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How Do End-Users Really Feel About Our Mediated Messages?: Using Technology to Move Past Self-Report Data

Stephen J McNeill[1]*

Emma Bishop[1]

[1]Department of Science, Kennesaw State University, United States

*Email: smcneil2@kennesaw.edu

Abstract

Galvanic Skin Response (GSR) technology allows users to monitor their response to stress while engaged in various tasks. The PIP, from Galvanic, Inc., is an integrated Bluetooth app that can measure stress levels and relaxation in a closed-loop system. Moreover, PIP's diverse apps offer competition and gamification of the users' relaxation levels, as one can learn to adapt behavior to achieve desired performance. This paper discusses the gamification of meditation and mindset, with specific concern for PIP's various mobile learning uses when incorporating the device in K-12 and higher education schools and universities in the United States; corporate wellness; Public Relations research, theory testing, and work with corporate partners. The paper considers the applications of the PIP system, informed by original PIP case studies, including client campaigns and fear appeal research.

Keywords: Electrodermal activity monitoring, cognitive neurorehabilitation, biometric user interfaces, galvanic skin response, health and gaming

Introduction

Electrodermal activity monitoring (EAM) is not new. EAM is often referred to as Galvanic Skin Response (GSR). It has numerous uses; in grades K-12, it can be used to promote mindfulness; in marketing and corporate work environments, one can use EAM to measure consumer behavior. Indeed, Hutcherson (2015) indicated that "Electrodermal activity is the most sensitive physiological indicator of events in consumer behavior." The technology reduces the need to administer self-reporting mechanisms among employees when analyzing corporate wellness.

EAM technology is now being deployed via Bluetooth apps. In essence, companies are using old technology (Bluetooth and EAM) in novel ways. Indeed, EAM uses similar sensors and tracking that were developed in the mid-twentieth century, historically dubbed galvanic skin response (GSR) – at this juncture, the two are synonyms. EAM

uses perspiration or another activity on the skin to measure mindset, usually indicating either relaxation or stress.

The PIP, from Galvanic, Inc., is an integrated Bluetooth app that can measure stress levels and relaxation in a closed-loop system. Moreover, PIP's diverse apps offer competition and gamification of the users' relaxation levels; via such gamification, one can learn to adapt behavior to achieve desired performance. This paper examines the PIP and its variety of applications within scholastic, corporate wellness, research, and theory testing environments. The methodology for the discussion is straightforward.

Methodology

The current work and discussion were preceded by three forms of sources and research on the part of the authors: secondary source analysis (literature review), case study analysis (focused literature review), and real-time demonstrations. The authors surveyed available literature, refined the literature for focused review, observed real-time demonstrations, and finally offered a presentation on the technology that included a live demonstration. The current work is an adaptation of that presentation.

Discussion

The PIP is an elaboration on extant technologies that have sought to quantify the self. Exercise trackers like Basis and BodyMedia have already deployed GSR metrics. They track physical exertion, with the assumption that humans sweating more indicates working harder. However, the PIP expands on the quantification of self toward quantifying the mind. The PIP is one of several new mindfulness programs. Its system features hardware and software – at their core a small, thumb-sized device that connects to associated apps on a designated smart device at a sample rate of 8hz per second. It features a closed-loop system to measure electrodermal activity with a 2-minute default measurement that can be extended for longer periods.

The closed-loop system importantly differs from an open-loop system. In an open loop system, one may monitor GSR via polygraph when performing a task. When an event occurs in the GSR, it is difficult to specify the cause, such as whether it was a direct result of the task or something else. The PIP is an example of a closed-loop biofeedback system. The goal of biofeedback is for the user to gain conscious control over an ordinarily unconscious biometric under the power of the autonomic nervous system. In using the PIP, the app asks the user to relax before providing sensory feedback via GSR. The feedback is recorded in a historical log, which allows one to track data over days, months, or even years. As one learns to control one's GSR while consciously trying to relax, one may induce a non-aroused physiological state associated with a form of relaxation.

This relaxation is difficult to encourage, so the PIP's layout appears to be designed to be minimalist and avoids distraction, catering to user experience. The only hardware

involved is a thumb-sized sensor. The system uses a proprietary algorithm to translate data collected by the sensor and make it presentable to the user. The user may access all interfaces through Bluetooth and smart devices, but one can also access one's history and statistics through standard personal computers. Unfortunately, from a data analytics perspective, the oversimplification of data could prove to be a limitation.

The PIP employs a menagerie of apps for different purposes toward the goal of quantifying the mind and gamifying mindset. PIP Stress Tracker and Session Views offer charted data that offer visualization of the user's activities. The Loom shows weather patterns and other phenomena that affect mindfulness. Clarity performs the role of the actual meditation app, offering guided and unguided meditation complete with sounds that maintain, increase, or decrease based on relaxation levels. Different natural scenes and scenarios accompany these sounds. Furthermore, Clarity's weather and sound effects are customizable to the need of the user, as waves may stress one person out while relaxing another, who may prefer rain or the sound of wind or birds. Finally, the Dashboard is available to corporate users and allows one to view aggregate data of, for example, a class or workforce. One of the more overt gamification efforts is the Relax and Race app, where users "win" races by deeply relaxing – this app has already been used in K-12 schools as a means of gamification of mindfulness, successfully helping children develop techniques to control stress levels.

