Physiological Correlates to Variations in Ultra-weak Photon Emission Measurements during Periods of Focused Intent (249/2020)

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Aims

There are two goals of this study which are expressed in three hypotheses. The first goal is to confirm previous findings (Joines, Baumann, & Kruth, 2012) that participants in a state of focused intention will produce a larger quantity of ultra-weak photon emissions (UPE) than they will when they are at rest. Confirming this hypothesis (H1) would demonstrate that it is possible to intentionally control the expression of UPE.

The second goal of this study is to explore the physiological states that are associated with purposeful expressions of UPE to determine if there are direct physiological correlates (H2) and whether these correlates are associated with increased arousal (H3).

Hypothesis 1: (confirmatory)
Selected participants will demonstrate more UPE during periods of focus than during periods of rest, implying that the production of UPE can be controlled by focused intention.

Hypothesis 2: (exploratory)
Changes in physiology will correlate with changes in the quantity of UPE detected during times of focused intention.

Hypothesis 3: (exploratory)
Physiology indicating increased arousal will produce a stronger correlation with an increase in UPE during times of focused intention.

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Modifications from original proposal

This study originally documented two hypotheses (H2 & H3), but a confirmatory hypothesis was added (H1). H1 was an implied hypothesis that was explicitly added to this study in the final report.

Some of the analysis methods for this study were refined to provide greater detail of the results of each session rather than only exploring overall results of all of the sessions. The R statistical package was used to perform analyses of means differences and correlations across all sessions and to locate patterns of activity that could be compared in each session. These additional analyses provided insight into patterns of physiological changes that accompany strong changes in UPE.

In addition, this study was originally scheduled to be pre-registered, but due to the exploratory nature of H2 & H3, the study was not pre-registered as planned.

Publication of these results will be pursued in a professional peer-reviewed journal.

Introduction

Physiology is the examination of the workings of the body, including autonomic processes, in an effort to reveal how the body functions and the mechanism that may contribute to human experience. Oftentimes, autonomic activity, recorded by physiological measurements, reveals hidden or unrecognized factors that contribute to more obvious expressions of the body including health and illnesses or psychological states like emotions, stress, and relaxation.

Many psi events occur spontaneously, unconsciously, or unintentionally (e.g. Pratt & Roll, 1957; Rhine, 1961; Feather & Schmicker, 2005; Cardeña, Lynn, & Krippner, 2014), and the mechanisms that lie behind them continue to be a mystery. As researchers continue to mine the research data for greater insight into the working of ESP, PK, and other psi phenomena, a natural extension is to explore the physiology of the body to look for clues into the inner workings of the body and physiological correlates to psi experiences.

The Rhine Bioenergy Lab consists of a dark room with equipment designed to detect very low levels of ultraviolet light emissions or ultra-weak photon emissions (UPE). The room is completely painted black to reduce the effects of any stray light leaks in the room, and within the room is a photomultiplier tube (PMT) that is filtered to detect light in the near-ultraviolet range to the low visible range (wavelengths 200-700 nm). UPE detected in this range near organic matter is recognized as biophotons. Previous studies in the Rhine Bioenergy Lab have produced evidence that an increase in UPE is detected when some people are focusing their intention on a specific task like meditation, martial arts, energy healing, and even the performance of some psi tasks (Joines, Baumann, & Kruth, 2012 – BIAL Project 151/06).

Studies in this lab for over 12 years have produced a standard procedure for measuring UPE emissions during focused intention, including the cooling of the equipment to reduce dark noise, an independent power supply, and the establishment of baseline readings before and after each session. These studies have identified specific participants who are able to reliably increase the number of UPE detected with very significant results (Kruth, 2016).

Despite the intentional variation in UPE observed during times of focus, no information has been recorded to determine if there are physiological correlates to the moments of increased UPE detection. This study examines this question by taking measurements of heart rate, heart rate variability, electrodermal activity, blood flow/vasoconstriction, and skin temperature during sessions in the bioenergy lab. The physiological activity is correlated with the count of photons to determine if there are specific physical states that are present when a person produces a larger quantify of UPEs.

