Article

The Potential Effects of Human Group Emotion and Subjective Novelty on the Statistical Behaviour of a Random Event Generator: Exploratory Study

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Abstract

Many traditional beliefs regard "human energy" as an integral component in human health and positive life experience. A number of areas in the realm of complementary and alternative medicine, as well as consciousness research in general, have explored the potential for these subtle energies in a myriad of experiments and applications. The FieldREG experiments previously conducted by a number of researchers have demonstrated an apparent effect of novel or emotional group activities on the statistical deviations of a proximal Random Event Generator device. In the present study, further exploration of this phenomenon was employed in both novel and relatively mundane group settings. Furthermore, a directional hypothesis was pursued whereby positive emotional experiences were expected to produce upward (positive) trends in the random data, while negative emotional settings would produce downward (negative) deviations. Finally, an overall comparison between random data from positive and negative settings was investigated. Results tended to support current theories that emotional or novel group experiences appear to influence the statistical performance of a random physical device, and that the emotional valence may further affect the overall direction of the random data obtained.

Key Words: Consciousness, Random Event Generators (REG), Human Emotions, Subtle Energies, FieldREG

1. Introduction

There are a multitude of both past and current theories and beliefs regarding a potential 'energy' associated with living beings, specifically humans. These theories appear within a number of varying traditions from spiritual and esoteric beliefs to modern energy healing theories [1-2]. Many spiritual traditions employ some concept consistent with the idea of a 'life force'. The ancient Hindu *Vedas* describe the *prana* ('life force') which connects the universe. This concept

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is largely similar to *qi* ('breath') in Chinese culture which continues to provide a major underlying foundation for traditional Chinese medicine.

Throughout the history of science, Eastern belief systems have influenced a range of new ideas regarding this 'vital energy', particularly those in the aptly named vitalist tradition. In the 18th century, Franz Mesmer described a natural invisible force exerted by living things which he later termed animal magnetism [3]. By employing magnetism in the context of various therapies, Mesmer sought to affect human health. Despite his apparent successes at the time, this theory eventually lost favor and is largely forgotten today. The far less known concept of 'Odic force', originally conceived by Carl von Reichenbach in the mid-19th century, similarly described a vital force associated with human energy. This theory posited that the life force was related to electromagnetism and temperature [4], which is remarkably consistent with current theories of consciousness [5-7].

A small number of these early theories of human energy have also had a considerable impact on literature and other important areas of Western culture. The concept of 'orgone' energy, originally hypothesized by Wilhelm Reich in the 1930's, described a similar 'life force' to many previous philosophies [8]. Charles Kelley eventually posited that 'orgone' was a universal force which opposed entropy [9]; whereas nature tends toward disorder (entropy), orgone was viewed as the 'creative' counterpart to the entropic principle. Despite its eventual dismissal on the grounds of severely lacking empirical support, this theory appears remarkably convergent with current theories regarding the effects of conscious intention eliciting increased order in an external random system [10]. Although many 'life energy' theories appear crude or even ridiculous in the context of modern scientific investigation, the continual appearance of this type of idea throughout the history of spirituality and the humanities indicates that this concept is consistently at least an intriguing feature of the subjective experience.

Many areas of modern complementary and alternative medicine (CAM) have continued to pursue the integration of Eastern philosophy and Western science through the investigation of energy medicine and non-local healing. While decades of research have revealed significant effects of consciousness on an external random physical system [11-13], there has also been a plethora of similar research conducted on the potential effects of human 'energy' [14-15] and consciousness [16-17] to affect change in external biological systems. The apparently non-local healing effects previously observed in the tradition of Reiki continue to be implemented in various CAM settings [1, 18], while the concept of *qi* remains an integral factor in the practice of traditional Chinese medicine [2]. Although some 'essence' of life may or may not be responsible for these observed effects, there are many theories grounded in physical bases which further suggest that consciousness itself may play a role in the physical realm [19] and this idea has been supported with convergent quantification of physical parameters [20].

Furthermore, a theory of 'global consciousness', capable of introducing anomalous deviations in random physical systems, has recently been examined with evidence suggesting that large-scale events which induce emotional reactions in people across the globe might affect the outcome of many random event generator (REG) devices located around the planet [21]. If this hypothesis is correct in any manner, then this might suggest that immediate gatherings of human groups should be capable of eliciting similar effects during periods of heightened emotional states. The

following experiments sought to investigate whether emotional experiences in large groups could produce statistically anomalous deviations within a REG device located in the local environment.

Indeed, there have been a small number of 'FieldREG' studies conducted previously, which seem to support this contention to some extent. While one early study in this area revealed reasonable effects in favor of this hypothesis [10], later research examined events of greater emotional significance which subsequently showed much more consistent REG effects [22]. Furthermore, similar effects have been noted with impressively significant results in the context of large group meditation [23].

