Could a 40-day-long Secondary Brain Dopamine Cycle Lead to a Map of Human Temperament and a Wave Function of Consciousness?

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A speculative essay, in the scientific tradition of ever more granular human behaviors falling into a reductionist paradigm, where, in addition to the previously established human behavioral patterns tracked to the annual sunlight-driven dopamine cycle, a second dopamine "clock" is proposed in the human brain. This measured cycle starts with a 10-day-long "low dopamine" phase (with various stages of impulsivity, anxiety, and depression and then the reverse as it quickly climbs back up), then a 10-day-long "high dopamine" phase (with hyperactive and manic behaviors), before diminishing to a 20-day-long "normal dopamine" phase (with calm and focus), before the cycle starts again with the "low dopamine" phase. The levels of the primary sunlight-driven cycle and the proposed secondary dopamine cycle aggregated together are considered as the only factors needed to create an annual behavioral calendar or "human temperament map." Daylight Savings Time and evolutionary fitness benefits are discussed as possible causes of the secondary dopamine cycle and its amplitude is considered as driving behaviors due to changes to (or limits to) working memory. The aggregate graph of both dopamine cycles has a striking resemblance to the quantum mechanical Schrodinger wave function leading to a speculative yet possible "wave function of consciousness."

The data that supports the findings of this study are available from the corresponding author upon reasonable request. The author has no conflict of interest to declare, and no funding source is associated with this work.

Could a 40-day-long Secondary Brain Dopamine Cycle Lead to a Map of Human Temperament and a Wave Function of Consciousness?

A model is proposed where, in addition to the previously established human behavioral patterns tracked to the annual sunlight-driven dopamine cycle (Figure 1), a second dopamine “clock” is proposed in the human brain. This measured cycle starts with a 10-day-long “low dopamine” phase (with various stages of impulsivity, anxiety, and depression and then the reverse as it quickly climbs back up), then a 10-day-long “high dopamine” phase (with hyperactive and manic behaviors), before diminishing to a 20-day-long “normal dopamine” phase (with calm and focus), before the cycle starts again with the “low dopamine” phase (Figure 2). The proposal intimates a sort of “universal cyclothymic disorder” where the vast majority of human beings share the same general temperament on any given day of the year that can be mapped and that is the same every year with an inherent and inverse difference between humans in the northern and southern hemispheres.

Methods

Over a period of three years, three adult males in their forties were tracked on a daily basis measuring subjective values of mood or temperament. The subjects included a bipolar individual with ADHD and a benign essential blepharospasm, an individual with only ADHD, and a control individual with neither. Changes in medication, behaviors (exercise, focus, creativity, quality of sleep) and blepharospasms (in the bipolar subject) were monitored to attempt to isolate any possible reoccurring seasonal or annual patterns or cycles inherent in all humans (e.g., the proposed additional cyclic pattern of fluctuating dopamine levels) that could help explain behaviors in aggregate human populations. A pattern was observed in all three subjects with the severity of the effects diminishing from the bipolar subject to the ADHD and the control subject. The observed pattern was of the noted drop and then spike and slope temperament function that had a reoccurring pattern of eight 40-day-long wavelength cycles year-over-year.

The observations in this informal study and prior literature were used to create a year-long calendar where the dopamine sinusoidal wave pattern (Maruani et al, 2018), tied to blue light from sunlight, was overlaid with the proposed secondary 40-day-long wavelength (Figure 3) to create an *aggregate map of human temperament* (Figure 4).

One premise driving this informal study was that the severity and reoccurring timing of blepharospasm events, of the bipolar subject, might reveal a subtle dopamine pattern via the regularity of blepharospasms triggered during decreasing dopamine intervals. This pattern would otherwise get lost in the "noise" of variations in mood from everyday life events and exogenous factors listed below as limitations to this work.

Note that benign essential blepharospasms - the uncontrollable eyelid blinking and facial dystonia or “motor tics” i.e., the blink system - are sensitive to central dopamine levels (Evinger, 2013). Dopamine depletion alone is also noted as a cause of blepharospasm (Evinger, 2013). Evinger (2013) also noted that “abnormalities in dopamine transmission may be a proximate cause of the predisposing condition that allows the development of benign essential blepharospasm.” Abnormalities in the basal ganglia dopamine system are also noted as leading to abnormal sensorimotor mappings manifest as blepharospasms (Peterson DA and Sejnowski TJ, 2017). Abnormal dopaminergic signaling in the striatum of the human brain could also induce pathological reinforcement learning and lead to blepharospasms (Peterson DA and Sejnowski TJ, 2017).

One possible cause of the proposed additional 40-day-long dopamine cycle is a possible lag in the adjustment in eye retina size to seasonal changes, i.e., the pupil size is incorrectly sized too large or too small (thus leading to excessive or diminished dopamine levels from blue light) until the lag is adjusted to the proper pupil size for the given time of year after 40 days. Murani et al (2018) noted that “retinal anomalies are apparent in Seasonal Affective Disorder during the depressive phase in autumn/winter” (pg. 11). Murani et al (2019) also note in their research that:

> The photoperiod also alters the balance of dopamine. Dopamine acts to regulate the sleep/wake cycle. Dopamine is also important to adaptation to the light/dark cycles in retina photoreceptors (pg. 11).

Also note that lack of sleep, like that caused by sleep apnea or poor circadian rhythm “clocking,” has been linked to poor impulse control and emotion dysregulation (McCarver-Reyes, 2019). McCarver-Reyes (2019) noted in their research that sleep deprivation was associated with impaired response inhibition, risky decision-making, increased risk-seeking, attention deficit hyperactivity disorder (ADHD), gambling disorder symptoms, Internet addiction symptoms, and personality-related impulsiveness. Dopamine via its involvement in the sleep process, as well as directly, can influence impulsive and hyperactive behaviors. Katherine Harmon wrote that “impulsivity has long been linked to the neurotransmitter dopamine, which is involved in learning and reward” (pg. 1) in her July 29, 2010, article in Scientific American titled *Dopamine Determines Impulsive Behavior: Brain scans illuminate the internal connection among the neurotransmitter, impulsiveness, and addiction*.

Limitations to the proposed model include the obvious small sample size leading to large assumptions and generalizations not backed by standard statistical regression analysis. Other limitations to the model include the lack of detailed tracking of many other factors that can influence human temperament and thus behavior.

The claim of the model is that only two dopamine associated cycles are needed to represent the vast majority of temperament of a given individual on a given day of the year which, at an individual level, may obviously not be accurate given the number of other known possible influences or factors. Those factors could include stress, travel, sleep apnea, low blood sugar (glucose) levels, cloudy or stormy days, medications for blood pressure, SSRIs, sedatives, stimulants, tranquilizers, alcohol, illegal drugs, daylight savings time interruptions to sleep, time of day, physical or psychological trauma, medical conditions like rapid-cycling bipolar disorder, and even oxytocin (i.e., emotional love) or heartbreak related depression.

Additional limitations include estimates made for the scale of change and the relative or comparative weights of the primary and secondary dopamine cycles, or between comparisons of these cycles, created by subjective data and analysis.

Census, sociology, Big Data, and criminal justice groups would be urged to regress this model with their vast year-over-year and larger data sets to find additional granularity and possibly additional contributing factors. Scientists, researchers, and medical professionals can work to confirm the number of dopamine cycles in the human brain via Big Data supercomputing top-down analysis as well as via f-MRI or PET brain scans and laboratory blood and sleep testing to qualitatively validate the theorized 40-day-long secondary dopamine cycle. The days or weeks in the model, when there are dual reinforcing peaks or troughs from both of the dopamine cycles, should be compared against data sets of violent crimes, mass shootings, stock purchasing, heart attacks, consumer spending, consumer sentiment, suicides, engagements, etc.

Results

An analysis of the subjective data indicated a second dopamine "clock" in the human brain. This cycle was measured starting with a 10-day-long "low dopamine" phase (with various stages of impulsivity, anxiety, and depression and then the reverse as it quickly climbs back up), then a 10-day-long "high dopamine" phase (with hyperactive and manic behaviors), before diminishing to a 20-day-long "normal dopamine" phase (with calm and focus), before the cycle starts again with the "low dopamine" phase (Figure 4 and Figure 5).

A benefit of knowing, a priori, the likelihood of one's temperament on a given day or week, is that one could adjust or "sanity check" their decisions accordingly e.g., pause, seek advice, sedate, isolate, avoid spending, give the major speech, do the job interview, relax, or enjoy nature or the company of friends, etc.

The effects of changes in environmental pollen levels were also noted, with the inverse histamine and serotonin relationship, as another key impactor to behaviors, but only within their limited fall and spring pollen season timeframes each year. While the sunlight-driven dopamine cycle is generally understood, the additional proposed cycle likely has not been identified due to obfuscation from the seasonal pollen produced histamine and serotonin influences, that have historically been underestimated in terms of their effect on individual and population temperaments and behaviors.

The biochemical mechanism behind the seasonal pollen and histamine cycles are mast cells in the human body that emit serotonin that is known as a mood-modifying molecule. Theoharides T. et al. (1982) noted in the journal Nature:

> Because of mast cell involvement in these clinical syndromes… there has been great interest in the pharmacological modulation of histamine release from mast cells.

