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# EVALUATION OF ENVIRONMENTAL BIOPHYSICAL PARAMETERS DURING AN EMOTIONAL RELEASE EVENT USING CONTINUOUS MULTIVARIABLE MONITORING WITH PCE-VDL 16I EQUIPMENT

Jonathan Abdiel Calderon Nava<sup>1\*</sup>, Ricardo Javier Ponce Herrera<sup>2</sup>

<sup>1</sup>Graduate in the Faculty of Medicine, University of the Zulia, Maracaibo, Venezuela.

<sup>2</sup>Creator of the Self-healing Emotional and Hekalogia, University Anáhuac of Cancun, Mexico.

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Corresponding Author: Jonathan Abdiel Calderon Nava  
([investigacion@hekalogia.com](mailto:investigacion@hekalogia.com))

## SUMMARY

*To evaluate the stability and variability of environmental biophysical parameters during a Hekalogia event using continuous multivariable recording on October 25 and 26, 2026. An exploratory field study with repeated measurements (pre-during-post) was conducted during a group event within the Hekalogia framework. A PCE-VDL 16I data logger was used to measure acceleration along three axes (X, Y, Z), along with other environmental variables, continuously before, during, and after the event. 72,510 samples per axis were analyzed. Descriptive statistics and stability patterns were calculated. The Z-axis showed values close to gravitational acceleration ( $\approx 0.9$  g), with a low standard deviation (0.0071 g), indicating vertical stability. The X and Y axes showed minimal variations ( $SD < 0.05$  g), suggesting low ambient vibration. The low overall dispersion of the data indicates a stable physical environment without significant disturbances. Conclusion: The results suggest that the environment during the event remained biophysically stable, with variability in acceleration-gravity measurements. These findings provide preliminary evidence of environmental stability in collective interaction contexts, although controlled studies are needed to establish causal associations. No external funding was received.*

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**KEYWORDS:** Ambient Vibration, Gravity, Acceleration, Hekalogia.

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## 1. INTRODUCTION

The study of the physical environment in relation to collective emotional processes represents an emerging area within interdisciplinary research. Traditionally, studies on emotional release have focused on individual psychological and physiological variables; however, the role of the physical environment as a modulator of these experiences has received less attention.

In turn, technological advances in environmental sensors allow for the real-time recording of physical variables, including mechanical vibration, temperature, humidity, and atmospheric pressure. In particular, the measurement of acceleration on three axes using multivariable devices has been widely used in industrial contexts to assess structural stability and vibration. The PCE-VDL 16I is a portable multivariable data logger designed for the continuous measurement of environmental and mechanical parameters. This device integrates sensors capable of simultaneously recording acceleration on three axes (X, Y, Z), as well as environmental variables such as temperature, relative humidity, atmospheric pressure, and illumination (9).

accelerometer system measures vibrations and accelerations up to  $\pm 16$  g, with a maximum sampling frequency of 800 Hz, enabling detailed analysis of the dynamics of the physical environment. The device features internal storage via SD card (up to 32 GB), allowing for the continuous recording of large volumes of data for later analysis.

Furthermore, its compact and portable design facilitates installation in various environments, ensuring stable and reproducible measurements. This type of device is widely used in vibration monitoring, environmental condition analysis, and physical stability studies of dynamic systems.

In group contexts, it is plausible that collective dynamics can be associated with specific patterns of environmental behavior. However, empirical evidence on these interactions is limited. This study aims to evaluate the stability and variability of environmental biophysical parameters during a group emotional release event within the framework of Hekalogia, using continuous acceleration measurements as an indicator of the physical stability of the environment.

### AIM

Evaluate the stability and variability of environmental biophysical parameters during an emotional release event: Hekalogia using continuous multivariable recording on October 25 and 26, 2026 in San Miguel de Allende, Mexico.

## 2. METHODS

An exploratory, field, quasi-experimental study with repeated measures (pre-during-post) was conducted. This design allowed for the recording and analysis of time series of variables before, during, and after the intervention, without direct manipulation of external conditions.