These theories were explored in the current research protocol with the additional hypothesis that the outcome of a random system might be affected in terms of overall directionality. We suspected that a binary series of data (0 or 'down', 1 or 'up') produced in direct proximity to human gatherings would conform to the emotional valence of those present. Although this theory may initially appear rather farfetched, the mere fact that individuals appear capable of producing similarly anomalous deviations which conform to their pre-stated intentions ('up' or 'down') in identical systems could lend some support to the current hypothesis [11]. This point adopts a particular salience regarding the anomalous nature of human intention and consciousness in general given that the digital representations of random physical systems to which human intentions are typically directed are simply abstract symbols applied to the fundamental process being sampled (e.g., electron tunneling). Therefore, we further hypothesized that novel positive and negative emotional settings would reveal significantly different deviations with overall directions opposite to each other. This theory might be further supported by the many experiments conducted within the area of presentiment or human 'intuition' which suggest that anomalous non-local processes correlated with consciousness have a greater effect in emotional contexts [24-26].

In addition to this, we further suspected that the overall magnitude of subsequent effects would be related to the subjective novelty of each context examined. We reasoned that relatively novel events would elicit the greatest anomalous effects in the output of a random physical process while more mundane scenarios would be associated with baseline or chance probability results as typically obtained in a controlled setting.

2. Methods

2.1. Equipment

Random data was produced using two Psyleron REG-1 random event generators (www.psyleron.com). This device produces a random output which is generated by electron tunneling effects within two field effect transistors. The varying voltage levels which result from this process are converted into digital data through a gated sampling procedure which allows for regularly spaced bit sequences. The output of both transistors is internally compared through an alternating (0, 1) XOR masking process in order to reduce any potential influence of physical artifacts or other external environmental variables. The device itself is further protected from static electromagnetic factors by an aluminum outer shielding and a Permalloy mu-metal inner

shield. Furthermore, the device was rigorously calibrated prior to shipment in order to ensure output conformed to statistical expectations. The random event generator (REG) devices were also tested in control experiments within respective laboratories (Canada and Spain) to confirm these expectations. The resulting data streams were collected through USB-port using the Psyleron FieldREG software package on laptop computers. Individual events were produced at a rate of either 1/sec or 5/sec (1 event = 200 bits) for longer or shorter experiments respectively. However, internal consistency was maintained within each experiment. There were no significant differences noted between event rates in previous testing ($p > .05$).

During data collection, the device was located within proximity to various human gatherings in a number of contexts; this included subjectively negative, positive, and neutral or mundane scenarios.

Values for each individual REG event refer to the number of 1's out of 200 bits with binary probabilities, represented by a value of 0-200. The theoretical (chance) mean for each event is 100 with a standard deviation of $\sqrt{50}$. Each data segment (time period) from each experiment was processed and analyzed independently according to manually time-stamped behaviours and other occurrences in the local environment. All segments consisting of fewer than 100 total events were discarded due to inherently large measurement uncertainties.

All data processing procedures were conducted using Microsoft Excel 2010 software.

2.2. Locations

Initial data collection took place on February 10, 2013 during services at a Catholic church in Sudbury, Ontario, Canada (*Catholic Service*). The experimenters and the REG device were located in the right side of the rear seats in the church. There were approximately 185 individuals in attendance. Output of REG data was produced at a rate of 1 event/sec during this particular session, which lasted ~49.8 minutes.

The second session was conducted on February 17, 2013 during services at a non-denominational Christian church also located in Sudbury, Ontario, Canada (*Non-Denom*). There were approximately 275 people in attendance, and it was noted that the regular pastor was away on holidays. Data was collected at a rate of 1 event/sec and lasted ~90.43 minutes. During testing, the experimenters and the REG were located in an upper aisle to the left of the congregation (Figure 1).

Figure 1. Non-denominational Christian church service; vantage point of image is that of the experimenters and REG device

The next session took place in Prado Nuevo, a large field on the outskirts of El Escorial, about 45 km from Madrid, Spain (*Prado Nuevo*). On the first Saturday of every month, devout worshippers gather here to pray to the Virgin Mary, who was allegedly sighted in Prado Nuevo 30 years previous. Data collection took place on December 7, 2013 during ceremonies at both the local chapel (Figure 2) and in the field of Prado Nuevo proper (Figure 3) which lasted approximately 77 minutes. The REG data was produced at a rate of 5 event/sec, while the device was located within a backpack worn by an experimenter who traveled with the crowd throughout the festivities.

Figure 2. Chapel at Prado Nuevo

Figure 3. Holy field of Prado Nuevo

Data was also collected near Es Vedrà, an island off the coast of Spain (*Es Vedra*). The REG device was placed on the central table of the crew's sailboat equidistant from each bedroom (centre of the ship). Data was produced at a rate of 1 event/sec during a combined period of ~583.47 minutes. While primarily stationed just in range of the small island (Figure 4), the expedition had to return to shore a number of times (Figure 5) due to turbulent conditions. A number of relatively mundane scenarios took place during this particular session, while there was also a funeral ceremony, as well as physical pain (serious jellyfish wound) which occurred. Data collection took place from August 22 to 23, 2013.

Figure 4. Island of Es Vedrà; X mark indicates location where boat was positioned; obtained from Google Maps

Figure 5. Island of Es Vedrà (lower left) and path taken to shore with docking location; obtained from Google Maps

REG data was also collected during a flight from El Hierro Island to Gran Canaria in the Canary Islands (*Canary Flight*). A regular flight was grounded on January 5, 2014. Despite poor weather conditions, approximately 40 passengers proceeded to board a small plane to complete the trip to Gran Canaria. A REG device was located within a backpack worn by an experimenter while boarding the second plane, during flight, and after arrival at Gran Canaria. Data was collected at a rate of 5 event/sec for ~49 minutes.