> Serotonin is also stored in mast cell granules. Because histamine and serotonin may have divergent functions in delayed hypersensitivity, we hypothesized that these amines could undergo differential release. (p. 1)

Nautiyal, K. M. et al. (2012) in The European Journal of Neuroscience noted that:

> Mast cells are a source of serotonin. We conclude that mast cells contribute to behavioral and physiological functions of the hippocampus. It is known that mast cells can synthesize and store serotonin. The hippocampus is important in the regulation of anxiety and depressive behaviors. (p. 2)

Mentally unstable individuals can be triggered into impulsive and violent activities from spikes in serum serotonin (Cetin et. al., 2017). Serum histamine level is directly proportional to environmental allergen levels producing the obvious and dreaded seasonal allergic reaction symptoms. But serum serotonin level, or the body's control of the level, is inversely proportional to serum histamine levels (Hough, 1999, and Munari et. al., 2015, and Ryo et. al., 2006). It is also critical to note that male humans have fifty-two percent more serotonin than females (Nishizawa et. al., 1997).

Serotonin levels in the body also influence temperament and behavior indirectly via serotonin's role in sleep via melatonin synthesis. As Maruani et al. (2018) note "serotonin, which is derived from tryptophan via the enzymes tryptophan hydroxylase and 5HTP-decarboxylase, is acetylated by AANAT to form NAS (N-acetyl-serotonin), which is then methylated by hydroxyindole-O-methyltransferase (HIOMT), also called acetyl serotonin-methyltransferase (ASMT), to synthetize melatonin" (pg. 5). Maruani et al. (2018) also note that bipolar disorder patients show:

> Alterations in pineal melatonin secretion, including hypersensitivity to light and decreased serum melatonin in both acute and euthymic bipolar disorder patients compared to healthy controls. Decreased serum melatonin and hypersensitivity to light have therefore been proposed as bipolar disorder. … Alterations in melatonin secretion may be an important driver of internal biological clock anomalies, contributing to the suboptimal adaptation to environmental changes, including seasonal (pg. 9).

Serotonin has thus been associated with Seasonal Affective Disorder temperament changes via its role with biological clocking with serotonin modulating the brain's suprachiasmatic nuclei (responsible for synchronizing biological behavioral and physiological rhythms) response to light (Maruani et al, 2018).

Spring and fall seasonal pollen (histamine) induced serotonin increases, as pollen levels fall, similar to dopamine, impact impulsive behavior in human populations as seen in United States mass shootings data between the years 2017-2021 (Figure 6). Thus, an optimal annual "human temperament map" or calendar would take into account not only both of the dopamine cycles, but also the spring and fall seasonal serotonin spikes from seasonal pollen however those impacting windows tend not be very long and vary by latitude. Also note the convenient location or timing of winter Christmas holiday shopping dates like Black Friday (the day after the United States Thanksgiving holiday) - that occur during the large "serotonin surge" as ragweed pollen produced histamine subsides – that is perfectly timed to take full advantage of subsequent increased consumer spending via impulsivity.

The United States stock market is a useful proxy, not for this model to attempt to predict its stock return behavior in any given week but, rather, to help validate if variations in the temperament model are visible at all in indexed stock market purchasing - as an example of aggregate human behavior. In this respect, that association does appear to exist. The linear regressions are left to formal economists to confirm to what degree, but the United States stock market could thus potentially be interpreted, in theory, as based fundamentally only on exogenous shocks, endogenous shocks, the aggregate dopamine cycle, and the two pollen-driven seasonal serotonin cycles.

Additional analysis of the temperament map shows that it is also consistent with research related to the timing of violence and aggression. Research findings suggest that when serotonin levels are low, it may be more difficult for the prefrontal cortex to control emotional responses to anger (University of Cambridge, 2011). Additional research "suggests that dysfunctional interactions between serotonin and dopamine systems in the prefrontal cortex may be an important mechanism underlying the link between impulsive aggression and its comorbid disorders. Specifically, serotonin hypofunction may represent a biochemical trait that predisposes individuals to impulsive aggression, with dopamine hyperfunction contributing in an additive fashion to the serotonergic deficit" (Seo et. al., 2008, pg. 1). Research by Seo, D., Patrick, C. J., & Kennealy, P. J. (2008) noted that:

> considering the functional regulation of serotonin over the dopamine system, deficient serotonergic function may result in hyperactivity of the dopamine system, promoting impulsive behavior. This relationship may account for co-occurring serotonin and dopamine dysfunctions in individuals with impulsive aggression (pg. 5).

So why would nature use a 40-day-long dopamine cycle, instead of 30 or 50 days etc.? Likely because, like everything else nature does and achieves with evolutionary fitness, it optimizes birth rate and healthy fertility. We can compare five timeframes from human biology including: 1) a 365-day-long calendar year, 2) the proposed 40-day-long wavelength between dopamine "peaks" with a range of a few days before and after during which time humans are more hyperactive and impulsive and, thus, more likely to procreate or take risks leading to planned and unplanned pregnancies, 3) a 280-day-long average pregnancy length (New York State, 2021), 4) a 6-day-long fertility window (Marquez, J.R., 2020), and 5) a 28-day-long fertility cycle (Wilcox, A. J., Dunson, D., & Baird, D. D. (2000). Figure 7 shows an overlay of the above five timeframes noting the windows where dopamine hyperactivity and fertility overlap. In Figure 8 we can see that, using a 40-day-long wavelength, we find an optimal set of "windows" (akin to how cicadas have 13 and 17 year birth cycles) where the largest overlapping fertility windows are perfectly aligned to the proper dates to maximize birth rate, occurring exactly 280 days after a given day 1 fertilization - matching the average 280-day-long human female pregnancy duration (New York State, 2021). The proposed 40-day-long dopamine cycle length thus appears to have theoretical support considering how it appears to fit a model that would be consistent with, or optimized from, centuries of fitness-driven evolutionary biology.

But perhaps there is another cause of the second dopamine cycle? Note that the proposed 40-day-long secondary dopamine cycle does not occur throughout the entire year. This is a significant observation. It provides circumstantial evidence to support the premise that the cycle is indeed dopamine driven as the delayed eighth cycle, after the annual fall Daylight Saving Time clock change, implies the cycle is related to the modification of the amount of blue light or sunlight which directly impacts dopamine levels and, thus, human brain clocking. One can extrapolate that perhaps the entire need for the second dopamine clock is due to suboptimal brain clocking directly due to the implementation of human initiated Daylight Savings Time! Or perhaps the existence of the proposed second dopamine cycle is due to the combination of circadian rhythm impacting factors now affecting modern humans, an organism that for hundreds of thousands of years spent a large amount of its waking day outside, in sunlight, and near the equator. Human beings are only relatively recently: living in locations higher in latitude on the planet that have less sunlight, spending most of their time working indoors, and having too much exposure to artificial light (especially blue light) from LED television, smartphone, and computer monitor screens. There is additional research supporting the theory of severe impact to human health from the Daylight Savings Time clock changes. As Sandee LaMotte notes in her CNN article from 2022 called *Permanent Daylight Saving Time will hurt our health*:

> Studies over the last 25 years have shown the one-hour change disrupts body rhythms tuned to Earth's rotation, adding fuel to the debate over whether having Daylight Saving Time in any form is a good idea. …Your body clock stays with (natural) light not with the clock on your wall…there's no evidence that your body fully shifts to the new time… Between March and November your body gets less morning light and more evening light, which can throw off your circadian rhythm… Standard time, which we enter when we move our clocks back in the fall, is much closer to the sun's day and night cycle… This cycle has set our circadian rhythm, or body clock, for centuries. That internal timer controls not just when you sleep, but also when you want to eat, exercise or work, as well as your blood pressure, your heart rate and your cortisol rhythm.

Deeper tracking of behaviors during the 10-day-long "low dopamine" phase of the second dopamine cycle shows a range of specific behaviors during the first 5 days on the downslope that exactly match those that occur on the remaining 5 days during the upslope. This very close correspondence of behavior may imply a correlation with brain memory. Dopamine has been shown to be associated with memory from many research efforts (Braun et al, 2021; Frick et al, 2022; Kamiński et al, 2018; Sabandal et al, 2021), thus we have not only additional support for dopamine as the driver of the secondary cycle and its associated behaviors but also for brain "working memory" as possibly a driver of the behaviors during the low dopamine phase. Individuals on day 1 and day 10 of the 10-day-long "low dopamine" window had increased fantasy thoughts and imagination and increased social media sharing, day 2 and day 9 involved increased impulsivity including increased spending and addictive behaviors. There were also suicides observed amongst similar aged peers on day 9. Day 3 and day 8 observations showed individuals with OCD behaviors including ranking and organizing. On day 2 and day 7 individuals became anxious and on day 5 and day 6 all subjects were depressed (Figure 9 and Figure 10). With the width of the various phases of the dopamine cycle appearing consistently set in exact duration lengths (e.g., the 10-day-long "low dopamine" phase), we can imagine differences between "normal" individuals and bipolar or manic-depressive individuals as related only to the amplitude (height) of the wave cycle. We can use a figurative analogy (Figure 11) where a bipolar individual has an excessively lengthened wave amplitude and if we assume a sort of triangle "conservation of area," then we can see an analogy where brain working memory, the red squares in the Figure 11, becomes reduced in a bipolar human versus a normal human. That reduced "working space" thus being a literal scenario of a person unable to "get a song out of their head" as they are limited on specific days by their limited amount of working or functional memory as excessively low-dopamine leads to the vertically extended and thin wave shape.