An increase in UPE activity has been demonstrated to be correlated with the activity of energy healers during a healing session, martial artists who are manipulating chi, meditators who are experiencing an increase in kundalini energies, and mediums who claim to be communicating with spirits. Knowledge about the physiology of these people during moments of increased UPE will shed light on the similarities and differences between these practitioners and provide a greater insight on the mechanisms that contribute to these activities.

Previous studies of UPE and physiology

Ultra-weak photon emissions (UPE or biophotons) from organic matter have been observed to be related to health and possibly information transmission is animals and plants since 1925 (Gurwitsch, 1925). Though there is still controversy about the origin of UPE, (Rubik, et al, 2015) the phenomenon is now well established. Examinations of the purpose of UPE are becoming more prevalent (Brouder & Cifra, 2015; Cifra, Brouder, Nervudova, & Kurcera, 2015), and more recent studies have begun to explore the possibility that this light may carry information between cells and even organisms (Popp, 2002; Mayburov, 2012; Tessaro, Dotta, & Persinger, 2019).

Ultra-weak photon emissions have been explored to determine if they can be purposely produced through focused intention (VanWyjk, Bosman, & Ackerman, 2008), and a groundbreaking study from the Rhine Research Center established a relationship between energy healer, martial artists, and meditators and the intentional production of ultraviolet light emissions in a carefully controlled environment (Joines, Baumann,& Kruth, 2012). Subsequent studies by Rubik & Jabs (2017) provided supporting evidence for these findings in explorations of ultraviolet light emissions from practitioners of qi gong, a martial arts practice that claims to produce energetic healing effects.

Psychophysiology and psi have been explored since 1924, but it is only since the 1990s that the equipment has become more accessible to researchers. Recent research looking for physiological correlates to psi are mostly focused on brain activity (EEG) and presentiment or anticipatory events (Radin & Pierce, 2015). Dean (1966) explored correlations between blood flow in participants separated by a distance, and electrodermal activity (Radin, 2004), heart rate (Tressoldi, et al., 2009), and pupillary reactions (Tressoldi, et al., 2010) have been used to detect stimuli response in anticipatory reactions in presentiment studies. Besides studies of EEG activity, a suite of physiological measures of an apparent psi agent have rarely been completed.

The field of psychophysiology continues to explore the relationship of autonomic responses to emotional states and human activities, and some of the major correlates to emotion involve heart rate, heart rate variability, skin temperature, electrodermal activation, and vasoconstriction. These characteristics are related to levels of stress, arousal, relaxation, and activities that evoke the emotional states associated with them.

Burgos, et al. (2016) recommended that metabolites (tissues, cells, etc.) be combined with UPE to develop new methods of healthcare for patients. Rahnama, et al. (2010) explored the relationship between biophotons (UPE) and brain activities. UPE have been explored on the micro level and internally in numerous studies, but no previous studies have examined how human physiology corresponds with changes in UPE during periods of focused intention.

This study examined the physiological correlates with the intentional expression of UPE during moments of focus by selected participants. If UPE are a component of information transfer used in energy healing, expressions of chi, meditative experiences of kundalini, or the performance of PK or other psi activities, finding a correlation between an increase in UPE and physiological states will provide additional information to describe the mechanisms and experiences of these phenomena.

Methodology

Sample

Five selected participants were included in this study because of their previous demonstrated ability to intentionally control the expression of UPE in the Rhine Bioenergy Lab. Each participant completed between 7 and 12 sessions for a combined total of 50 sessions in the lab.

Equipment

All sessions were conducted in the Rhine Bioenergy Lab which consists of a double-darkroom which is a room painted completely black and shielded from outside light contained within another room that is shielded from outside light. The result is a very dark room with nearly no light contamination.