2.3. Data Processing

REG data from each segment within each experiment condition was analyzed independent of either previous or subsequent values; relevant statistics and figures were produced accordingly. Individual REG event scores were standardized according to 0.5 chance expectations ([*x*-100] / √50). Combined overall z-scores for each segment were computed according to Stouffer's method ($z_c = \sum z / \sqrt{N}$) where z = individual event z-scores and N = the number of event scores. Effect sizes follow a method proposed by Helfrich [27] and employed by other researchers in this area, using the relationship $es = z_c / \sqrt{N}$ which is equivalent to the mean event z-score. One-tailed probabilities (1T) are reported according to *a priori* hypotheses regarding the directional component of REG output. Measurement uncertainty for each segment (σ_μ) was computed according to $\sigma/\sqrt{2N}$, where $\sigma = \sqrt{50}$ and N = number of REG events.

3. Results

3.1. Mundane Setting

The first test session (*Catholic*) took place during standard church services. We had hypothesized that few if any segments of REG data would present with significant deviations of particularly large magnitude given the relatively little novelty involved in a weekly process. However, we suspected that any deviations observed would be in the 'up' direction (more 1's than 0's) given the typically positive emotional experiences religious individuals associate with this type of activity. Changes in group activity were logged in real time by experimenters (Figure 6).

As anticipated, the behaviour of the REG device remained within chance expectations ($p > .05$) for a majority of the church service (Table 1). Furthermore, a period of sustained applause from the congregation prior to the end of the service produced a significant upward trend in the data ($z_c = 2.94$, $p = .002$, $es = .28$), although this segment had a relatively high measurement uncertainty given the smaller total number of events ($\sigma_\mu = .477$). Note that all periods of REG deviation which cross the threshold for statistical significance during testing were in the upward (positive) direction.

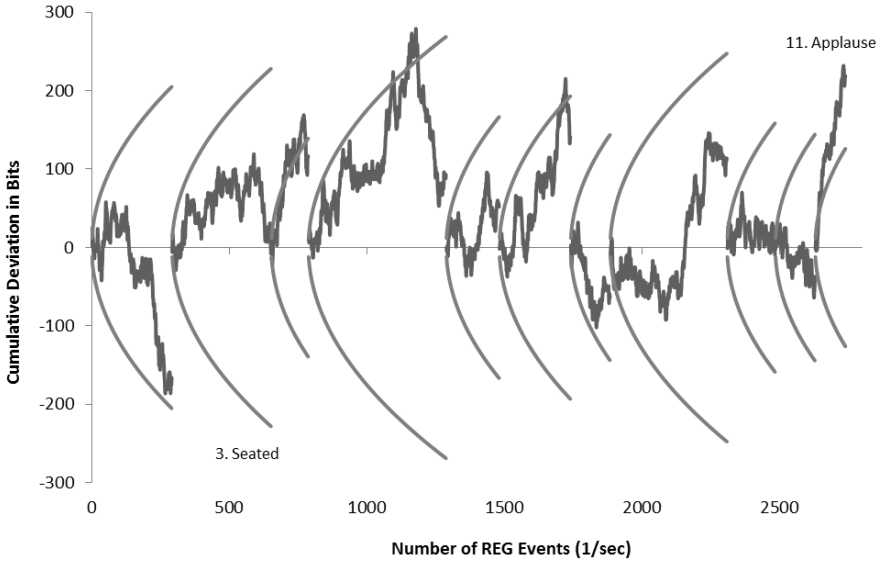

Figure 6. Cumulative deviation in REG data during the *Catholic Service* experiment; parabolas indicate threshold for statistical significance ($p = .05$)

Table 1. REG event data for each *Catholic Service* segment; **N** = number of events, $\boldsymbol{z_c}$ = combined z-score, ***es*** = effect size ($z_c/\sqrt{N}$; equal to mean REG *z*), ***p*** = probability of z_c, $\boldsymbol{\sigma_\mu}$ = measurement uncertainty ($\sigma/\sqrt{2N}$)

Segment	N	z_c	*es*	*p*	σ_μ
1. Start REG (Standing)	291	-1.376	-.08	.084	.293
2. Seated	360	-.06	0	> .45	.264
3. Stand/Sing	134	1.405	.121	.08	.432

4. Seated/Sermon	500	.588	.026	.278	.224
5. Stand/Lord's Prayer	192	.53	.04	.298	.361
6. Seated Hymn	258	1.24	.08	.108	.311
7. Stand	143	-.76	-.06	.224	.418
8. Stand/Lord's Prayer	424	.78	.04	.218	.243
9. Communion	174	-.11	-.01	>.45	.379
10. Stand/Announcements	144	-.44	-.04	>.45	.417
11. Applause	110	**2.94**	**.28**	**.002**	**.477**

The second test session occurred during a non-denominational Christian church service (*Non-Denom*) and it was again anticipated that the REG data would tend to remain within baseline probabilities due to the relative frequency with which this particular event occurs.

All cumulative z-scores during this experiment (Table 2) were within chance expectations ($p > .05$; Figures 7 & 8). Again, note that the isolated moments of significant REG deviation *within* the sermon segment (Figure 8) were in the direction previously associated with positive emotional experience (upward trend).