Discussion

The creation and verification of an actual cyclical temperament calendar has the possibility to be formalized into an actual mood or impulsivity gauge. Obviously, the amplitude of any given map would be more severe for bipolar individuals due to their blue light sensitivity. One can envision a smartphone application or "dashboard," akin to a pilot's altimeter or cockpit instrumentation, as seen in Figure 12, showing a daily or weekly "score" or meter (Figure 13) as form of "temperamentometer." Some additional possible applications could include an add-on feature for a Microsoft Outlook Calendar or an add-on feature (Figure 14) for a Zoom or Microsoft Teams video conferencing meetings where the week of the year and participant location data (obtained via area code, I.P. address, or Active Directory information) could allow a salesperson to know which person in their meeting is most likely to make an impulsive purchase (individual with a red colored outline) versus "normal" participants (green) and those that are least likely spend due to anxiety, depression, or low energy (blue). The calendar feature can also be used to note when it is best for an employee (green) to give a speech or an important sales pitch and also which weeks to avoid (blue and possibly red).

A full list of potential uses of the temperament map could include using it to find: when to schedule a sales promotion and who (based on zip code or location) to most likely sell to, gym exercise workout routines - when to lift heavy (red) and when light weights (blue), diet routines - when to fast (red) and when not (blue), optimal weeks for: military actions, holidays, long work activities or projects, medication adjustments (mental health), and when law enforcement should be aware of potentially increased violence.

Note, that while the scientific community can monitor gravitational waves smaller than an atomic nucleus, we have comparatively little tooling or visibility for "real-time monitoring" of dopamine and serotonin levels in humans and, thus, temperament, for a given individual. Progress is being made however, with current smartwatch technology now able to check metrics like blood pressure, pulse, and even blood sugar.

This proposal, while very speculative in nature and informal in presentation, is an effort to instigate additional focus in the direction of individual biochemical monitoring and feedback.

The claim of the work is that there are only three major factors (annual calendar neurotransmitter cycles – the primary sunlight and proposed secondary dopamine cycles and the fall and spring histamine/serotonin spikes) that play into an individual's temperament or impulsivity and that this temperament can be measured, scored, and predicted and, thus, help a person to avoid sub-optimal impulsive actions and poor decision-making. While advertising and marketing firms analyze Big Data related to aggregate consumer spending and sentiment data, this work proposes also examining behaviors and temperament from a biological basis.

A perfect long-term vision could involve nano-tech sensors inside individuals directly providing real-time feedback of dopamine, serotonin, and histamine levels, and also their external blue light and pollen levels, to help create an improved measure or score of an individual's temperament on a given day. Big Tech firms like Facebook (Meta), Twitter, or Google (Alphabet) could even use their massive behavioral data stores and super-computing resources to examine human temperament or mood from texts and social media post "text analysis" to produce an optimal temperament assessment tool. This tool would allow an individual or party to know the likelihood of their own bias toward (or against) impulsive, emotional, or irrational action to allow proper assessment of factors (including their own "state of mind") for better decision-making. Consider the scenario where, if you knew that you would be anxious on a given day, you could proactively move the date of your major speech. If you know you are at risk of impulsivity today, avoid the trip to the shopping mall or, from the vendor perspective, increase the number of advertisement buys.

There is another realm to consider. The first dopamine cycle is entirely driven by light, the foundation of quantum mechanics. The second dopamine cycle is also a wave form even if closer to a pulse-shaped wave. Thus, we can speculate very informally on the similarity between the shape of the two dopamine cycles and the famous Schrödinger wave function (Figure 15). Might a quantum mechanical wave function measurement, or decoherence of the wave function, be equivalent to, or instantiated by, changes in brain dopamine levels? We can envision our 40-day-long cycle as synonymous with the frequency variable in standard quantum mechanical equations with the speed of light (3×10^{8} m/s), c = frequency x wavelength. If we represent the 40-day-long cycle as 3,456,000 seconds, then, via some simple algebra, we obtain a wavelength of 86.80 meters, or, using the equation of energy (E = h x f), we obtain 3,456,000 seconds x (6.6×10^{-34} J/s) or 2.28096×10^{-27} Joules. Is this some minimum energy of consciousness or of a "thought" or a "now" or do we need to scale other parameters just as we scaled the variable of seconds to our 40-day-long cycle? Venturing into the realm of near science fiction, we can imagine each microscopic variation in dopamine levels moving a conscious mind into a different, albeit extremely similar, multiverse "universe" in a larger reality. We can imagine each universe (maybe only internal to our mind) "labelled" or distinguishable by the level of brain dopamine and perhaps even the level of serotonin (Khan, 2022) where levels of serotonin appear to correlate to levels of working memory. In this theory, each corresponding pair of levels of dopamine and serotonin in a brain equates to a consciousness in a specific universe. That universe being a slice of a larger universe and only "reachable" depending on a brain's levels of dopamine and serotonin.

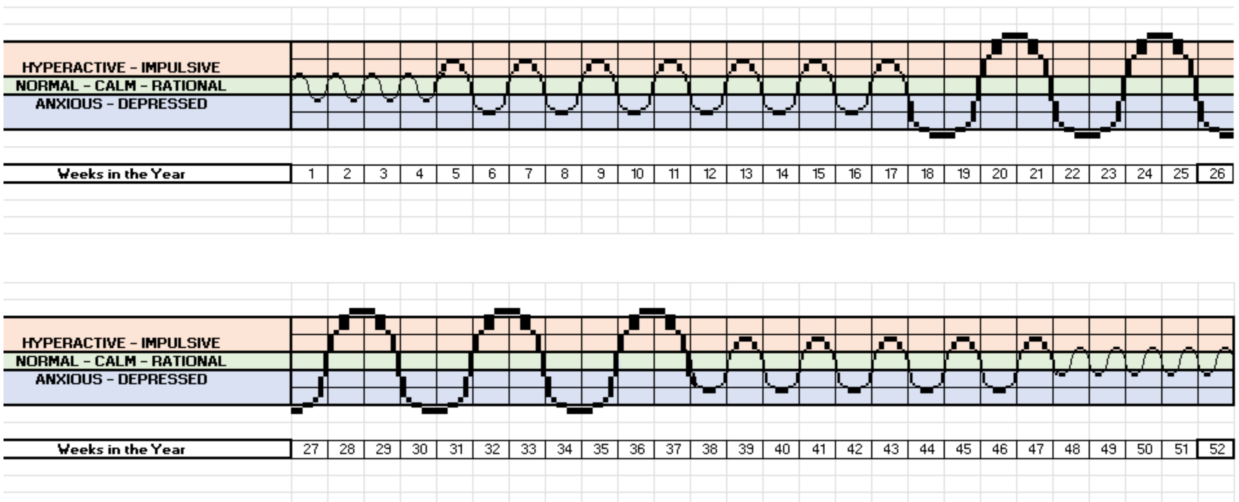
Conclusion

While modern civilization in the 21st Century is still far from the societal behavioral prediction capabilities of a science like *psychohistory* envisioned by Isaac Asimov in his Foundation science fiction novels, the possibility should not be considered out of reach. Changes in the level of dopamine can both lead to impulsive, depressed, and hyperactive behavior. Thus, the two main points of this work involve a proposed additional 40-day-long dopamine brain clocking cycle and that an examination of this cycle aggregated with the annual sunlight dopamine cycle can lead to a *human temperament map* or calendar to predict individual and even aggregate societal behaviors.