Within the internal darkroom is a photomultiplier tube (PMT) type 56 DVP with PMT housing (Pacific Photometric Instruments Model 62/2F – independently powered and thermoelectrically cooled to near -23 degrees C). The PMT is calibrated to measure light in the near-ultraviolet to visible range (200-780nm) with a peak sensitivity of 380nm. Signals from the PMT are amplified by a Pacific Photometric 3A14 amplifier, and photons are counted by a Thorn EMI GenCom model C-10 photon counter. This information is transferred to a computer in the external darkroom and the number of photons detected is recorded every half second for the duration of an experimental session. Due to careful configuration of this system, the dark noise count is typically measured below 3 photons per second which provides an opportunity to record very small variations in photon measurements during an experimental session.

Physiological factors were measured using a BIOPAC (www.biopac.com) system that included a data acquisition system (MP160U-W), and components to measure respiration (RSP100C), electrocardiogram (ECG100C), electrodermal activity (GSR100C), blood flow/vasoconstriction (PPG100C), and skin temperature (SKT100C). Data from this system was captured by a computer running Acqknowledge software and converted to csv files for analyses.

Procedure

Over a period of six months, five participants completed 50 sessions where they were monitored during periods of focus. Each session included readings of ultra-weak photon emissions (UPE), heart activity (ECG), respiration (RES), blood flow/vasal constriction (FLOW), electrodermal activity (EDA), and skin temperature (TEMP). Calculated values were heart rate per minute (HR), and heart rate variance (HRV). Readings were taken twice each second over a period of at least 20 minutes.

The sessions had three phases which consisted of a minimum of a five-minute baseline period, a ten-minute active period of focus, and a five-minute cooldown period. The readings from the baseline and cooldown periods were combined for analysis to produce a 10-minute period of rest and a 10-minute period of focus.

Table 1

A typical session in the bioenergy lab

Baseline period (at rest)	Active period (focusing)	Cooldown period (at rest)
Approx. 5 minutes (600 readings)	Approx. 10 minutes (1200 readings)	Approx. 5 minutes (600 readings)

Data Preparation

Data was electronically maintained for each factor in each session, and the photon count was also electronically recorded each half-second of each session. The data for each session was combined into a single dataset based on the time synchronization of the data. This enabled an efficient comparison of the data for each moment in each session from each monitoring system.

Analysis
The analyses examined two major areas and in three additional subcomponents. The initial examination of UPE examined a confirmatory hypothesis (H1) which predicted that the selected participants would produce more UPE during periods of focus than they would in periods of rest. The subsequent exploratory analyses examined correlations between physiological activity and the measurements of UPE. The physiological correlations were explored across all of the sessions, across all sessions showing six-sigma differences in UPE, and for each individual session that showed six-sigma differences in UPE readings. The exploratory hypothesis (H2) predicted that there would be correlations between physiological measurements and high readings of UPE.

Results

Ultraweak photon emissions
The bioenergy laboratory measures ultraviolet light emissions (peaking at 380 nanometers) from participants twice a second. All sessions were evaluated to determine whether periods of focus resulted in more photons than periods of rest (H1).

Across all 50 sessions, the photons counted during periods of rest ranged from 0 – 146 photons per half second with a mean of 3.75 photons and a median of 3.00 photons. During active periods of focus, the range was 0 – 1116 photons per half second with a mean of 49.07 photons and a median of 23.00 photons. A Welch Two Sample t-test demonstrated a very significant difference between the samples ($t = -79.28$, $df = 19172$, $p < 2.2e-16$) with a 95% confidence interval.

The first confirmatory hypothesis (H1) was supported across all of the sessions, but a further evaluation was completed for each individual session. Each session was evaluated separately to identify which most clearly demonstrated the difference between photon expression in the resting and active periods.

Because each session includes a large number of individual readings, a small number of large variations in a single session can be lost in a means evaluation. For this reason, each session was also evaluated for the number of readings that crossed a two-sigma and six-sigma threshold as described below.

Two-sigma variations
The mean and standard deviation (SD) of the photon count were calculated for the resting period of each session. A significant threshold was calculated by adding 2SD to the resting mean. The mean plus 2SD demonstrate a two-sigma variation which is unlikely to occur more than 5 times in each 100 readings. The number of readings in each session that exceeded the threshold were counted for both the resting and the active periods. If a single session had at least twice as many significant readings during the active period, that session was considered to demonstrate H1.