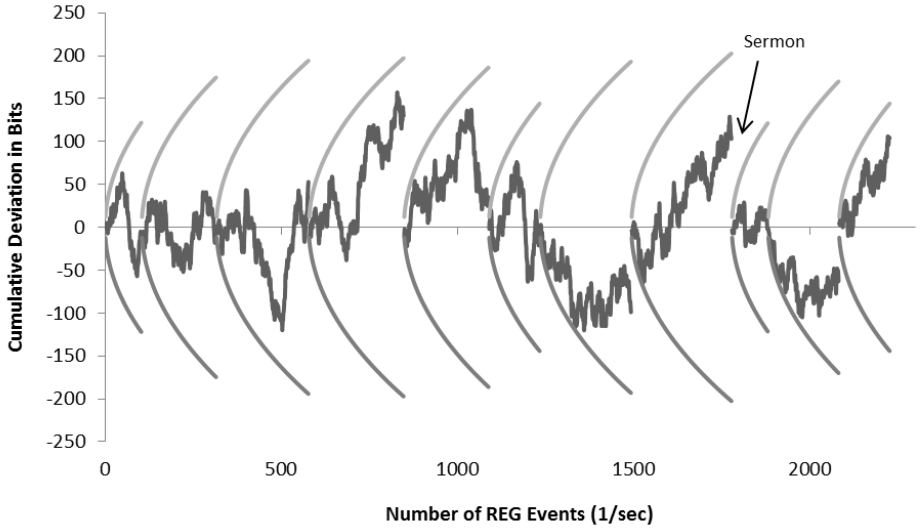

Figure 7. Cumulative deviation in REG data during the *Non-Denom* experiment for segments of N > 100; arrow indicates break in data for Sermon segments (Figure 8); parabolas indicate threshold for statistical significance ($p = .05$)

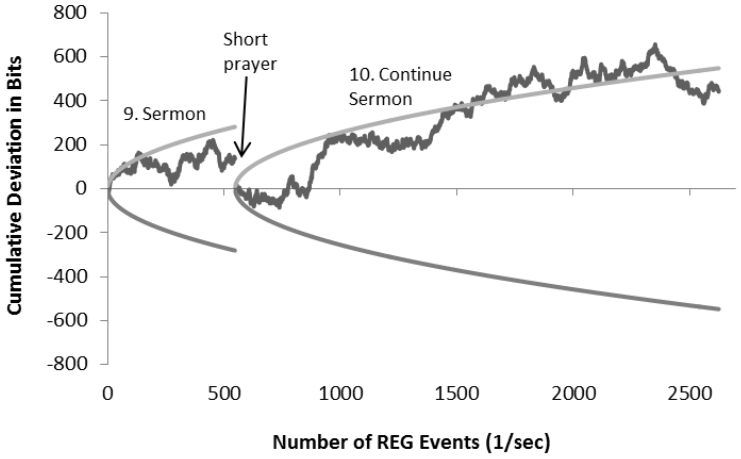

Figure 8. Cumulative deviation in REG data during Sermon time period(s) for the *Non-Denom* experiment; arrow indicates break in data for short prayer segment (N = 18, not included); parabolas indicate threshold for statistical significance (p = .05)

Table 2. REG event data for each *Non-Denom* segment; **N** = number of events, $\boldsymbol{z_c}$ = combined z-score, ***es*** = effect size ($z_c/\sqrt{N}$; equal to mean REG z), ***p*** = probability of z_c, $\boldsymbol{\sigma_\mu}$ = measurement uncertainty ($\sigma/\sqrt{2N}$)

Segment	N	z_c	*es*	*p*	σ_μ
1. Start REG	103	-.098	-.01	>.45	.493
2. Song	211	-.058	-.004	>.45	.344
3. 2nd Song	261	.464	.029	.321	.31
4. 3rd Song	269	1.121	.068	.131	.305
5. 4th Song	240	.32	.021	.375	.323
6. 5th Song	144	-.212	-.018	.416	.417
7. Children Leave/Greetings	258	-.872	-.054	.192	.311
8. Choir/Offering	284	.864	.051	.194	.297
9. Sermon	547	.847	.036	.199	.214
10. Continue Sermon	2077	1.369	.03	.086	.11
11. Choir on Stage	102	-.014	-.001	>.45	.495
12. Prayer	200	-.63	-.045	.264	.354
13. Final Song	144	1.226	.102	.11	.417

3.2. Novel Positive Emotional Setting

The preliminary analysis of a relatively novel positive emotional gathering was conducted on data obtained during a large religious event at Prado Nuevo in Spain, which has spiritual significance for Christians. This event occurs on a monthly basis and is attended by a varying group of individuals. We had hypothesized that the prayer segments in this experiment would show significant upward deviations in the REG data, while other segments would show baseline z-scores.

While the periods outside of prayers consistently demonstrated baseline results ($p > .05$), the initial prayer in which the mass was developed near the local chapel showed a highly significant upward trend as anticipated (Figure 9; $z_c = 3.037$, $p = .001$, $es = .062$). However, the considerably longer praying of the rosary which occurred in the field of Prado Nuevo proper displayed non-significant results supporting the null hypothesis (Figure 10), although it is interesting that it was the primary prayer (e.g., the more 'novel' of the two) which displayed the significant deviation (Table 3).