Figures

Figure 1

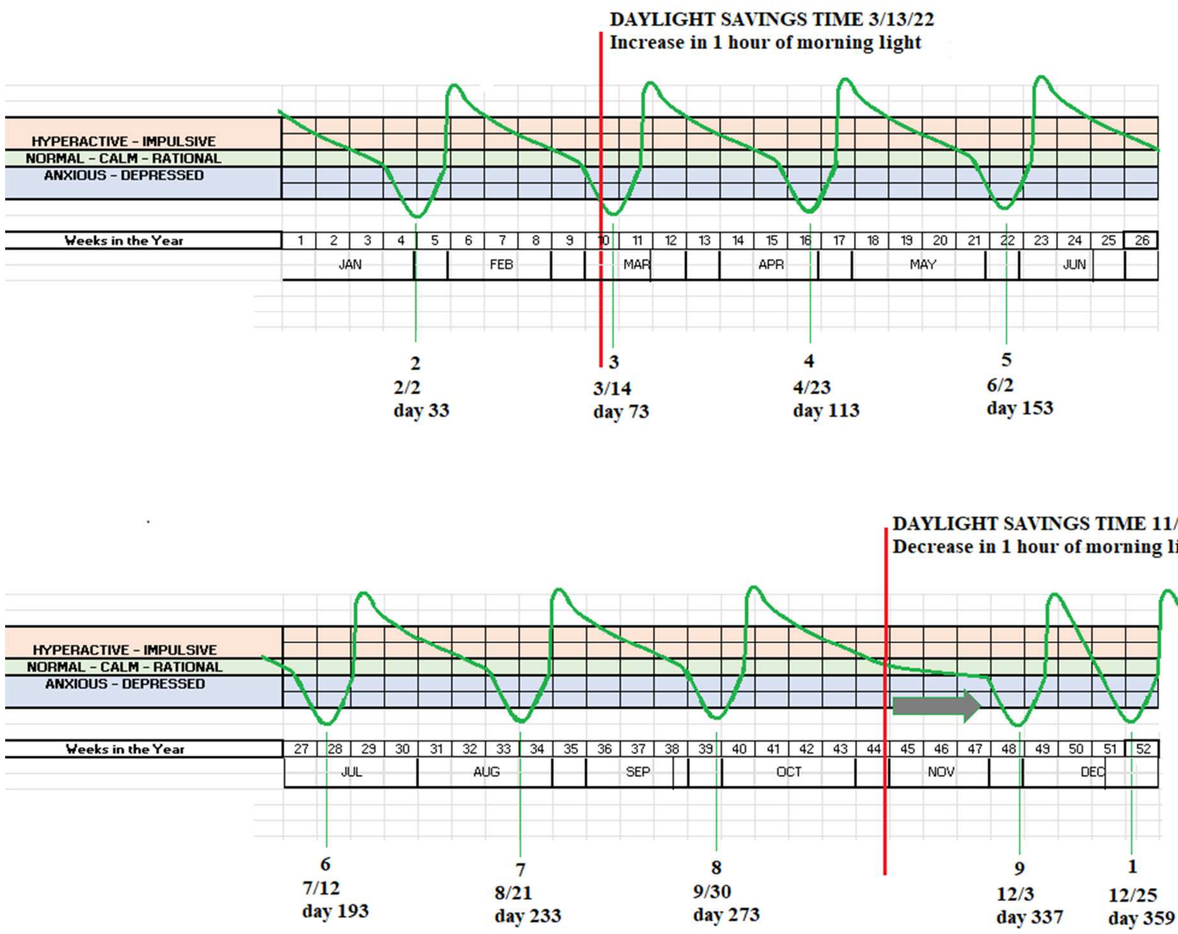
The primary sunlight driven (blue light level) dopamine cycle with shorter wavelengths in winter and longer in summer where temperament varies between Hyperactive – Impulsive, Normal – Calm – Rational, and Anxious – Depressed mental states and behaviors.



40-DAY-LONG

Figure 2

The proposed second dopamine clock-cycle involves a wavelength of 40 days that includes the first 10 days in an interval where there is a "low dopamine" state. There are 30 days between all but the last 10-day-long "low dopamine" intervals. The annual fall clock adjustment for "Daylight Saving Time" causes a delay of at least three weeks before the 40-day-long cycle begins again for the ninth and final cycle of the year.



40-DAY-LONG

Figure 3

A combined graph of the primary dopamine sinusoidal annual wave with the additional proposed secondary 40-day-long cycle is shown below that is used to create a final aggregate graph or "temperament map."

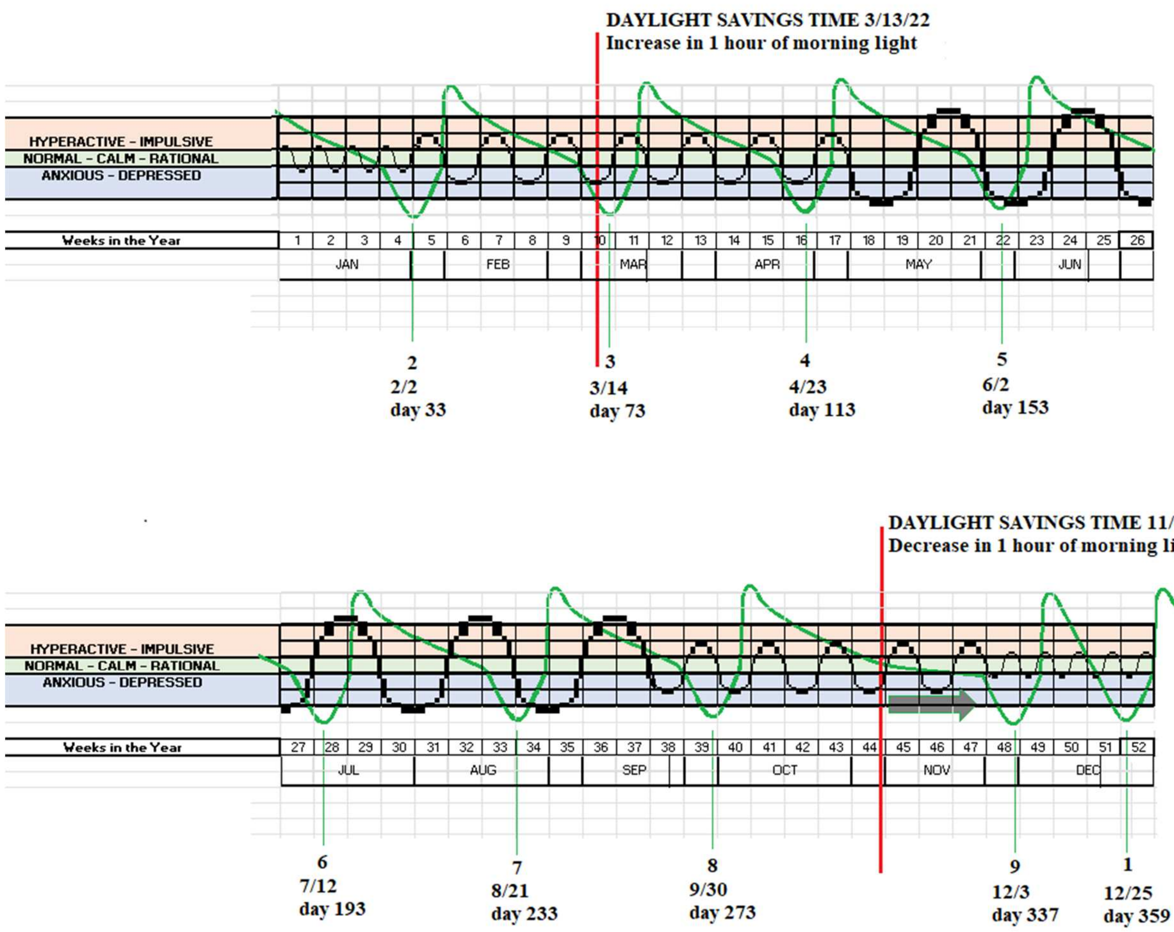
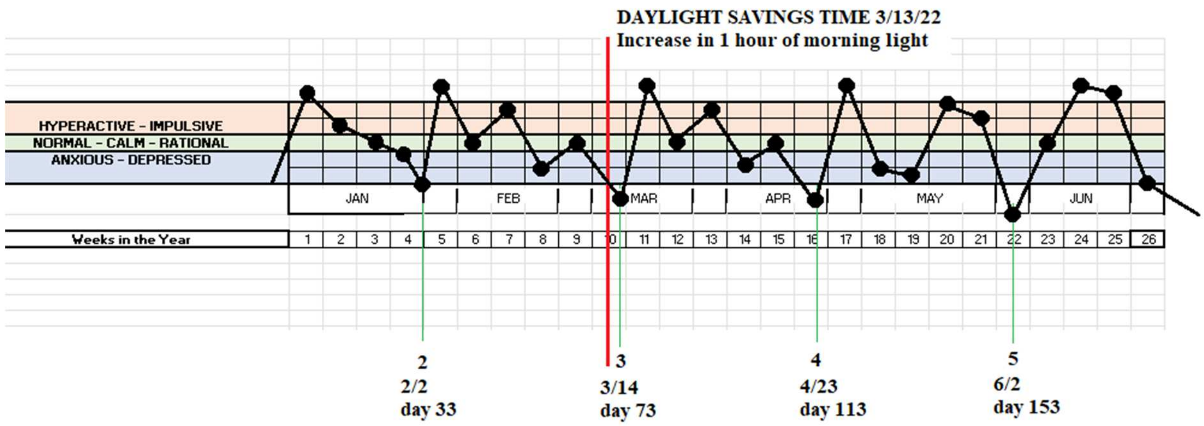
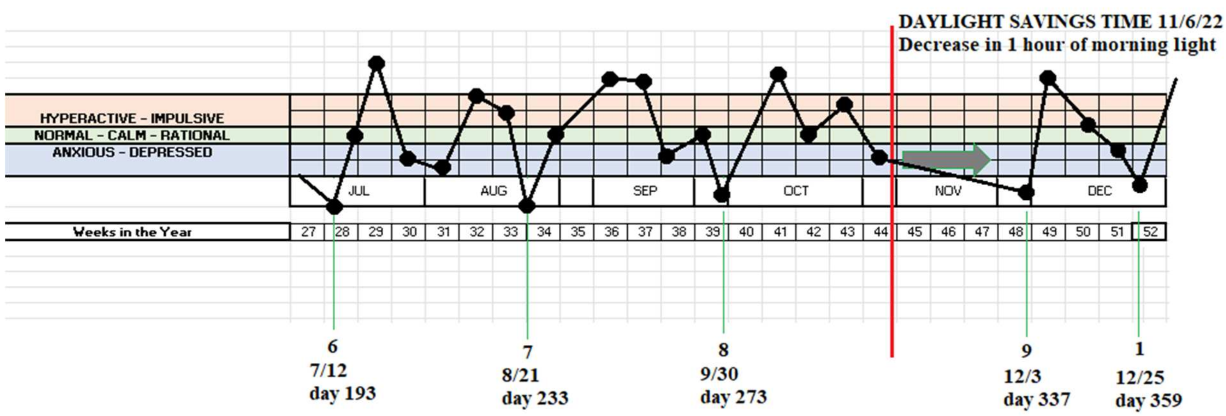


Figure 4

An aggregate summation graph from the combined values of the two dopamine cycles produces this "human temperament map."





