

Positive Technology Improves Health and Well-Being

“To enjoy good health, to bring true happiness to one's family, to bring peace to all, one must first discipline and control one's own mind.”

—Buddha

▶ By Brenda K. Wiederhold & Mark D. Wiederhold

In exploring the deepest meaning of this quote, some definitions are in order. Thefreedictionary.com defines health as “a relative state in which one is able to function well physically, mentally, socially, and spiritually in order to express the full range of one's unique potentialities within the environment in which one is living.”

But what is the definition of happiness? Philosophy has identified two different meanings for happiness: 1) a state of mind (life satisfaction, pleasure, or a positive emotional condition), or 2) a life that goes well for the person leading it. To elucidate further this second meaning, “Happiness in this sense concerns what benefits a person, is good for her, makes her better off, serves her interests, or is desirable for her for her sake (well-being).”

This leads us to the question: What is well-being? There are three different theories of well-being according to Parfit: hedonism, desire theories, and objective list theories. Hedonism and desire theories are subjective approaches, with well-being grounded in the individual's subjective states. Objective list theories take an impartial approach, holding that there are some things that benefit us independent of our attitudes or feelings.

According to Riva and colleagues, these philosophical traditions have influenced psychological reflections about well-being. Specifically, in positive psychology (PP) we can find two different conceptions of well-being, namely “subjective well-being” (also called “hedonic well-being”) and “psychological well-being” (also called “eudaimonic well-being”). In addition to these two forms of individual well-being, social and interpersonal well-being is important to the smooth functioning of individuals' lives within their communities and organizations. In this review, we will use these three constructs—hedonic, eudaimonic, and social and interpersonal—to explore the influence of positive technology on our lives.

Hedonic Technologies

Hedonic technologies are those that we use to foster positive emotional states and pleasant experiences. The feeling of hedonism is associated with the mental states of excitement, relaxation, and happiness. In the hedonic approach, happiness is dependent on the amount of time one is in a predominantly positive emotional state, based on the individual's subjective experience.

European and U.S. projects have begun to capture this aspect of positive technology (PT). The EMMA (Engaging Media for Mental Health Applications) Project called Emotional Parks, combines mood induction procedures (MIPs) with virtual reality (VR) to produce positive emotions. Botella's team also developed a mood device called the Butler System, which is an online health system designed to improve the lives of elderly people: For example, one of its virtual environments presents the image of a park and nature.

What is positive technology?

Positive psychology (PP) can be defined as the scientific study of human functioning. A tool of PP is positive technology, which can be defined as the scientific approach to using technology to enhance human functioning. PP may have had its official birth in 1998 but the roots of PP date back at least to the concept of “healthy mindedness” at the beginning of the 20th century.

Riva's team developed a mood device using VR called Relaxation Island, which aims to support established relaxation techniques as part of interventions for specific anxieties such as examination stress. VR environments developed by the Wiederholds are being used in Iraq, Afghanistan, and U.S. military facilities to help service members practice combat breathing and reduce post-combat stress. Most recently, Repetto and colleagues showed that use of a campfire, beach, or waterfall VR environment on a mobile phone could significantly reduce anxiety in individuals with generalized anxiety disorder.

Using media created from familiar voices, family photos, and detailed patient histories, technology-assisted reminiscence creates happy moments in the lives of people with dementia. "John had advanced dementia and was very withdrawn, which made it difficult to interact and connect with him. Researching his life, we discovered he played football for a Big Ten school in the 1940s. By showing him pictures of the school's team and playing the school's

that all is well, may be measured by heart rate variability using one of several affordable, portable monitors such as emWave. To help people gain such temporary detachment and generate positive emotions, VR environments are available as smartphone applications.

Eudaimonic Technologies

We use eudaimonic technologies to heal ourselves in order to gain self-realization and self-actualization to reach a positive emotional state. Acting in accord with or realizing one's true self produces the eudaimonic aspect of happiness.