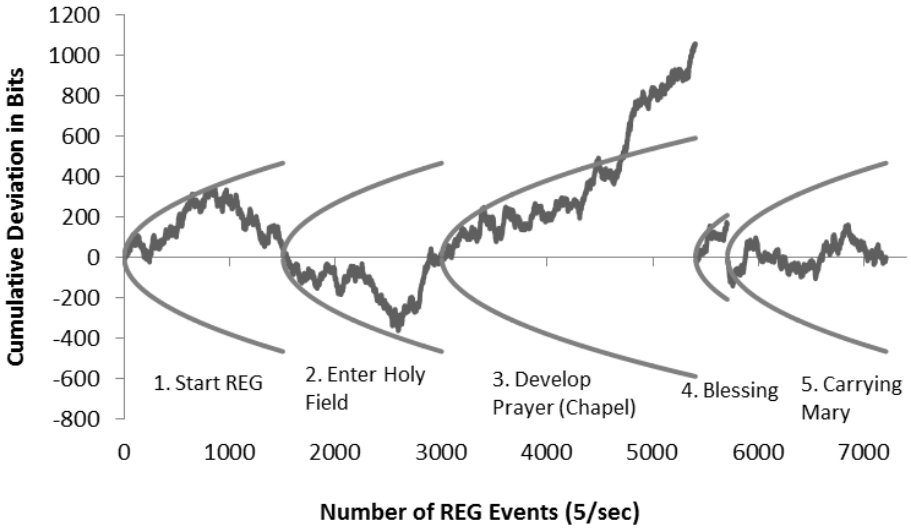

Figure 9. Cumulative deviations in REG data during each time period for the *Prado Nuevo* experiment; parabolas indicate threshold for statistical significance ($p = .05$)

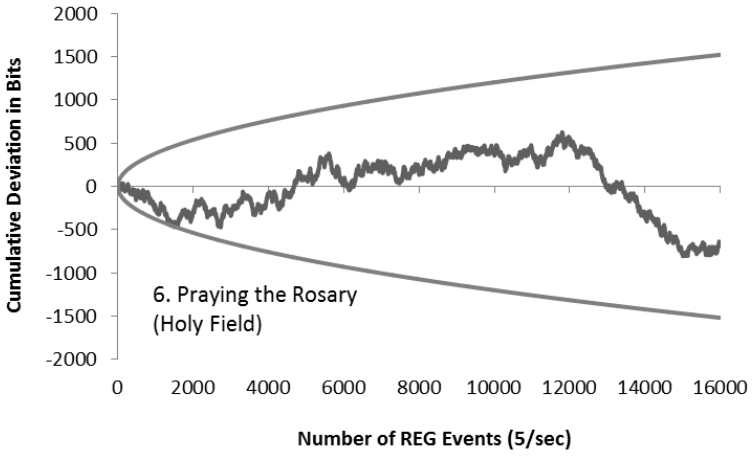

Figure 10. Cumulative deviation in REG data during final time period for the *Prado Nuevo* experiment; parabolas indicate threshold for statistical significance ($p = .05$)

Table 3. REG event data for each *Prado Nuevo* segment; **N** = number of events, $\boldsymbol{z_c}$ = combined z-score, ***es*** = effect size ($z_c/\sqrt{N}$; equal to mean REG *z*), ***p*** = probability of z_c, $\boldsymbol{\sigma_\mu}$ = measurement uncertainty ($\sigma/\sqrt{2N}$)
† primary segments of interest

Segment	N	z_c	*es*	*p*	σ_μ
1. Start REG	1500	.19	.005	.425	.129
2. Enter Holy Field	1500	$1.58\cdot10^{-15}$	$4.09\cdot10^{-17}$	>.45	.129
3. Develop Prayer†	2400	**3.037**	**.062**	**.001**	**.102**
4. Final Blessing	300	1.364	.079	.086	.289
5. Carrying Mary	1500	.004	$9.43\cdot10^{-5}$	>.45	.129
6. Praying the Rosary†	15990	-.755	-.006	.225	.04

3.3. Novel Negative Emotional Setting

The next experiment we examined occurred in the context of a negative emotional event (e.g., funeral ceremony). Again, this type of event is somewhat rare and novel compared to initial experiments (*Catholic* and *Non-Denom*), particularly given the relatively exotic location of the event (Es Vedrà Island). As with the previous analyses, we hypothesized that REG output would remain consistent with control conditions during the more mundane events (e.g., eating dinner) while the events associated with the funeral would show significant data deviations. Furthermore, in contrast to the previous experiments, we hypothesized that the funeral events would demonstrate downward trends consistent with the theory of emotional valence in the FieldREG phenomenon.

As expected, mundane events demonstrated non-significant z-scores ($p > .05$). However, when the crew returned to Es Vedrà on the day of the funeral, there was a slightly significant deviation in the anticipated direction (Figure 11; $z_c = -1.94$, $p = .026$, $es = -.032$). Following this segment, a crew member received a serious jellyfish wound. While this was not expected prior to conducting the experiment, it provided an interesting opportunity to examine REG output in proximity to severe physical pain. This segment revealed a significant deviation ($z_c = 2.22$, $p = .013$, $es = .038$). If emotional valence indeed plays a role in this phenomenon, then physical pain may differ from 'emotional pain' given the upward trend displayed during this period. The main segment of interest was the actual funeral ceremony and the scattering of the ashes (Table 4). As initially hypothesized, this segment displayed a significant downward trend ($z_c = -1.927$, $p = .027$, $es = -.045$). This particular segment appears to confirm the hypotheses regarding both valence and occurrence of significant deviations.