40-DAY-LONG

Figure 5

2022 is used as an example year with the day of year number, date, and week of year showing "low dopamine" 10-day-long intervals and the fall and spring "Daylight Saving Time" dates.

Interval	Day	Date	Week	Note
	1	1-Jan	52	
	2	2-Jan	1	
	3	3-Jan	1	
	4	4-Jan	1	
	5	5-Jan	1	
	6	6-Jan	1	
	7	7-Jan	1	
	8	8-Jan	1	
	9	9-Jan	2	
	10	10-Jan	2	
	11	11-Jan	2	
	12	12-Jan	2	
	13	13-Jan	2	
	14	14-Jan	2	
	15	15-Jan	2	
	16	16-Jan	3	
	17	17-Jan	3	
	18	18-Jan	3	
	19	19-Jan	3	
	20	20-Jan	3	
	21	21-Jan	3	
	22	22-Jan	3	
	23	23-Jan	4	
	24	24-Jan	4	
	25	25-Jan	4	
	26	26-Jan	4	
	27	27-Jan	4	
	28	28-Jan	4	
	29	29-Jan	4	
	30	30-Jan	5	
	31	31-Jan	5	
	32	1-Feb	5	
2	33	2-Feb	5	
	34	3-Feb	5	
	35	4-Feb	5	
	36	5-Feb	5	
	37	6-Feb	6	
	38	7-Feb	6	
	39	8-Feb	6	
	40	9-Feb	6	
	41	10-Feb	6	
	42	11-Feb	6	
	43	12-Feb	6	
	44	13-Feb	7	
	45	14-Feb	7	
	46	15-Feb	7	
	47	16-Feb	7	
	48	17-Feb	7	
	49	18-Feb	7	
	50	19-Feb	7	
30 days	51	20-Feb	8	
	52	21-Feb	8	
	53	22-Feb	8	
	54	23-Feb	8	
	55	24-Feb	8	
	56	25-Feb	8	
	57	26-Feb	8	
	58	27-Feb	9	
	59	28-Feb	9	
	60	1-Mar	9	
	61	2-Mar	9	
	62	3-Mar	9	
	63	4-Mar	9	
	64	5-Mar	9	
	65	6-Mar	10	
	66	7-Mar	10	
	67	8-Mar	10	
	68	9-Mar	10	
	69	10-Mar	10	
	70	11-Mar	10	
	71	12-Mar	10	
	72	13-Mar	11	DST
3	73	14-Mar	11	
	74	15-Mar	11	
	75	16-Mar	11	
	76	17-Mar	11	
	77	18-Mar	11	
	78	19-Mar	11	
	79	20-Mar	12	
	80	21-Mar	12	Equinox
	81	22-Mar	12	
	82	23-Mar	12	
	83	24-Mar	12	
	84	25-Mar	12	
	85	26-Mar	12	
	86	27-Mar	13	
	87	28-Mar	13	
	88	29-Mar	13	
	89	30-Mar	13	
	90	31-Mar	13	
	91	1-Apr	13	
	92	2-Apr	13	
	93	3-Apr	14	
	94	4-Apr	14	
	95	5-Apr	14	
	96	6-Apr	14	
	97	7-Apr	14	
	98	8-Apr	14	
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	108	18-Apr	16	
	109	19-Apr	16	
	110	20-Apr	16	
	111	21-Apr	16	
	112	22-Apr	16	
4	113	23-Apr	16	
	114	24-Apr	17	
	115	25-Apr	17	
	116	26-Apr	17	
	117	27-Apr	17	
	118	28-Apr	17	
	119	29-Apr	17	
	120	30-Apr	17	
	121	1-May	18	
	122	2-May	18	
	123	3-May	18	
	124	4-May	18	
	125	5-May	18	
	126	6-May	18	
	127	7-May	18	
	128	8-May	19	
	129	9-May	19	
	130	10-May	19	
	131	11-May	19	
	132	12-May	19	
	133	13-May	19	
	134	14-May	19	
	135	15-May	20	
	136	16-May	20	
	137	17-May	20	
	138	18-May	20	
	139	19-May	20	
	140	20-May	20	
	141	21-May	20	
	142	22-May	21	
	143	23-May	21	
	144	24-May	21	
	145	25-May	21	
	146	26-May	21	
	147	27-May	21	
	148	28-May	21	
	149	29-May	22	
	150	30-May	22	
	151	31-May	22	
	152	1-Jun	22	
5	153	2-Jun	22	
	154	3-Jun	22	
	155	4-Jun	22	
	156	5-Jun	23	
	157	6-Jun	23	
	158	7-Jun	23	
	159	8-Jun	23	
	160	9-Jun	23	
	161	10-Jun	23	
	162	11-Jun	23	
	163	12-Jun	24	
	164	13-Jun	24	
	165	14-Jun	24	
	166	15-Jun	24	
	167	16-Jun	24	
	168	17-Jun	24	
	169	18-Jun	24	
	170	19-Jun	25	
	171	20-Jun	25	
	172	21-Jun	25	Solstice
	173	22-Jun	25	
	174	23-Jun	25	
	175	24-Jun	25	
	176	25-Jun	25	
	177	26-Jun	26	
	178	27-Jun	26	
	179	28-Jun	26	
	180	29-Jun	26	
	181	30-Jun	26	
	182	1-Jul	26	
	183	2-Jul	26	
	184	3-Jul	27	
	185	4-Jul	27	
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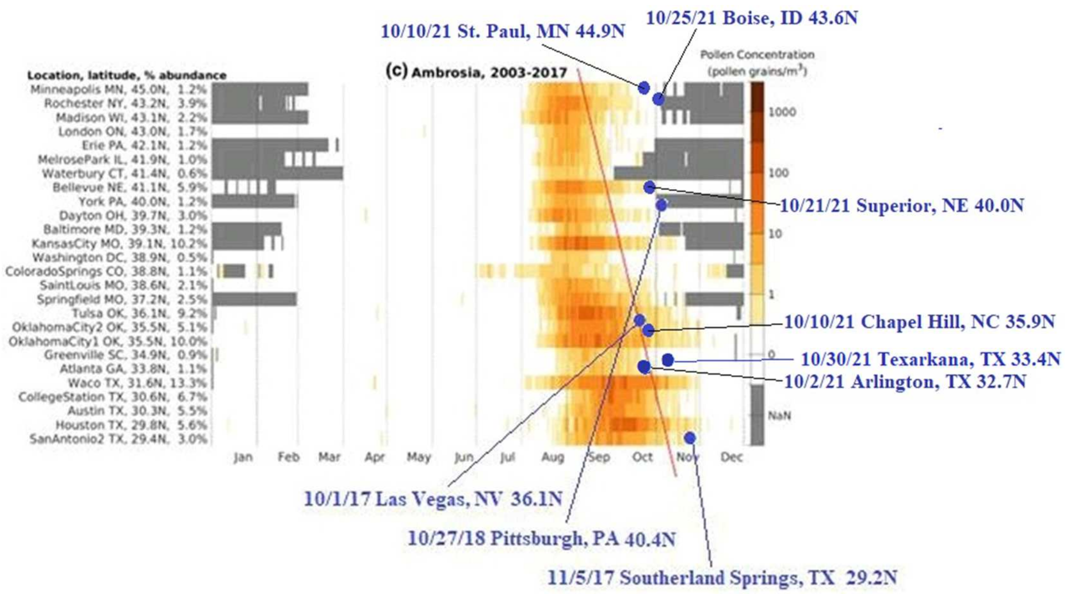
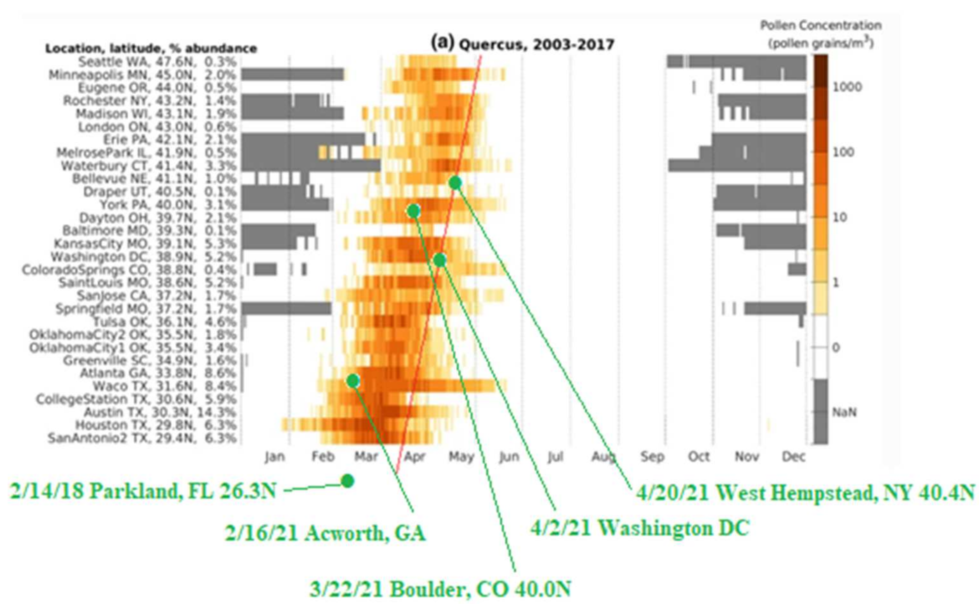
	187	6-Jul	27	
	188	7-Jul	27	
	189	8-Jul	27	
	190	9-Jul	27	
	191	10-Jul	28	
	192	11-Jul	28	
6	193	12-Jul	28	
	194	13-Jul	28	
	195	14-Jul	28	
	196	15-Jul	28	
	197	16-Jul	28	
	198	17-Jul	29	
	199	18-Jul	29	
	200	19-Jul	29	
	201	20-Jul	29	
	202	21-Jul	29	
	203	22-Jul	29	
	204	23-Jul	29	
	205	24-Jul	30	
	206	25-Jul	30	
	207	26-Jul	30	
	208	27-Jul	30	
	209	28-Jul	30	
	210	29-Jul	30	
	211	30-Jul	30	
	212	31-Jul	31	
	213	1-Aug	31	
	214	2-Aug	31	
	215	3-Aug	31	
	216	4-Aug	31	
	217	5-Aug	31	
	218	6-Aug	31	
	219	7-Aug	32	
	220	8-Aug	32	
	221	9-Aug	32	
	222	10-Aug	32	
	223	11-Aug	32	
	224	12-Aug	32	
	225	13-Aug	32	
	226	14-Aug	33	
	227	15-Aug	33	
	228	16-Aug	33	
	229	17-Aug	33	
	230	18-Aug	33	
	231	19-Aug	33	
	232	20-Aug	33	
7	233	21-Aug	34	
	234	22-Aug	34	
	235	23-Aug	34	
	236	24-Aug	34	
	237	25-Aug	34	
	238	26-Aug	34	
	239	27-Aug	34	
	240	28-Aug	35	
	241	29-Aug	35	
	242	30-Aug	35	
	243	31-Aug	35	
	244	1-Sep	35	
	245	2-Sep	35	
	246	3-Sep	35	
	247	4-Sep	36	
	248	5-Sep	36	
	249	6-Sep	36	
	250	7-Sep	36	
	251	8-Sep	36	
	252	9-Sep	36	
	253	10-Sep	36	
	254	11-Sep	37	
	255	12-Sep	37	
	256	13-Sep	37	
	257	14-Sep	37	
	258	15-Sep	37	
	259	16-Sep	37	
	260	17-Sep	37	
	261	18-Sep	38	
	262	19-Sep	38	
	263	20-Sep	38	
	264	21-Sep	38	Equinox
	265	22-Sep	38	
	266	23-Sep	38	
	267	24-Sep	38	
	268	25-Sep	39	
	269	26-Sep	39	
	270	27-Sep	39	
	271	28-Sep	39	
8	272	29-Sep	39	
	273	30-Sep	39	
	274	1-Oct	39	
	275	2-Oct	40	
	276	3-Oct	40	
8	277	4-Oct	40	
	278	5-Oct	40	
	279	6-Oct	40	
	280	7-Oct	40	
	281	8-Oct	40	
	282	9-Oct	41	
	283	10-Oct	41	
	284	11-Oct	41	
	285	12-Oct	41	
	286	13-Oct	41	
	287	14-Oct	41	
	288	15-Oct	41	
	289	16-Oct	42	
	290	17-Oct	42	
	291	18-Oct	42	
	292	19-Oct	42	
	293	20-Oct	42	
	294	21-Oct	42	
	295	22-Oct	42	
	296	23-Oct	43	
	297	24-Oct	43	
	298	25-Oct	43	
	299	26-Oct	43	
	300	27-Oct	43	
	301	28-Oct	43	
	302	29-Oct	43	
	303	30-Oct	44	
	304	31-Oct	44	
	305	1-Nov	44	
	306	2-Nov	44	
	307	3-Nov	44	
	308	4-Nov	44	
	309	5-Nov	44	
	310	6-Nov	45	Daylight Savings less morning light
	311	7-Nov	45	
	312	8-Nov	45	
	313	9-Nov	45	
	314	10-Nov	45	
	315	11-Nov	45	
	316	12-Nov	45	
	317	13-Nov	46	DST DELAY
	318	14-Nov	46	
	319	15-Nov	46	
	320	16-Nov	46	
	321	17-Nov	46	
	322	18-Nov	46	
	323	19-Nov	46	
	324	20-Nov	47	
	325	21-Nov	47	
	326	22-Nov	47	
	327	23-Nov	47	
	328	24-Nov	47	
	329	25-Nov	47	
	330	26-Nov	47	
	331	27-Nov	48	
	332	28-Nov	48	
	333	29-Nov	48	Day 1
	334	30-Nov	48	Day 2
	335	1-Dec	48	Day 3
	336	2-Dec	48	Day 4
9	337	3-Dec	48	Day 5
	338	4-Dec	49	Day 6
	339	5-Dec	49	Day 7
	340	6-Dec	49	Day 8
	341	7-Dec	49	Day 9
	342	8-Dec	49	Day 10
	343	9-Dec	49	
	344	10-Dec	49	
	345	11-Dec	50	
	346	12-Dec	50	
	347	13-Dec	50	
	348	14-Dec	50	
	349	15-Dec	50	
	350	16-Dec	50	
	351	17-Dec	50	
	352	18-Dec	51	
	353	19-Dec	51	
	354	20-Dec	51	
	355	21-Dec	51	Winter Solstice (start)
	356	22-Dec	51	
	357	23-Dec	51	
	358	24-Dec	51	
1	359	25-Dec	52	
	360	26-Dec	52	
	361	27-Dec	52	
	362	28-Dec	52	
	363	29-Dec	52	
	364	30-Dec	52	
	365	31-Dec	52	

