

Gender, Dopamine, and a Closed Gas Station

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In April 2020, my husband and I received an unexpected email involving a small gas station in New Jersey that we had purchased in 2012. It was supposed to be a safe and management-free investment for retirees. But the pandemic had significantly reduced traffic, so the tenant company abruptly closed the pumps and walked away, leaving a mechanic who paid a small rent. Suddenly all the dreaded landlord responsibilities were thrust upon us.

Gas station leases involve sophisticated tenants who know how to protect themselves in disputes. Regulatory requirements are onerous, especially in New Jersey, which requires that attendants pump gas, adding significantly to costs and logistics. Despite the distance from our home in Virginia, we thought we could handle the challenge. Specifically, I thought I could.

I had no background in motor fuel technology, environmental science, or gas economics. I was 69 at the time, a Greek cognitive psychologist with a doctorate and fluency in 19 languages. I had retired in 2013, after 27 years as an education specialist at the World Bank. I was teaching a course on internet behaviors

at my alma mater, the University of Texas at Arlington. I was also finalizing a textbook that uses evolutionary psychology, motivation neuroscience, and memory functions to clarify internet-based phenomena such as compulsive social media use and emotional manipulation in e-commerce and politics. When the gas station closed and my 6-month quest for solutions began, many chapters came alive.

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Gas tanks must be either used or removed at great expense. Tanks, lines, and pumps must be inspected and repaired according to schedules required by the local authority (in our case, the New Jersey Department of Environmental Protection, or NJDEP). Steel tanks of earlier decades frequently leaked and polluted the groundwater. Our fiberglass tanks are newer and safe, but the property had earlier contamination that requires regular sampling and analysis. Unbeknownst to us, the tenant had not complied with these requirements. All told, the following tasks fell to me:

- securing a diagnostic environmental study and legal help to convince a large oil company to resume its monitoring responsibilities
- learning about and conforming to NJDEP rules for tank operation and for renewing the state-mandated tank insurance
- appealing high property taxes with appraisals, hearings, lawsuits, and written documentation
- finding a new tenant or a reasonable gas wholesaler, new attendants, new credit-card processing companies and equipment, and new accounting companies for workers' compensation

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Male guilds versus solitary women

The evolutionary basis of the division of labor along gender lines may be controversial, but it is hard to ignore. It is hypothesized that Paleolithic males joined together in groups and hunted animals much bigger than any of them, using hierarchies and attack strategies. Females, who were usually excluded from hunting, gained reproductive advantages by competing against other females for male resources and therefore working alone or with female relatives (Buss, 2016). To this day, males tend to engage in cooperative competitiveness, often through fraternities and guilds in which they form alliances, defend one another, and jockey for higher status while ceding to leaders (Benenson & Markovits, 2014).

The motor-fuel industry relies on these stereotypical male abilities. It involves complex and expensive technology as well as hierarchies of distributors and dealers. Oil companies demand sales volume and long-term contracts, so people in this industry must collaborate to survive. During many discussions, men highlighted the brotherly bonds and reliable networks that helped them find a slightly better deal, pay off a loan, or repair equipment. Such benefits did not extend to a disconnected, aged female. In fact, men warned vaguely about unspeakable risks and offered services to “save” me. The friendliest and

most informative gas distributor gave me the highest prices and said I should get used to losses. Expressions of distress raised opportunities for exploitation. In my youth in Greece, I had heard comments such as “a widow is selling a taxi” signaling cheap deals. The analogy became obvious.

Furthermore, network members sometimes refer clients as a favor to their colleagues. I was referred to providers who raised prices and refused to negotiate. A monitoring company normally selling service at \$100 per month demanded \$180 and wanted to repeat tank tests for an extra \$4,000. I often had to get my husband on the phone so that a male voice could be heard. The interlocutors seemed unaware of their biases.

Would women be more helpful? In the gas industry, women mainly have peripheral roles as secretaries and clerks. Research on intrasexual competition (Arnocky & Vaillancourt, 2017) suggests that women do not readily stand up for their conspecifics. Some NJDEP staff helped, but most others did not. A female attorney sided with a blackmailing appraiser, an insurance agent exaggerated obstacles, and an environmental scientist refused to simplify a technical report. Whenever my husband got involved, he got more information and better results. Men seem to get support from both other men and women, perhaps in hopes of future reciprocity.

Emotions in the throes of the reward prediction gap

Being able to enter alliances and rely on comrades helps men relax and feel confident. When women face formidable alliances of men, they sense the odds. No wonder women tend to appear more anxious (Costa et al., 2001).

Anxiety may increase cortisol levels that stimulate hunger, particularly for women (Epel et al., 2001). After every frustrating conversation, I opened the fridge door. While writing a difficult text, I would frequently get up and eat something. My serotonin may have increased, but so did my weight. It took me a while to become conscious of the eating problem. And it gave me some insights into people’s frequent difficulties with smoking cessation and weight management.