For example, although group therapy is a technique that can be empowering to some who are struggling to help themselves, it's not for everyone. Eudaimonic technologies fill the gap for those who are unable to reach positive estimations about themselves within a group environment. Some researchers believe that by constructing a system in which people can address their emotional turmoil or distress them-

using these introverted technologies our external feelings and thought processes may progress with persistent improvement. Recent evidence has demonstrated that positive emotions and the erosion of negative feelings can potentially lead to a positive emotional state. What eudaimonic technologies teach us is that we are sometimes able to attain that state by ourselves. Recent examples include the application called EARTH (Emotional Activities Related to Health), which within the framework of the MARS500 research project (www.esa.int/esaMI/Mars500/) is designed to help astronauts in a future mission to Mars. This project funded by Ministerio de Innovacion y Ciencia includes virtual reality MIPs and an application called the Book of Life, which includes several chapters that focus on significant events of one's life experiences and also one's future plans. Each chapter is designed to focus on people's psychological strengths. A range of media is used such as images, videos, and even personalized elements. After the user's positive ambitions have been recorded, the user is able to play them back and enjoy them at any time. To boost resiliency, Wiederhold and Wiederhold have been working with elite athletes and medical and military personnel in order to enhance and solidify their strong skill sets.

Self-actualization virtual environments are designed for children, too. For example, researchers designed an anti-bullying virtual intervention called FEAR NOT to enhance the coping skills of victimized children or children at risk for victimization. In a randomized clinical trial of this intervention enrolling 1,029 nine-year-old children in the U.K. and Germany, the researchers found a dose-response between time spent in the virtual learning environment and ability to escape bullying. Subsample analysis found a significant effect for U.K. children.

What eudaimonic technologies are moving from the lab to retail shelves? A recent evaluation of assistive technologies designed to enhance the quality of life and preserve independence for veterans returning from Iraq and Afghanistan identified eight technologies useful in assisting those with sensory, cognitive, and physical dis-

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'fight song,' John engaged in limited conversation and would sing part of the song. This made him happy, and it easier for others to relate to him."

Some technologies are moving from the research lab to become commercial products available to the public. For example, physiological effects of temporarily detaching from a stressful situation and taking a moment to generate a feeling in the chest

oneselves, a more individualized, progressive approach to emotional recognition and stability may result.

Eudaimonic technologies focus on self-well-being and the conclusions one can come to by oneself about one's mental stability, progress, and mood. Our internal feelings have a profound effect upon the ways in which we perceive ourselves as persons, and some thinkers have discovered that by

abilities. Among these were readily available technologies such as the Wii, for cognitive fitness.

Social and Interpersonal Level Technologies

Finally, social and interpersonal level technologies are designed to improve what can be called the connectedness between individuals, groups, and organizations. The social and interpersonal level of PT concerns itself with the notion that individual happiness and positive notions may also need to be understood in the context of others. It is in this context that the term positive computing (PC) arises, as PC is the notion that the study and development of technologies are designed to support well-being, wisdom, and human development.

For example, Morris has recently described how social networking and PC technologies can be used to help reduce feelings of social isolation and depression in older individuals. Sensor data measuring phone calls and visits are used to derive public displays of social interactions with relatives and friends, which are introduced into selected elders' homes. These ambient displays, which reflect data on remote and face-to-face interaction gathered by wireless sensor networks, are intended to raise awareness of social connectedness as a dynamic and controllable aspect of well-being. According to findings, this strategy was effective in reducing the feeling of social isolation of elderly users.

At this writing, Facebook has 955 million—nearly one billion—users worldwide. Although this may appear to be just a number, it is in fact a measure of its great popularity and power in affecting the emotions of others. Positive characteristics (such as gratitude, flexibility, and positive emotions) can uniquely predict disorders beyond the predictive power of the presence of negative characteristics, and buffer the impact of negative life events, potentially preventing the development of a disorder. While individual decisions for using these websites vary, it is clear that they offer some kind of positive emotional stim-

ulation to integrate into individuals' lives—something that can be classified as a positive technological measure to improve people's well-being.

One study of 391 college students published last year suggests that the number of Facebook friends and positive self-presentation may enhance users' subjective well-being. Furthermore, honest self-presentation may enhance happiness rooted in social support provided by Facebook friends. An earlier study showed that 1,715 Texas college students joined Facebook Groups to obtain information about on- and off-campus activities, socialize with friends, seek self-status, and find entertainment. An important social result was that active Facebook Group users were more likely to participate in offline civic and political activities.