Figure 6

Drops in histamine levels create a "serotonin surge" that occurs as pollen levels decline each fall and spring. Impulsive behavior is thus seen in the United States via mass shootings data from 2017-2021. Fall (top) ragweed pollen levels by city ranked by latitude and Spring (bottom) tree pollen ranked by city ranked by latitude.



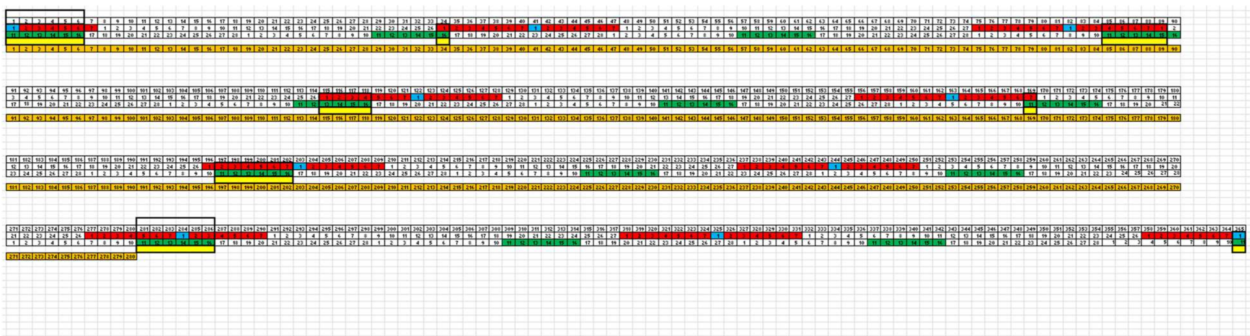
Source: https://link.springer.com/article/10.1007/s10453-019-09601-2