For example, if the mean of the photon count for the resting period was 3.50 photons per half second and the SD was 1.25 photons, the significant threshold would be the mean plus 2SD or $3.50 + 2(1.25) = 6.00$ photons per half second. Any photon value above 6.00 would be considered a significant, two-sigma difference. The number of significant photon counts (>6.00) would be tallied in the resting period and the active period. If there were more than twice as many significant values in the active session, that session would be considered to support H1.

Of the 50 sessions, 20 produced at least twice as many two-sigma differences in the active period, showing very strong support for H1. Each of the five participants in the study produced at least one session that supported H1.

Six-sigma variations
In order to provide even stronger support for H1, the threshold value was increased to a six-sigma difference (mean + 6SD) which would be likely to occur less than 3.4 times for every million readings. Sixteen of the 50 sessions demonstrated at least twice as many six-sigma values in the active sessions. These sessions produced the strongest support for H1, and they were used to examine physiological correlations with photon counts.

Defining events
When a session contained a significant, six-sigma variation in photon counts, there would often be a series of significant readings in a short period of time. In order to determine if these readings were associated with changes in physiology, the individual readings were grouped into events. Because autonomic physiological factors typically precede moments of expression, events were defined with five seconds before and after each event. In other words, five seconds of nonsignificant readings were followed by at least one significant reading which was again followed by five seconds without a significant reading.

Table 2
Duration of One Event

Five consecutive seconds of nonsignificant readings	Any number of six-sigma significant readings and fewer than five consecutive seconds of nonsignificant readings	Five consecutive seconds of nonsignificant readings
(5 seconds)	(Indeterminant amount of time)	(5 seconds)

There were 103 six-sigma events in 16 sessions and zero (0) six-sigma events in 34 sessions. The six-sigma events were used for additional physiological analyses.

Physiological correlations
Five physiological factors were examined in each session including heart rate per minute (HR), heart rate variance (HRV), blood flow/vasal constriction (FLOW), electrodermal activity (EDA), and skin temperature (TEMP). Respiration was also measured but was not considered as a potential correlating factor.

All five factors were examined to determine if they were different during periods of focus and periods of rest. The means for each factor was compared across all sessions using a Welch Two Sample t-test.

In the resting state, HR had a mean of 77.73 with a median of 75.12 while in the period of focus, the mean was 84.73 with a median of 82.19. The means were very different ($t = -39.4$, $df = 38407$, $p < 2.2e-16$) indicating that HR increased during periods of focus as might be expected.

In the resting state, HRV had a mean of 0.7884 and a median of 0.7980 while in the period of focus, the mean was 0.7311 and a median of 0.7300. The means were very different ($t = 49.84$, $df = 39415$, $p < 2.2e-16$) indicating that the heart rate (R-R difference) was much more consistent during moments of focus.

In the resting state, FLOW had a mean of 2.079 with a median of 0.001 while in the period of focus, the mean was 1.263 with a median of 0.001. The means were very different ($t = 24.19$, $df = 36675$, $p < 2.2e-16$) indicating that veins became more constricted and blood flow was reduced in the extremities during moments of focus.

In the resting state, EDA had a mean of 0.744 with a median of 0.748 while in the period of focus, the mean was 0.745 with a median of 0.748. There was no significant difference in the means ($t = 0.56$, $df = 38961$, $p = 0.57$).

In the resting state, TEMP had a mean of 92.08 with a median of 92.65 while in the period of focus, the mean was 92.38 with a median of 92.49. The means were very different ($t = -7.69$, $df = 39464$, $p = 1.46e-14$) indicating that skin temperature rose slightly during moments of focus, as might be expected.

Physiology and photon counts for all sessions

All of the physiological factors were compared to the count of photons at each moment during the sessions using the Pearson correlation coefficient. There was a weak correlation between the photon count and HRV across all of the sessions ($r = 0.239$), indicating that when photon counts increase, the heart rate is more consistent.

During the resting period, there were no correlations that were weak or stronger ($r > 0.2$) between the photon count and any of the physiological measurements.