During a 10-hour period while the crew was sleeping (Figure 12), there was a steady downward trend present within the data records which peaked beyond the threshold for significant deviations. Although this segment presented with a weak overall effect ($z_c = -1.791$, $es = -.009$, $p = .037$), it should be noted that the large number of accumulated bits (N = 36000) allowed for the most precise calculation of the overall mean shift of REG event scores ($\sigma_\mu = .037$). Furthermore, data collection for such a prolonged period should "smooth" any artifactual deviations out of the record over time, while this period instead demonstrated a consistent negative drift over the 10-hour period. While not included in the initial novelty/directional hypotheses, this segment

presents some intriguing possibilities, particularly given the absence of studies examining non-conscious (sleeping) individuals in proximity to random physical systems. Subjective reports of individuals prior to this segment suggested a generally sad disposition among the crew attributable to the coming activities of the following day.

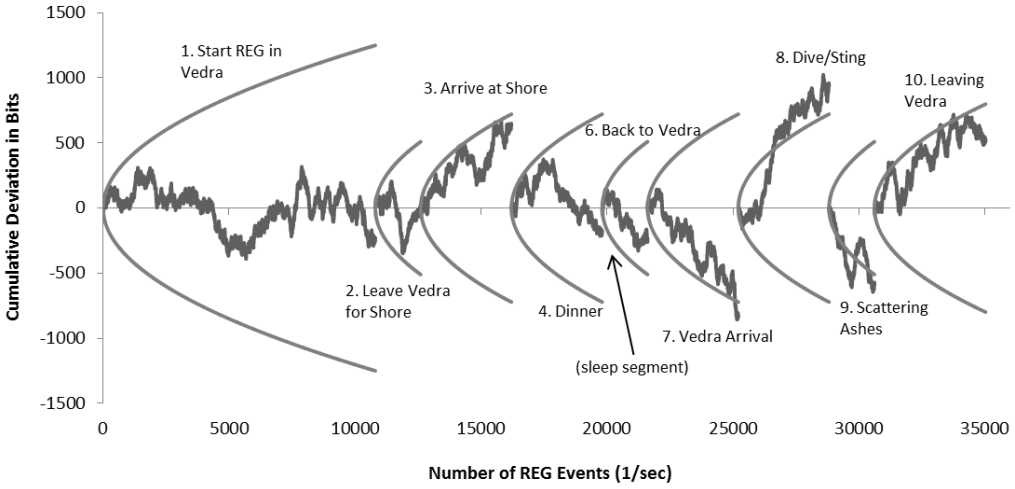

Figure 11. Cumulative deviations in REG data during each time period for the *Es Vedra* experiment; arrow indicates break in data for Sleep segment (Figure 12); parabolas indicate threshold for statistical significance (p = .05)

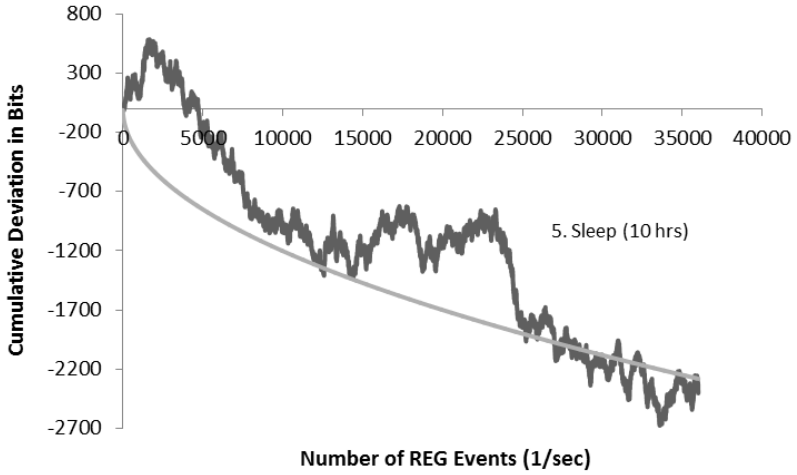

Figure 12. Cumulative deviation in REG data during the Sleep time period (10 hrs) for the *Es Vedra* experiment; parabolic curve indicates threshold for statistical significance (p = .05)

Table 4. REG event data for each *Es Vedra* segment; **N** = number of events, $\boldsymbol{z_c}$ = combined z-score, ***es*** = effect size ($z_c/\sqrt{N}$; equal to mean REG z), ***p*** = probability of z_c,

σ_μ = measurement uncertainty ($\sigma/\sqrt{2N}$)
† primary segment of interest

Segment	N	z_c	*es*	*p*	σ_μ
1. Start REG in Vedra	10800	-.31	-.003	.378	.048
2. Leave Vedra	1800	.067	.002	>.45	.118
3. Arrive at Shore	3600	1.49	.025	.068	.083
4. Dinner	3600	-.413	-.007	.34	.083
5. Sleep	**36000**	**-1.791**	**-.009**	**.037**	**.026**
6. Back to Vedra	1800	-.773	-.018	.22	.118
7. Vedra Arrival	3600	**-1.94**	**-.032**	**.026**	**.083**
8. Dive/Sting	3600	**2.22**	**.038**	**.013**	**.083**
9. Scattering Ashes†	1800	**-1.927**	**-.045**	**.027**	**.118**
10. Leaving Vedra	4408	1.086	.016	.139	.075

The final test session occurred aboard a small plane travelling within the Canary Islands. It was noted that the weather conditions were not favorable and the small number of passengers were particularly anxious regarding these specific circumstances. Due to this, we had hypothesized that the REG device would produce negative, downward trends during the flight consistent with emotional valence previously suspected.