Source: https://link.springer.com/article/10.1007/s10453-019-09601-2

Figure 7

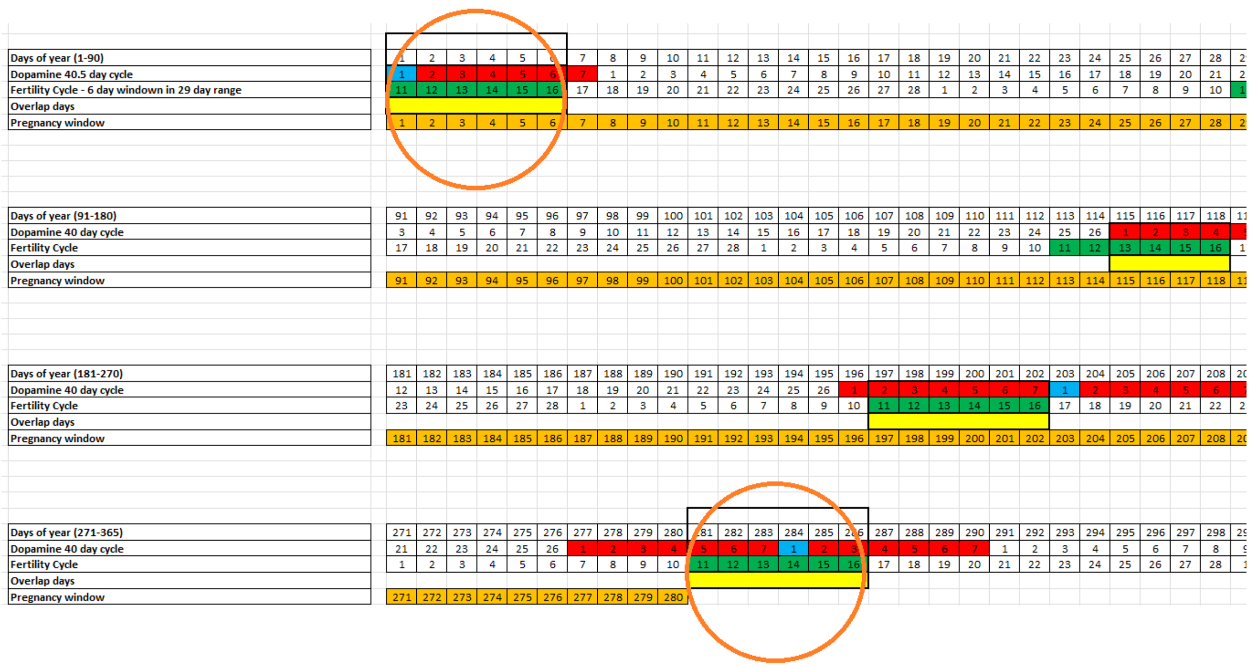
A high-level overlay of the secondary dopamine cycle (red), human female fertility cycle (green), overlapping dates (yellow), and the average human female pregnancy duration (orange) from an initial day 1 fertilization event. The year is broken out into four 90-day-long quarters. Peak days at 40-day intervals from the secondary dopamine cycles are noted in light blue squares.



40-DAY-LONG

Figure 8

A close-up of the overlay calendar shows the next optimal fertilization window occurring exactly 280 days after the start of the first pregnancy hinting at a fitness-driven evolutionary biology origin of the 40-day-long secondary dopamine cycle.



Days of year (1-90)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	2
Dopamine 40.5 day cycle	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	2
Fertility Cycle - 6 day windown in 29 day range	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	1
Overlap days																													
Pregnancy window	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	2

Days of year (91-180)	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	11
Dopamine 40 day cycle	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	1	2	3	4	5
Fertility Cycle	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1
Overlap days																													
Pregnancy window	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	11

Days of year (181-270)	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	20
Dopamine 40 day cycle	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Fertility Cycle	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	2
Overlap days																													
Pregnancy window	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	20

Days of year (271-365)	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	29
Dopamine 40 day cycle	21	22	23	24	25	26	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9
Fertility Cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1
Overlap days																													
Pregnancy window	271	272	273	274	275	276	277	278	279	280																			

40-DAY-LONG

Figure 9

The "low dopamine" 10-day-long interval analyzed in detail shows identical behaviors on both sides of the inverted triangle demonstrating a direct association with dopamine and various behavioral states.

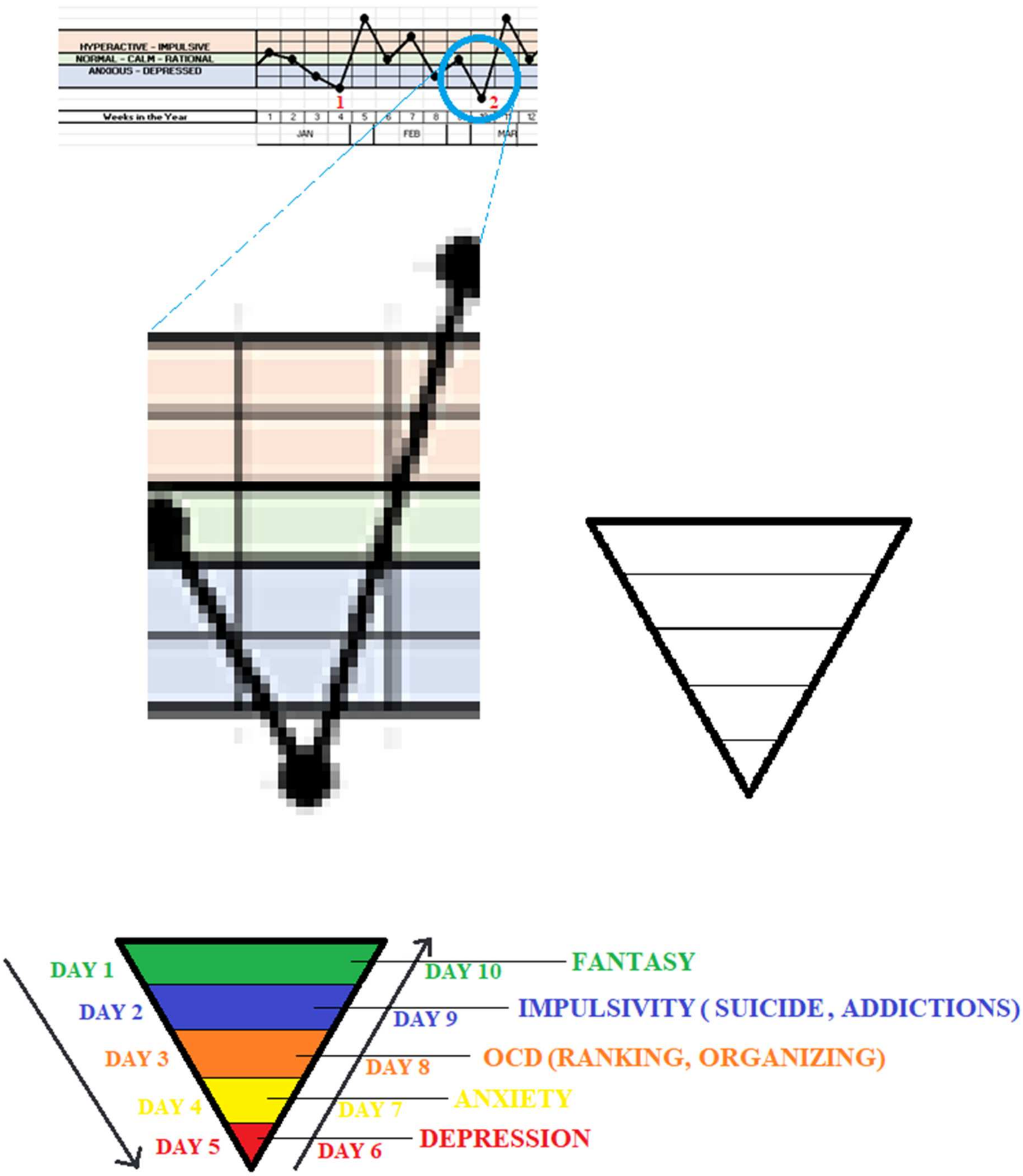


Figure 10

The detailed color-coded map of behaviors during the 10-day-long "low dopamine" phase is mapped against the first four intervals of the calendar year 2022.

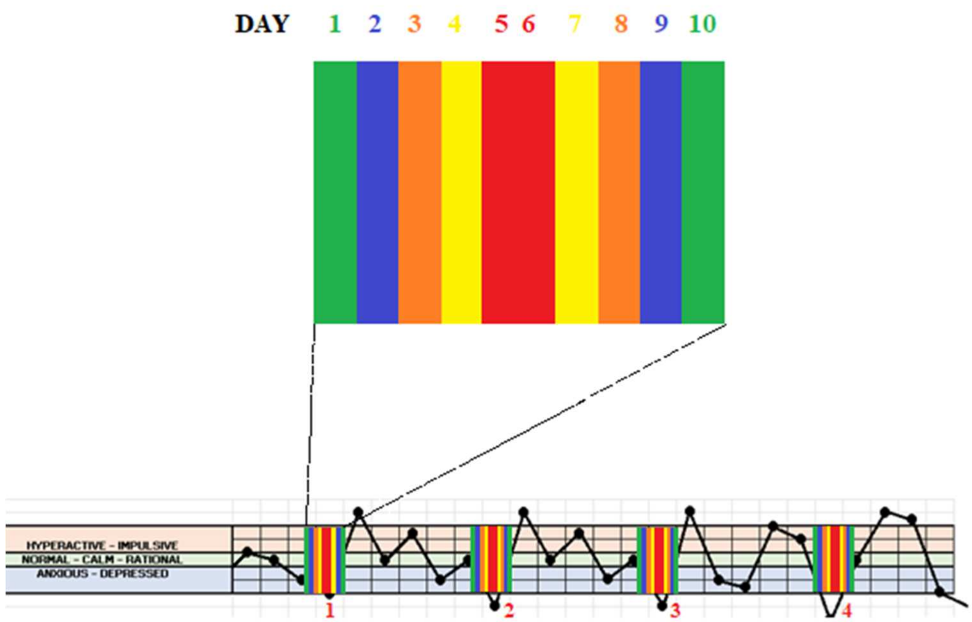


Figure 11

A simplistic model is used, starting with the 10-day-long "low dopamine" portion of the temperament map graph, comparing a "normal" human (left) with a bipolar human (right) and extending the analogy to imply that the latter, with much lower dopamine, involves restricted layers of working memory in the brain (red squares) and thus more severe behavioral impacts.