Discussion and Analysis

The PIP harnesses EAM in ways that may apply in a variety of circumstances and benefit several fields. In some cases, the PIP has already been effective in its application. Some primary areas in which the PIP system shows significant promise include education, corporate wellness, research, and theory testing.

Studies have been undertaken to examine the PIP's use among K-12 and higher education schools and universities in the United States, such as that conducted by the National Center on Time and Learning. Within education, the field of communication may benefit from examining how students might be communicating in K-12 schools, including the methods of receiving our messages and how those messages are making them feel. The Relax and Race app, for example, has been adapted to function for grade-school students in school. Children in North America are known to favor video games, but few are even aware of meditation as a practice, let alone a beneficial addition to a daily routine. The app combines the two, gamifying the process so that children must practice mindfulness to win races. While most games induce stress, this app rewards relaxation.

This would be highly appropriate for application by administrators or people who are trying to communicate with this age group because it would allow such third parties to quantify and track stress levels among students and create methodology or policies

accordingly. For example, one could use collected data to examine whether students are more relaxed after being at school for an hour once having had time to adjust or to examine whether having announcements first thing in the morning, when stress is at a high, may distract from information absorption as students are busy trying to acclimate. Likewise, information at the end of the day may be poorly absorbed while students are anticipating leaving school. This means that the use of the app would have, at least, a two-fold benefit: allowing them to help themselves learn how to manage their stress while also offering evidence-based policy construction.

Strong policies are at the core of successful corporations. As a protection against liability, corporations pursue corporate wellness policies within which the PIP system could innovate. Analyzing employees' responses to different tasks at different times in aggregate data may allow the creation of strong corporate wellness strategies, but just as the PIP can benefit students, employees would also have access to coping and mitigating tools through the PIP. This would not only allow the refinement of stress reduction but also improve communication in a given corporate environment, thereby likewise increasing the effectiveness and efficiency of the organization.

Most organizations rely on one form of research or another, including schools and corporations; the PIP has significant practical potential within research methodology when it comes to collecting data on human behavior and its effects. This might include public relations, consumer behavior, and a host of other sectors; for this reason, corporate partners also stand to benefit substantially from investing in applications of the system.

There is potential to develop better data sets for moving forward in crafting strategic messages, but especially fear appeal. For example, under-consuming calories or nutrients in the morning may lead to poor outcomes in-class evaluations, resulting in substantial stress; the PIP has the potential to track these correlative results, then allow an analyzer to provide recommendations to address the initial source of the stress, traced back a few steps. A study in Boston examined a K-12 program for two years, measuring physiological engagement with functional magnetic resonance imaging and GSR to determine correlations between each measure and develop a scale that differentiates degrees or levels of engagement. This has broad applications, from K-12 to college, the corporate world, and into the consumer market.

The PIP system, while perhaps broad in its adaptability, also has distinct advantages over traditionally applied EAM, particularly in its potential to eliminate the need for self-reporting. Self-reporting is the least reliable means of data collection, so exercise trackers like BodyMedia or Basis, which use GSR metrics to track physical exertion, are quite different from the subject of meditation or mindset. These trackers fail to include context; for example, the assumption that sweating means one is working harder may entirely elide the GSR measurements of an individual whose hands are sweating due to being interrogated by police, or who may be public speaking. The

purpose of the PIP is to measure and quantify mindfulness, rather than track physical exertion. It is not a replacement for the latter, but rather a complement to it.

The PIP as a proprietary system has other advantages over commercially available devices. There are eight Hertz of a pre-programmed algorithm designed to measure the skin on the thumb and forefinger as it relates to stress level or relaxation; more importantly, the PIP is a closed-loop system that includes hardware and software optimized to work together. Indeed, this unification is relatively unique, as apps and devices are often disparate and collaborate poorly or in a very limited fashion. The data generated by the PIP, unlike many other systems, is also fully exportable, making it a strong tool of data collection for organizations or even for people interested in maintaining a record of mindfulness following the end of life of a device.

Conclusions

The PIP poses a host of new ways to collect mindfulness and stress data both at the individual and group levels, while effectively gamifying mindfulness and meditation. Its apps and device are user-focused and easy to use; some, like Loom, are non-linguistic, which means they are highly appropriate for international use as well with very little adaptation effort. The developers of the PIP intuited the need for corporate users to view aggregate data, which simultaneously makes the PIP a strong candidate for research in fields such as education, corporate wellness, and theory testing.

The PIP is easy to use and simple to deploy, perhaps leading to less user error and certainly limiting self-reporting, which means more complete data and less data corruption. The simplicity of the data makes it highly consumable at the individual level, or at the corporate teams or workplace levels where an employer could choose to make workplace policy based on data results. Indeed, the collected data is fully exportable, making it even more usable. However, the simplicity of the data itself is perhaps the PIP's greatest limitation when it comes to technical research, or for those individuals who require in-depth data.

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