### *Hypothesis pre-established*

It is hypothesized that during a collective emotional release event, no significant variations occur in the environmental biophysical parameters measured by accelerometry. multi-axis, maintaining a stable pattern in acceleration measurements.

### *Size of the Sample*

The analysis was based on a total of 72,510 acceleration records for each axis (X, Y, Z), obtained through continuous monitoring during the study period. This sample size corresponds to the number of environmental measurements recorded, providing high temporal resolution and statistical accuracy in the signal characterization. The event was held with approximately 100 participants, which is considered part of the context of the evaluated environment, but not as a unit of statistical analysis.

### *Criteria of Inclusion*

- Continuous recording of environmental data using the PCE-VDL 16I device during the event.
- Complete measurements on all three acceleration axes (X, Y, Z).
- Registration periods that include the pre-event, during-event, and post-event phases.
- Stable measurement conditions, with the device correctly installed and without direct external mechanical interference.

### *Criteria of Exclusion*

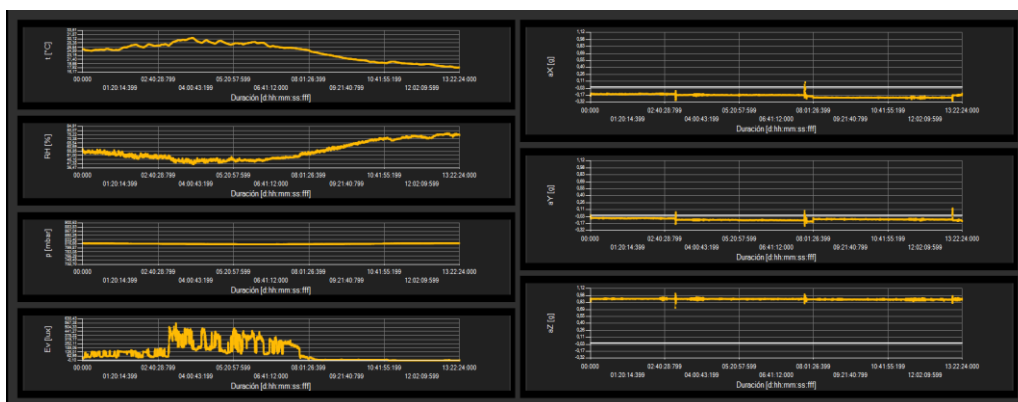
- Incomplete or missing data records on any of the acceleration axes.
- Interruptions in continuous monitoring during the study period.
- Presence of external interferences that may alter the measurement (device movement, physical contact, external vibrations unrelated to the event environment).
- Technical failures of the equipment or calibration errors during recording.

### *Variables Controlled*

In order to minimize the influence of external

factors on ambient acceleration measurements, the following variables were standardized:

1. Device location:
  - The PCE-VDL 16I recorder was placed in a fixed and stable position.
  - Standardized height between 1 meter above ground level.
  - Central location within the event space.
2. Physical environment conditions
  - Open space with controlled access.
  - Lighting, ventilation and space layout kept constant during the recording.
  - Absence of machinery or external sources of significant mechanical vibration.
3. Sensor installation conditions
  - Device previously calibrated according to manufacturer's specifications.
  - Stable fixation to prevent movement or displacement during measurement.
  - Without direct contact with moving or unstable surfaces.
4. Measurement conditions
  - Continuous recording without interruptions during the pre, during and post event phases.
  - Constant sampling frequency throughout the study period.
5. External environmental factors
  - Monitoring during a period without relevant external events (heavy traffic, construction, structural vibrations).
  - Recorded under stable weather conditions.
6. Interaction with the device
  - Equipment manipulation was avoided during recording
  - Restricted access to the measurement area to avoid direct interference.