The data segments which occurred prior to and following the flight were within chance expectations ($p > .05$). The flight segment produced an overall downward trend in the anticipated direction which peaked beyond the level of statistical significance as the plane gradually proceeded towards its destination (Figure 13). While it is tempting to posit an emotional effect during this period, the overall flight segment revealed a non-significant cumulative z-score (Table 5).

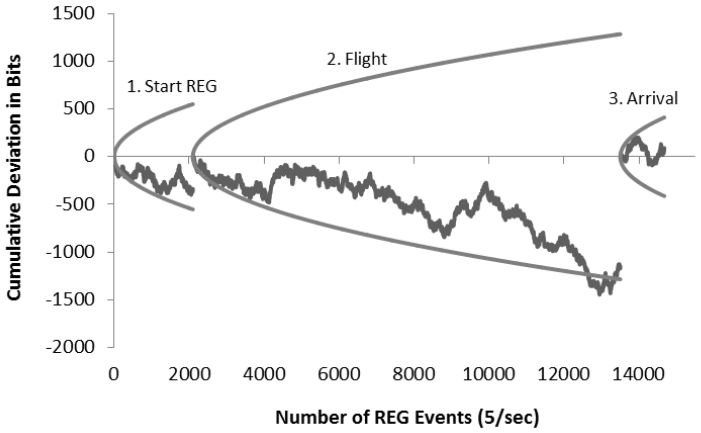

Figure 13. Cumulative deviations in REG data during each time period for the *Canary Flight* experiment; parabolas indicate threshold for statistical significance ($p = .05$)

Table 5. REG event data for each *Canaria Flight* segment; **N** = number of events, $\boldsymbol{z_c}$ = combined z-score, ***es*** = effect size ($z_c/\sqrt{N}$; equal to mean REG *z*), ***p*** = probability of z_c,

$\boldsymbol{\sigma_\mu}$ = measurement uncertainty ($\sigma/\sqrt{2N}$)
† primary segment of interest

Segment	N	z_c	*es*	*p*	σ_μ
1. Start REG	2100	-1.04	-.023	.149	.109
2. Flight†	11400	-1.538	-.014	.062	.047
3. Arrival	1173	.359	.011	.36	.146

3.4. Positive – Negative Setting Comparison

In order to further pursue the directional hypothesis that novel subjectively positive and negative emotional settings would show significantly differential deviations a number of calculations were performed (Table 6) allowing a direct comparison accounting for differing numbers of total REG events. The *a priori* segments of interest († in Tables 3-5) for which the project was originally designed to investigate included the two prayer sessions from the *Prado Nuevo* experiment (positive), the funeral ceremony from the *Es Vedra* experiment (negative), and the turbulent flight in the *Canary Flight* experiment (negative). By obtaining the absolute REG deviation difference between combined positive and negative conditions and computing the measurement uncertainty associated with the respective values for N, it was determined that a small but significant difference in REG output occurred between novel positive and negative emotional segments (z_c = 1.887, p = .03).

Table 6. N = combined number of REG events, $\boldsymbol{\delta_\mu}$ = absolute deviation ($\mu_{\text{positive}} - \mu_{\text{negative}}$), $\boldsymbol{\sigma_\mu}$ = measurement uncertainty in δ_μ ($\sigma \cdot \sqrt{([1 / N_{\text{positive}}] + [1 / N_{\text{negative}}])}$ where $\sigma = \sqrt{50}$), $\boldsymbol{z_c}$ = z-score of overall difference (δ_μ / σ_μ), $\boldsymbol{p}$ = probability of z_c (1T)

	Positive vs Negative Context
N	31590
$\boldsymbol{\delta_\mu}$	.152
$\boldsymbol{\sigma_\mu}$	.081
$\boldsymbol{z_c}$	1.887
$\boldsymbol{p}$	.03

4. Discussion

Present results were generally in favor of the overall FieldREG hypothesis. That is, events of interest identified *a priori* were typically associated with significant deviations in random event generator (REG) data. While the apparent data shifts revealed fairly weak overall effects, the greatest deviations persisted to appear in relation with significant events in the human environment. Furthermore, these results remain fairly consistent with those obtained in previous studies [10, 22]. The contention that relative novelty might play a role in this phenomenon seemed to play an even greater role in the current exploratory study. While the relatively mundane settings investigated demonstrated the expected baseline data conformation, the brief moments of significant excursions *within* the data were found to be in the upward (positive)

direction. This would follow the directional hypothesis regarding the emotional valence of a given group setting.

The more novel scenarios under investigation, through which our main hypotheses were explored, tended to support the role of both novelty and emotional valence as factors in the apparent effect on REG performance. Specifically, the novel positive emotional setting displayed a highly significant upward (positive) deviation in association with the first (more novel) of two major prayer sessions at Prado Nuevo. All other segments within this experiment revealed baseline REG activity.