In the active period of focus, there is a weak correlation between FLOW and photon count ($r = -0.256$) indicating that blood flow decreases as photon count increases. Also, in the active period, there is a weak correlation between photon count and HRV ($r = -0.230$) indicating that the heart rate becomes more consistent (R-R period) as the photon counts increases.

Session correlations

Each session that demonstrated very strong, six-sigma photon events was examined in-depth to determine if there were physiological patterns leading up to each event. Blood flow (FLOW), heart rate per minute (HR), heart rate variance (HRV), and skin temperature (TEMP) were all examined, while electrodermal activity (EDA) was not examined since it showed no previous correlation to photon expression.

During events where a six-sigma variation in photon expression was registered, HR increased strongly in 9 of 16 sessions, decreased in 4 sessions, with no change in 3 sessions. HRV decreased strongly in 11 of 16 sessions, only increasing in one session, with no change in 4 sessions. FLOW and TEMP showed no consistent pattern of change in the sessions.

These results support the findings from the analyses across all sessions that an increase in photon counts is correlated with an increased heart rate and more consistency between heart beats (R-R period).

Physiology and arousal
Some of the physiological measurements that are normally associated with arousal are an increased heart-rate (HR), increased respiration (RES), increasing skin temperature (TEMP), and increasing vasal constriction (FLOW). Vasal constriction can produce a higher blood pressure and lower blood flow in the extremities, all components of the physiology of arousal.

In this study, HR and TEMP increased during greater expressions of photons, and FLOW was decreased in the extremities. Though many factors are associated with arousal, stress, and strong emotional experiences, these factors indicate that participants were experiencing an increased state of arousal when the photon counts exceeded the six-sigma threshold. These results provide support for H3, but the complexity of human physiology calls for a more extensive examination of these factors to provide more conclusive evidence.

Conclusions

The first hypothesis was confirmatory, and it was strongly supported by this study. All five participants demonstrated a two-sigma variation in photon counts during the active periods of the session when they were focusing their intention on activities that they described as energy healing, projecting energy from their body, or increasing the light within the room. In 16 of the 50 sessions, a strong, six-sigma variation was recognized during the period of focus, demonstrating that experienced participants can intentionally produce consistent ultraviolet light events through a focus of their intention.

Besides the large changes in photon counts (PC), there were significant differences in their blood flow (FLOW), skin temperature (TEMP), heart rate per minute (HR), and heart rate variance (HRV) during periods of focused activity. HR and TEMP both increased during active periods when FLOW and HRV both decreased. This indicates that periods of focus are characterized by the expected physiological correlates of a faster heart rate and higher skin temperature and that focus also produces a more consistent heart rate with reduced blood flow to the extremities.

The second hypothesis of this study proposed that there would be correlations between physiological activity and ultra-weak photon emissions (UPE). It was found that an increased HR and a more consistent heart rate were strongly correlated with the expression of UPE. This hypothesis was confirmed across all sessions and through a detailed analysis of the 16 sessions that produced the strongest UPE expressions. There was also a weak correlation indicated between a reduced blood flow and UPE expressions.

The third hypothesis proposed that physiological measurements that indicated increased arousal in a participant would be correlated with increased UPE expression. H3 was supported by an increase in HR, TEMP, and reduced blood flow (FLOW) to the extremities when UPE expressions increased. Further explorations of the correlations between physiology and arousal would increase these findings.

If ultraviolet light is produced during moments of high emotion and arousal, it may be a protective mechanism used by the body to adjust to stress or physical challenges. Due to the unique qualities of light, UPE may also carry information that would communicate a stressful situation or the aroused state of the individual. In this study, we included people who were purposely attempting energy healing, deep meditation, and visualizing the production of light. It is possible that UPE are a mechanism to communicate healing intention or provide a sense of relaxation associated with meditation. Through further examinations of the healing effect and UPE, we may find that healing has less to do with energy and more to do with an exchange of information. Furthermore, we may find that people who perform successful healing sessions evoke an aroused physical state to perform these activities which could contribute to the creation of training methods for healers or deep meditations.

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