**GRAPHIC # 1 PCE-VDL 16i Equipment Measurement Image:**

The Z-axis showed values close to gravitational acceleration ( $\approx 0.9$  g), with a low standard deviation

## PROSECUTION

The data obtained from the PCE-VDL 16I multivariable recorder were exported in digital format and processed using descriptive and exploratory statistical analysis. A total of 72,510 samples were analyzed for each acceleration axis (X, Y, Z), allowing for a robust characterization of the environment dynamics during the study period.

For each axis, the following were calculated:

- Mean (average value)
- Standard deviation (variability)
- Minimum and maximum values (range)
- Variance
- Standard error of the mean

A PCE-VDL 16I multivariable data logger was used, a device capable of continuously and simultaneously measuring vibration (RMS acceleration in  $m/s^2$ ), temperature ( $^{\circ}C$ ), relative humidity (%), atmospheric pressure (hPa), and illumination (lux). The equipment was previously calibrated according to the manufacturer's recommendations and placed in a standard position within the room (approximately 1 meter above the floor, at a uniform distance from the center of the space, and free from contact with unstable surfaces). During the emotional self-healing event with 100 participants, 72,510 samples per axis were recorded using the PCE-VDL 16I.

## MATERIALS

- Equipment of PCE-VDL 16I, serial # 2024070202.
- Protocol of self healing emotional:
- Withdrawal structured (22 hours in-person, distributed in two days consecutive, with a schedule from 10:00 to 21:00 with three daily stages).

## 3. RESULTS

(0.0071 g), indicating vertical stability. The X and Y axes showed minimal variations ( $SD < 0.05$  g),

suggesting low ambient vibration. The low overall dispersion of the data indicates a stable physical environment without significant disturbances. In the measurement performed with the PCE-VDL 161 device during the emotional self-healing event with 100 participants, 72,510 samples were recorded per axis. The results show a pattern of vibrational stability in the environment, described as follows:

**Z-axis:**

- Average: 0.9042 g
- Standard deviation: 0.0071 g
- Range: 0.7266 – 1.0195 g

**X-axis:**

- Average: -0.1834 g
- Standard deviation: 0.0310 g
- Range: -0.2891 – 0.0938 g

**Y-axis:**

- Average: -0.0861 g
- Standard deviation: 0.0164 g
- Range: -0.2188 – 0.1406 g

The results showed that the Z-axis exhibited values close to gravitational acceleration ( $\approx 0.9$  g), while the X and Y axes remained close to zero, consistent with a stable device orientation. The standard deviation across all three axes was low (X: 0.0310 g; Y: 0.0164 g; Z: 0.0071 g), indicating low data dispersion and, therefore, a high degree of measurement stability.

The stability of the environment was assessed by:

- Magnitude of the standard deviation
- Absence of extreme peaks in maximum values
- Consistency of the mean over time

The observed values ( $<0.05$  g on all axes) are consistent with low vibration conditions, according to standards used in mechanical vibration analysis. Signal variability was assessed by measuring the dispersion of the data around the mean. The low variance observed on all three axes confirms that fluctuations were minimal and homogeneous throughout the recording period.

A visual analysis of the time series was performed to identify potential changes between the pre-event, event, and post-event phases. No abrupt changes or significant variations were observed between phases, suggesting continuity of environmental stability throughout the event. The 95% confidence intervals were narrow on all axes, reflecting consistency in the measurements. Overall, the results indicate a stable signal, with no evidence of significant disturbances in the physical environment during the measurement period. The results show a pattern of vibrational stability in the environment.

#### 4. DISCUSSION

This study evaluated the stability of

environmental biophysical parameters using multi-axis acceleration measurements during a Hekalogia group event held on October 25 and 26, 2026, with 100 participants. The measurements showed low variability and an absence of significant mechanical disturbances. These findings are consistent with recent literature describing the behavior of accelerometric sensors under rest conditions and in stable environments.

The results suggest that the collective practice of emotional self-healing developed in an environment with high vibrational stability, which can be interpreted as a reduction in environmental variability and an increase in group energetic coherence. This study also discovers the importance of the emotional release validated by the Hekalogía in the science medical in the present.