It was important to think of ingenious solutions or arguments in various circumstances. Research on creativity has some clear implications. Unusual solutions often emerge under conditions of urgency but also relaxation—for example, when people take showers (see Abadzi et al., 2014, for a review). So I cycled and walked while listening to foreign-language recordings and wrote ideas as they came.

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As I slowly progressed in the various tasks, I became aware that I was being shaped by variable-ratio reinforcers. The process was similar to learning a video game. I had some early wins, such as an agreement from a large oil company to resume pollution monitoring. But as with video games, rewards became less frequent and were interspersed with reversals. Sometimes I resolved an issue unexpectedly; sometimes an unexpected problem arose. One night I went to bed assured that I had secured tank insurance, but I woke up the next morning to an email saying that the company had rejected the tanks.

Motivation neuroscience has shed light on how some actions get reinforced (or not), according to Skinner's reinforcement schedules. Dopamine is a neurotransmitter associated with excitement, positive or negative. The dopaminergic neurons in the basal ganglia compare reality to expectations and create a prediction gap (or error; Jang et al., 2019). The size of this gap leads us to attempt actions that are doable but hard, and to give up, or to reject tasks deemed too easy (Salamone & Correa, 2012). However, motivation and emotion work in tandem. The amygdala, a brain region involved in how we experience emotions, has short-cut circuits to actions, some of which get activated in a few milliseconds (Klein-Flugge et al., 2016). The complex interplay of the various neurotransmitters creates momentary changes that we may not monitor efficiently. On top of that, working memory and attention spans are short and cannot keep track of all events. Therefore, somatic reactions and emotions can be under very limited conscious control, even by someone teaching the subject.

Large reward prediction gaps sometimes resemble the social media rollercoaster many people experience. They can trigger nonstop vigilance, obsessive thinking, and more unexpected prediction gaps. These are the hallmarks of addiction, which are hard to stop. I realized that anything can be addictive—even gas station logistics. This is also one way people gain expertise and derive pleasure from occupations that at first seem boring or unappealing.

The empowerment of technical expertise

To facilitate the tank registration and insurance, one insurance agent rather flippantly suggested that I get licensed as an underground storage tank operator. Being technically minded and handy with tools, I agreed. I took an online course and viewed YouTube videos on tank installations. I visualized opening the tank sump covers and looking at the parts inside. Then I took a challenging 2-hour online test. Many answers were not in the study materials and required me to search elsewhere as the last few minutes of the clock were ticking. High reading speed and much experience in multiple-choice tests proved critical. I passed.

I was suddenly overwhelmed by excitement and pride. At nearly 70 years I had been granted a back-door entrance to an exclusive club of younger men. Earlier, the long questionnaire required by NJDEP had seemed overwhelming, but now I could fill out all technical details knowing what everything meant. I registered the tanks in my name shortly before a deadline. Thereafter, my interlocutors took me more seriously.

There is certainly pride in knowing obscure topics. One evening at a Greek restaurant, I asked pointed questions about the cash register that left the owner astonished. I have repeatedly advised on problems of other gas stations. Incredibly, I now take pleasure and pride in reading groundwater-monitoring reports on various contaminants. I completed the equivalent of an undergraduate degree in about 6 months, and the information has significantly influenced my thinking in multiple areas.

The gender biases of challenging tasks

By February 2021, I had finished most tasks required to reopen the gas station. A qualified tenant had restarted gas sales, and I could go back to normal life. For a while, though, I found it hard to leave all this behind. The towering dopamine waves from unexpected losses and wins make ordinary life appear

trivial and drab. Considering sunken costs, it's no wonder people find it hard to quit while they're ahead in a casino game.

But overall, my gas station odyssey has me alarmed at women's disadvantages in the workplace, particularly when faced with complex tasks. Not having a supportive group reduces solutions and negotiating power. Men in my position might have struck up friendships with lawyers and others and gotten better deals or free advice. Women daring to do the same may have been brushed off at best or harassed at worst.

Often, women try to compensate for male group advantages by improving themselves (Benenson & Abadzi, 2019). This is called "scramble" competition. As a lone woman, I managed to reasonably navigate the gasoline world, demonstrating that old dogs can, in fact, learn new tricks. On the other hand, the need for expertise in multiple areas reveals even more of a gender bias. Most men would not need to achieve what I did. Only a few people in the business become underground storage tank operators, and they do not need to do it to prove their mettle. It was perhaps the best a woman could do, but it does not compare with the efficiency of male guilds.

Gender differences in networking have not been widely researched, but implications are ubiquitous. For example, university science programs tend to be disproportionately male; women can certainly learn technical subjects, but they may be more likely to have to solve alone the challenging problems that male students use to prove their competence to their comrades. Cooperative competitiveness continues in the work environment, often to the detriment of women who may have skimpier networks. Women are justifiably more likely to become risk-averse, face more financial problems, and accumulate fewer assets. One important consideration for the future concerns female networking and collaboration. Women would exercise greater personal effectiveness if they trusted and relied on other women. It is important to find ways to mitigate evolutionary trends through cultural change and education.

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