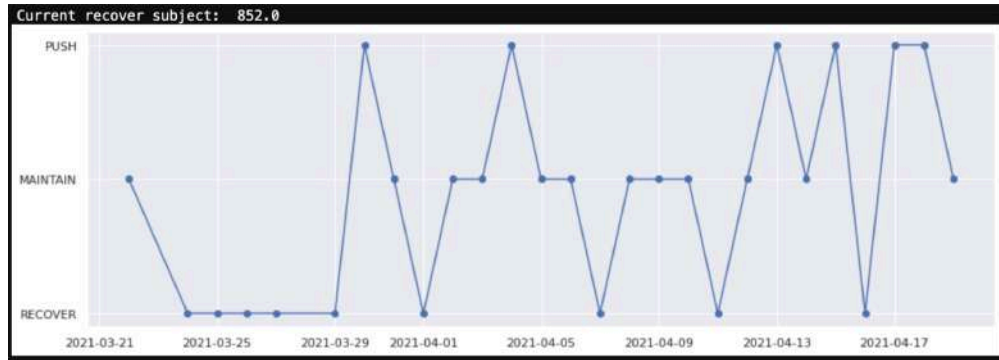


Figure 10. Sample Recover subject.

The Push type was the most common in the dataset (52 out of 91). The pattern of cycling is similar to the Maintain type, with subjects (1) tending to stop at Maintain between Push and Recover states and (2) a tendency to favor one or the other extreme states for extended periods. Unlike the Recover type, Push subjects do tend to have sufficient reserves to push more often than not.

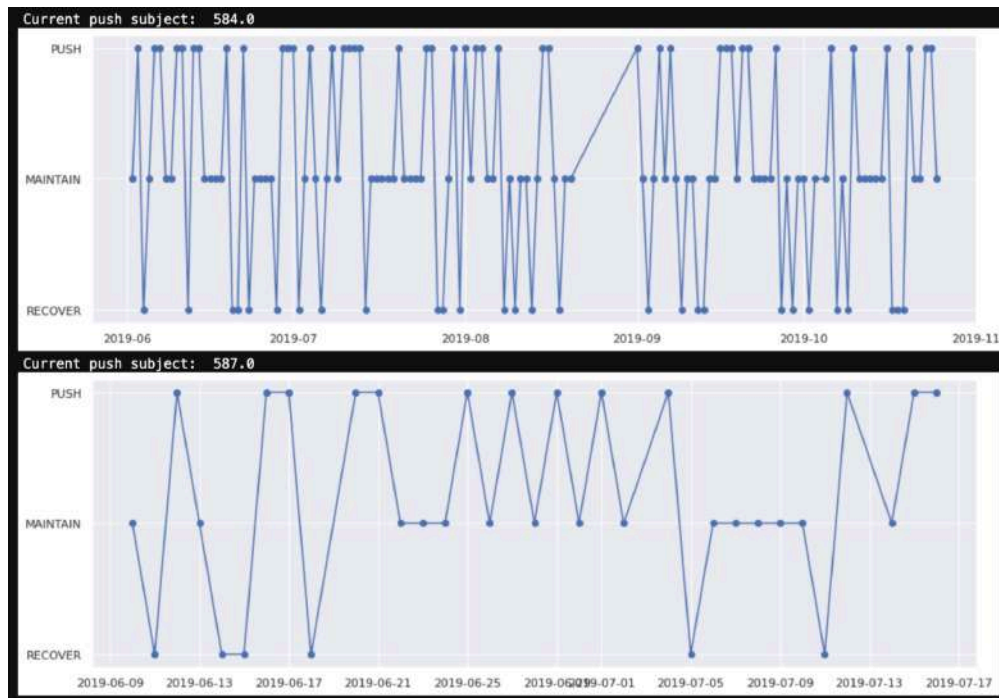


Figure 11. Sample Push subjects.

The High Push type was rare (6 of 91). In this category, we saw examples of typical cycling (e.g., Figure 12, bottom panel) where subjects have ample Maintain days between Recover and Push periods. However, we also saw an example (Figure 12, top panel) of switching back and forth between Recover and Push without Maintain assignments; in examples like these we are carefully monitoring our algorithm performance.