In contemporary studies, acceleration sensors have been widely used to characterize physical and behavioral states in real-world contexts. For example, recent research has shown that accelerometer data can distinguish activity levels and physiological states with high sensitivity, particularly in natural environments (1). In this respect, the low variability observed in our study is consistent with recordings made under conditions of low mechanical activity.

Furthermore, research in work environments has shown that continuous measurements of physiological and environmental variables under real-world conditions exhibit less variability than in controlled experimental settings, suggesting that natural systems tend to maintain stable states when disruptive stimuli are absent (2). This pattern aligns with the observed results, where no abrupt spikes or significant changes in the signal were detected.

From the perspective of the relationship between the physical environment and human processes, recent studies have shown that physiological variables such as heart rate variability (HRV) can reflect emotional states and their interaction with the environment (3). Although the present study did not directly measure physiological variables, the observed environmental stability could be interpreted as a non-disturbing physical context, potentially favorable for emotional regulation processes.

More recent research has explored the relationship between emotional states and physiological patterns, finding that positive emotions are associated with greater stability in biological signals and less dispersion in the data (4). Similarly, in our study, the low variability of the environmental signal could reflect a stable physical environment during the event.

On the other hand, studies on biofeedback and emotional regulation have shown that interventions aimed at self-regulation produce measurable effects on physiological variables, including stress reduction and greater autonomic stability (5). Although these studies focus on biological variables, they suggest that collective processes could develop under stable environmental conditions, as observed in our results.

In the field of sensors and portable systems, recent research has highlighted the importance of sensor stability and reduced signal noise for obtaining reliable measurements (6). In this study, the low standard deviation on all three axes confirms high signal quality and adequate device stability during recording.

Furthermore, engineering studies have established that acceleration values with standard deviations below 0.05 g are indicative of low vibration conditions, which are associated with physically stable environments. The results obtained on the three axes (X, Y, Z) meet this criterion, reinforcing the interpretation of environmental stability.

Recent research on human-environment interaction has shown that environmental variables such as temperature and physical conditions can influence physiological states, including heart rate variability and the perception of comfort (7). This suggests that the stability of the physical environment could play a relevant role in collective experience.

Similarly, studies combining accelerometry and physiological variables have shown that movement and environmental stability influence the quality of measurements and data interpretation. In this context, the absence of disturbances in our study allows for more reliable interpretation of the results.

Finally, research on continuous monitoring has shown that complex systems, including human environments, can maintain states of dynamic stability characterized by low variability and high temporal coherence, especially in the absence of disruptive external stimuli (8). This behavior is consistent with the patterns observed in the present study.

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## 5. ETHICAL CONSIDERATIONS

The study was non-invasive and limited to the measurement of environmental variables. Participant confidentiality was guaranteed, and informed consent was obtained for the measurements to be taken in the context of the event.

## 6. CONCLUSION

Hekalogía event, the environmental biophysical parameters – monitored by accelerometry Multiaxis measurements remained within low variability ranges, with no evidence of significant mechanical disturbances. In this regard, the standard deviations observed on all three axes were consistently below  $ag$ ; this value is indicative of stable physical conditions, according to the criteria established in vibration analysis standards.

Consequently, these findings suggest that the event's development is not associated with significant alterations in the stability of the physical environment. This supports the existence of an optimal environmental safety profile, in terms of mechanical vibration control, during its execution.

From an exploratory perspective, the stability observed in the measurements could be interpreted as the creation of a non-disturbing physical environment, which would be potentially favorable for processes of collective emotional release. While this study does not directly evaluate neurophysiological variables or states of consciousness, the consistency and low variability of the environmental signal allow us to hypothesize that this type of context facilitates conditions conducive to subjective experiences of well-being or group coherence.

However, these interpretations should be taken with caution. Future studies integrating simultaneous measurements of physiological, psychological, and environmental variables, under controlled experimental designs, are needed to accurately explore the correlation between the stability of the physical environment and the internal states of the participants.

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