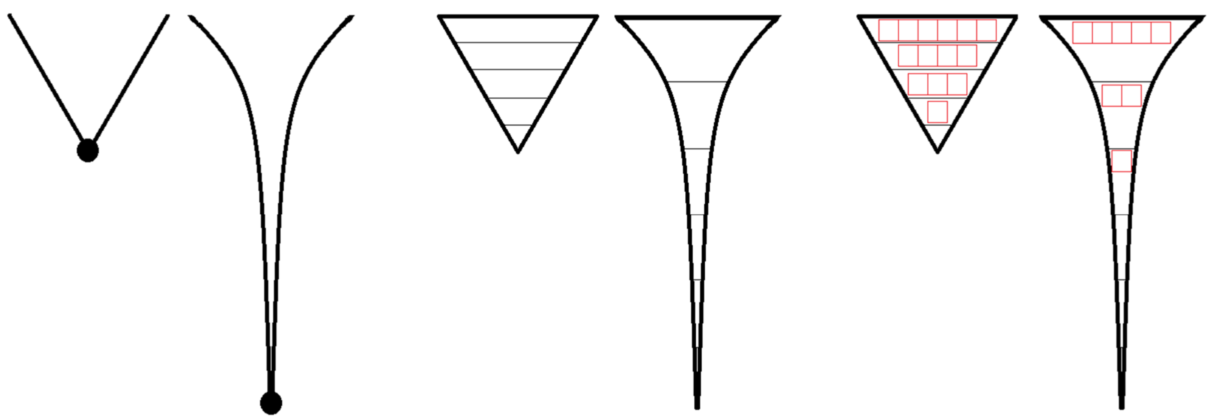


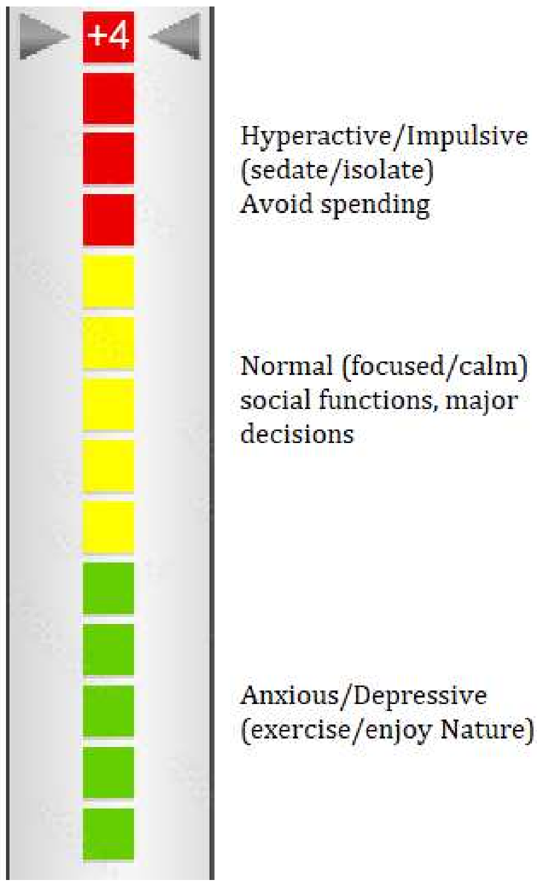
Figure 12

An aircraft cockpit instrument that monitors real-time altitude and orientation as an example of a "state" monitoring tool. An application that is presently absent for human neurotransmitter levels and temperament.

Source: https://allavionics.com/product/uavionix-av-30-c-primary-flight-display-certified/?gclid=Cj0KCQiAgP6PBhDmARIsAPWMq6mYOXR2xaEPKh_fBgayUXjlJJD1DIXeyipNQ7nudgaN38LTI1gdBOsaAkmwEALw_wcB

Figure 13

An example of a possible smartphone application where a standard scale is used to notify the user by color and the number of their measure of temperament per any given week or day of the year to allow them to adjust accordingly knowing how neurotransmitters are impacting their state of mind.



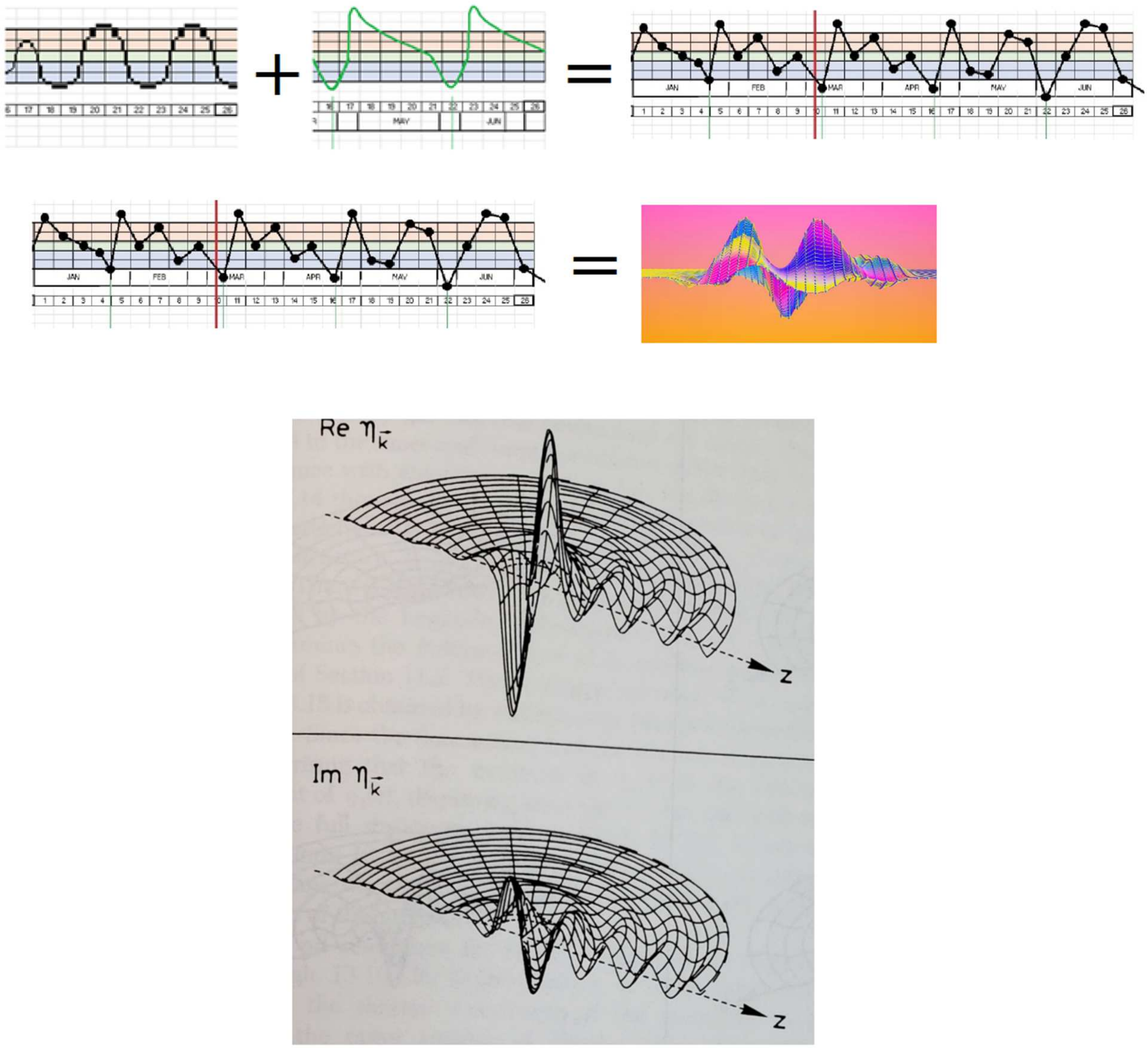
Source: https://www.123rf.com/photo_140341271_stock-vector-bar-of-meter-with-progress-level-from-red-to-green-vector-illustration.html

Figure 14

A possible application of the temperament app would be for salespersons using software like Video Conferencing to know real-time what the likely temperament of a given individual would be, given the time of year and possibly their location, versus dopamine and serotonin levels.

Figure 15

A visual comparison of dopamine wave forms and the quantum mechanical Schrödinger wave function. Might a quantum mechanical wave function measurement, or decoherence of the wave function, be equivalent to, or instantiated by, changes in brain dopamine? Might reality be defined by levels of dopamine and serotonin in conscious brains? Is the aggregate dopamine graph (the sum of the sunlight driven primary dopamine cycle and the secondary 40-day cycle) actually an image of the wave function with the dots and lines being a two-dimensional representation of a three-dimensional rotated wave:



Source: Wikipedia contributors. (2023, May 11). Schrödinger equation. In *Wikipedia*, The Free Encyclopedia. Retrieved 13:14, May 20, 2023, from https://en.wikipedia.org/w/index.php?title=Schr%C3%B6dinger_equation&oldid=1154346428 Image Credit: Brandt, S. & Dahmen, H.D. (1985). *The Picture Book of Quantum Mechanics*. John Wiley & Sons, Inc. USA. Image Credit: Yaroslav Kushta/Getty Images.

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