The major negative emotional setting explored (funeral ceremony) again supported both the pre-stated novelty and emotional valence hypotheses, displaying a significant downward (negative) trend over the course of this event. While not included in the *a priori* hypotheses, the novel negative *physical* event (jelly fish sting) provided an interesting opportunity to investigate potential effects which might be associated with physical pain. Contrary to the consistent pairing of negative emotions with negative deviations, this particular segment displayed a significant upward (positive) deviation in REG data. Although further experiments are required to further explore this finding specifically, it may be that emotional and physical pain produce opposite FieldREG effects. However, an experiment to specifically explore this comparison would be very difficult to conduct safely or ethically.

Furthermore, the segment during which individuals were sleeping might suggest further avenues of REG exploration. While there are currently no known studies which have examined the behaviour of a random physical system in close proximity to non-conscious participants (e.g., sleeping), the sustained trend observed over such a significant period of time certainly indicates this may warrant further investigation. This may be particularly useful in similarly emotional contexts as those currently employed.

Given that brain activity during sleep is very similar to that of a wakeful state, with the exception of minor additional components such as "sleep spindles", an emotional contagion capable of affecting a group of individuals in a waking state may also elicit similar effects during sleep, particularly when in close proximity. If some unifying emotional factor in the personal environment is present (e.g., the shared sadness around the funeral ceremony), then this may already provide some form of neuro-behavioural kindling foundation for enacting some form of excess correlation between pairs or groups of people.

While the Canaria flight incident provided an intriguing opportunity to further probe the nature of negative emotions on the output of a REG device, relatively fewer people were present during this event compared to previous experiments. While the REG data displayed a trend in the expected direction (downward, negative) associated with a negative event which peaked beyond the threshold for statistical significance, the final overall score for this particular segment was non-significant. While the *Es Vedra* experiment displayed a number of significant deviations with a small number of individuals present, it may be that a critical mass of proximal human consciousness is required to elicit or maintain the previously observed FieldREG phenomenon within the context of *specific* emotional responses (e.g., fear/anxiety).

Indeed, this theory could find further support through comparison with previous research in this area, particularly those examining 'global consciousness' effects on a much greater scale. Specifically, the Nelson [21] study which explored potential REG effects within a global network of devices during the events of the September 11, 2001 attacks found much larger effects than those obtained within the smaller group settings employed in the present study. However, it should also be noted that this study in particular [21] also revealed directional effects *opposite* of those anticipated by our previous hypotheses. However, it may also be that varying "modes" of negative emotion (e.g., fear, pain, sadness, disgust) are associated with varying degrees of effectiveness and/or overall event count profiles. Further investigation with a wider array of specifically varied emotional contexts is required to better understand this aspect of the apparent FieldREG phenomenon.

The potential for an experimenter effect in any of these studies cannot be immediately discounted. Given that the majority of research investigating the REG phenomenon associated with consciousness-correlated collapse [11-13] has focused on the directional aspect of pre-stated operator intentions, it is plausible that an experimenter could have influenced the outcome, particularly the directionality, within the preceding FieldREG study. However, it remains intriguing that the subjective novelty of each segment seemed to contribute to the observed effects.

Arguably, the most contentious issue with current the FieldREG investigation is how the cumulative deviations of the device could be affected by events which are subjectively positive or negative in nature. While the notion of non-material "forms" which underlie the material world has been considered since Plato, a number of modern physical theories could contribute to a better understanding of this phenomenon. One possible mechanism is found in the context of holonomic brain theory [28], suggesting that information is stored holographically within the nervous system whereby individual voxels of consciousness can independently represent wider concepts and behaviours associated with the self which may further encompass cohesive abstract forms in aggregate conceptualizations. It may also be relevant that the activity of a single neuron is capable of initiating a "wave" of depolarization throughout the entire cortical surface [29]. Furthermore, it has been demonstrated that electroencephalographic (EEG) activity of two individuals separated in space can become synchronized, or excessively correlated, through the application of specific circumcerebral magnetic fields [6, 30]. It has also been shown that these correlated changes in EEG activity are related to cerebral photon emission over the plane of the right temporal lobe [31].

If the energies associated with a single action potential ($\sim 10^{-20}$ J) can lead to the depolarization of the entire cortical surface, this would be coupled to large bursts in biophoton emissions, which itself may interact with the environment [32]. Therefore, the energies associated with a single thought could affect the thought of all proximal individuals [33]. This underlying concept of "emotional contagion" has also been examined experimentally with supporting evidence [34-35].

This is in slight contrast to theories of consciousness set in a cosmological framework [36], which suggest that consciousness should be an independent process which *interacts* with the brain, as opposed to reducing this phenomenon to purely organic foundations. Both perspectives provide some insight into how conscious thought could extend towards the external environment, even in the absence of active intentions to do so.

Further studies with greater experimental controls and a wider array of specific emotional contexts are required in order to further elucidate the true source of the FieldREG phenomenon. While a number of current studies have investigated potential physical mechanisms which may play a role in individual cognitive intention and consciousness-correlated collapse of random physical systems [13, 32] the precise process of significant REG deviation specifically attributed to emotional group settings remains to be ascertained.

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