This leads us to briefly explore the boundless potential that is just beginning to be tapped: The use of social PT to advance humanity's health and well-being. For example, so-called "citizen scientists" formulated a structure for a key enzyme related to the development of the AIDS virus by using FoldIt, an online game in which volunteers can shake, wiggle, or pull apart different pieces of a protein molecule (<http://fold.it/portal/>). It took these gamers a mere two years to crack a code that had eluded scientists.

Such "crowdsourced" solutions have the potential to allow governments to redirect funding to promote such creativity, with potential cost savings (read: slower rise in taxes) as a payoff. What, then, is the appropriate role of government in researching and promoting PT?

Role of Government

Life satisfaction or well-being is currently a hot topic in both psychology and economics. In 2006, Christensen and colleagues analyzed World Health Organization data to create a global view of well-being. It turns out that Denmark is the happiest nation; the U.S. ranks 23rd. A nation's health levels were most closely associated with happiness, followed by

gross domestic product and education. Qualitative research conducted in 2011 by the European Commission in eight countries put the economy first, followed by society and community as the most important determinants of well-being. While these measures of happiness are not perfect, they are the best we have so far. Politicians are talking of using them to measure the relative performance of each country and changes in its happiness.

Governments are beginning to make investments in preventive and integrative health, but only a small percentage is devoted to these technologies compared to those that treat disease. Despite the fact that creating and maintaining social relationships is considered a major indicator of well-being and a protective factor for health, Western society is characterized by increasing levels of loneliness and lack of social integration. The need for social integration is higher in specific social groups, such as adolescents, disabled people, and older people. As a consequence, there is increasing interest in supporting mental health and rehabilitation programs aimed at overcoming social isolation. Information and communication technologies (ICT) can play a key role in improving these programs, and governments can create ICT programs to fund the most promising PT research.

Future Directions

Positive psychology and adjunctive positive technology are essential components of prevention and treatment of disease and enhancement of well-being. As a way to foster positive emotions, positive technology has a bright future, regardless of whether, as some predict positive psychology is subsumed and integrated into psychology as a whole.

The future use of PT is essential to our understanding of the self, with the technological world we are involved in and the obvious role that the Internet plays in our daily lives – on our laptops, tablets, and phones. All three elements—hedonic positive technology, eudemonic positive technology, and social and interpersonal positive technol-

ogy—improve the quality of the lives of individuals in Europe and the U.S. It is therefore very important that we continue our research in the field, as it is essential that we are constantly examining the obvious positive impacts that these technologies have on the lives of our citizens.

As proof, researchers concluded in a new study that “Positive attributes are associated with improved cardiac outcomes, and this connection is likely mediated by both behavioral and physiologic factors. Positive psychology and related interventions may represent a means by which positive states and strengths of character can be cultivated in patients with—or at risk for—cardiac disease.”

In addition, a recent study showed that a large sample of adolescents and young adults who report higher positive affect or higher life satisfaction grow up to earn significantly higher levels of income. This suggests a strong possibility for reverse causality between income and happiness, highlights the importance of an emotionally stable and positive upbringing for children, and submits that policy makers’ investment in promoting well-being will yield positive economic effects.

Through the use of positive technology, we can learn to control our minds, with the consequence of improved health and happiness. As the citizens of our countries espouse these practices, we are able to

step more lightly on the Buddha’s path “to bring peace to all.”

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Human Computer Confluence Applied in Healthcare and Rehabilitation

“The confluence between computers and humans has opened new ways to improve the quality of life of people, whether it is by providing new diagnostic tools, or developing innovative therapeutic approaches, improving and accelerating the rehabilitation process of the patients.”

► **By Isabelle Viaud-Delmon et al.**

Nowadays, technological improvements have changed the way that people communicate, sense and interact. Undoubtedly, these technological improvements

have increased our capacities to understand the human brain and provided new ways to envisage healthcare.

A stronger integration between humans and technology represents an incredible

opportunity to investigate human behaviour and analyze all the potentialities and advantages when used in the field of healthcare and rehabilitation.

The confluence between computers and human has opened new ways to improve