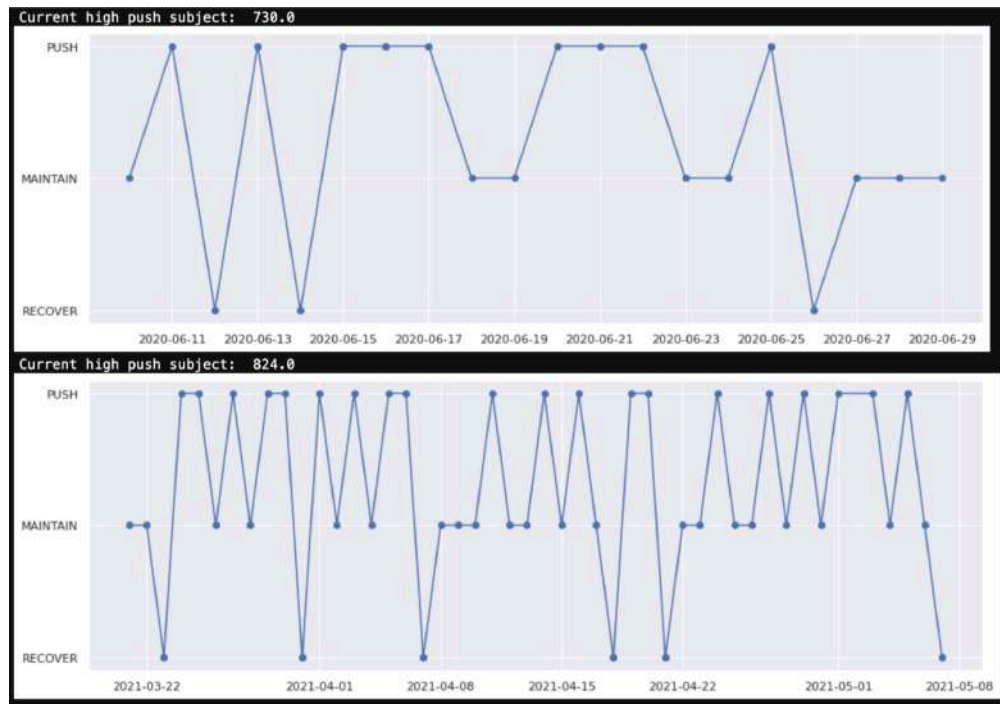


Figure 12. Sample High Push subjects.

Finally, we want to call out our favorite Push subject - subject 680 (Figure 13). We first caught sight of this subject as an example of consistent healthy cycling over a long period and were excited to see that registered user was none other than our own CEO, Jessica Corbin. In this long-time user, note that over the long time series it is normal to cycle between extended periods of Recovery (e.g., March 2021) or Push dominance (e.g., July 2020).

QUICK NOTE: Our commitment to the science behind our work means we will continue to evolve our algorithms and tools as we gain more data and feedback from our users.

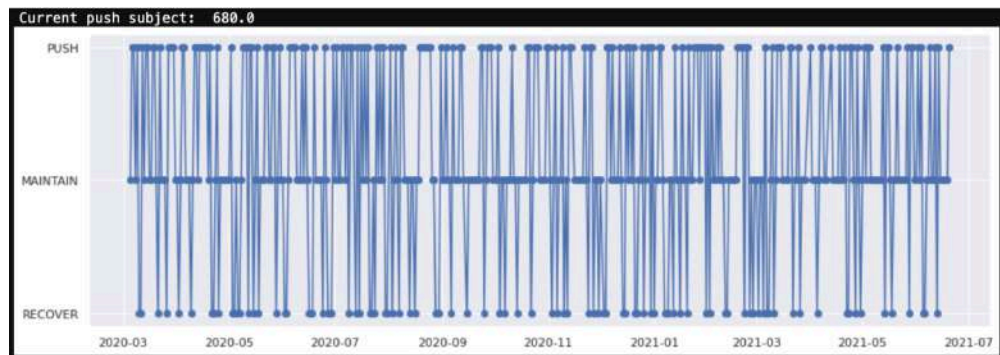


Figure 13. Our CEO's impressive RMP cycle.

Future work can (1) identify subjects who do not stop in Recover (potential algorithm issue); (2) attempt to predict switches between extended Recover/Push states and (3) flag subjects stuck in a true Recover rut. Additionally, we found that individual differences, such as average HRV, relate to average RMP scores (Figure 14). We plan to explore how other individual differences, e.g., personality type, relate to RMP type and cycling patterns. It would also be beneficial to explore and better understand the relationship between HRV patterns and RMP assignments.

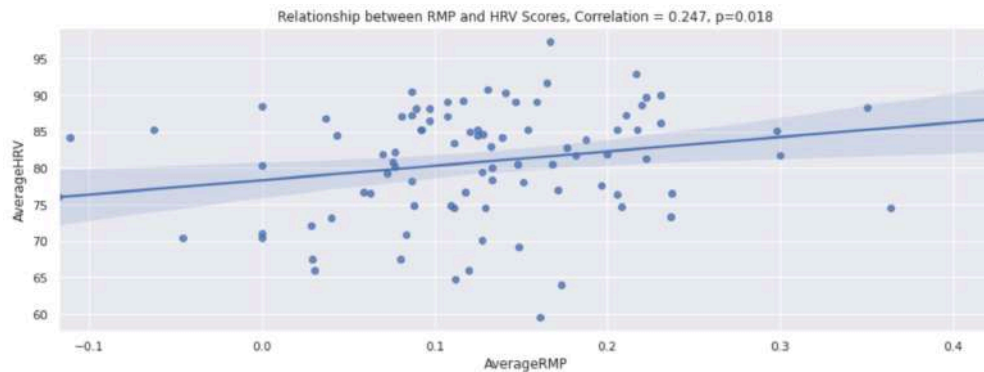


Figure 14. Relationship between RMP and HRV scores.

Conclusions

This preliminary data provides compelling support for the utility of our initial RMP classification system. This is most evident in the clear patterns observed in most participants where there is cycling between the three HRV classifications. This is completely consistent with the known physiology of HRV and its association with stress and recovery.

There is a somewhat surprising lack of individuals who receive a predominance of Recovery classifications. While this may well reflect the generally healthful and resilient conditions of this very active cohort, we will continue to explore and refine the algorithm we have developed to classify RMP. The linkage between HRV and functional status is not yet an exact science. And while these findings are strongly supportive of the Sorce RMP system, we plan to continue to be at the forefront of this very exciting dynamic field.

CREDITS

- Primary research and composition: Dr. Laura Harrison
- Additional research: Dr. Galen Buckwalter
- Editing: E.R. Burgess