Emerging Technology in Positive Psychology

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Abstract. Technological advances are providing the field of positive psychology with new means with which to potentially enhance well-being. Emerging interventions – such as those from psychopharmacology, noninvasive brain stimulation, apps, big-data computational linguistic analysis of social media, and virtual reality – often diverge in various ways from the primarily cognitive and psychosocial interventions more common in the extant positive psychology literature. This paper describes several of these emerging technologies and considers the effects that they may come to have on the science of well-being, and recommends that positive psychology discourse expand to more fully integrate biopsychosocial aspects of well-being.

Keywords: Positive psychology · Well-being · Enhancement
Psychopharmacology · Noninvasive brain stimulation · Linguistic analysis
Virtual reality · Mental health

1 Introduction

Sociological and historical factors can influence the approaches utilized by a field of research, especially in its early development – and positive psychology is no exception. Despite the adoption of findings and interventions from positive psychology across fields like neuroscience [1] and the humanities [2], positive psychology remains rooted largely in the perspective of cognitive psychology. Martin Seligman, one of the field's founders, was a major figure in the cognitive revolution and is heavily influenced by Aaron Beck, developer of cognitive therapy [3]. While positive psychology has been primarily discussed as a research approach to happiness and well-being that uses rigorous quantitative methods, the theoretical influence of cognitive psychology in positive psychology has been a less explored, yet influential factor in the inception and development of the field.

Accordingly, most positive interventions target cognitive processes, generally through psychosocial interventions [4]. Furthermore, the administration of these interventions typically takes place in face-to-face settings in which a therapist, coach, or trainer conveys information and facilitates evidence-based activities. Examples of this psychosocial, in-person delivery paradigm include University of Pennsylvania programs like Comprehensive Soldier Fitness [5] to prevent mental disorders in soldiers in the US Army, and the Penn Resiliency Program [6] to prevent depressive symptoms in school children. These psychosocial and largely cognitive-based

intervention programs delivered by in-person trainers have been moderately successful, with reliable well-being enhancements that are relatively small in magnitude.

New technologies, however, are creating novel avenues through which to test and apply well-being interventions. These methods will stretch the field of positive psychology beyond cognitive-based, in-person, psychosocial interventions to include technological advances in biotechnology and information technology. One way to organize these emerging technologies in positive psychology is by using the biopsychoscocial model, widely used in clinical contexts, which acknowledges the influences of biological (e.g. brain mechanisms), psychological (e.g. cognitive processes and emotions), and social (e.g. interpersonal support system) factors on mental health. In this paper, the biopsychosocial model organizes brief reviews of several emerging technologies – psychopharmacology, noninvasive brain stimulation, apps, big-data computational linguistic analysis of social media, and virtual reality – with immediate relevance to research and application in positive psychology. In some cases, these technologies might target cognitive mechanisms directly, whereas others might manipulate biological mechanisms with possible concomitant cognitive changes along with outcome measures of well-being. This paper argues that the field of positive psychology could benefit from more integration of biopsychosocial influences on well-being, especially as several emerging technologies in these categories become more accessible and widely used.

2 Biological

The paucity of mentions of biological research in positive psychology likely springs from superficial distinctions between academic fields, as the cognitive psychology approach tends to focus on non-pharmacological or biological factors. But researchers in the fields of pharmacology and neuroscience have been working on the topic of well-being and, more generally, mental enhancement, for decades [7]. This work is just beginning to become integrated into positive psychology research and discourse.

As for psychopharmacology, there have been several attempts to enhance happiness, usually as an adjunct to the goal of reducing depression and anxiety and often couched in terms of "quality of life." The use of fluoxetine, for example, has at times been described as going beyond meliorating symptoms of depression to enhancing well-being relevant traits, like sociability [8] – though this remains a controversial claim – and it is not clear what specific traits are amenable to alteration from this medication. In any case, psychopharmaceuticals have not been approved by federal regulatory agencies as a means to enhance well-being through prescription and research on such indirect psychological outcomes is still lacking.

While well-being enhancement for chronic-use substances like fluoxetine have generally received only scattered or poor support, the case for certain single-session substances is stronger, though the evidence is still emerging. Research at Johns Hopkins University using the substance psilocybin provides robust support for the possibility of pharmacologically-based well-being enhancement. In one study, Griffiths and colleagues demonstrated that a single session of psilocybin taken in a safe and supportive context reliably increases participants' mood, sense of meaning, and life satisfaction [9], an effect that persists for at least 18 months [10].

In neuroscience, technologies are now available that can leverage decades of neuroimaging findings. Noninvasive brain stimulation technologies can selectively modulate particular patches of cortex imaging studies have shown to be associated with a particular mental function, providing a causal means to test the observed correlations. The most widely used of these technologies, transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS), can modulate mental functions like learning and mood; as language learning has been shown amenable to enhancement and TMS is becoming part of psychiatric standard of care for treatment resistant depression [11]. While these technologies have not yet been widely tested in terms of their capacity to influence well-being, the identification of several 'hedonic hotspots' [12] throughout the brain provide compelling targets to test, which may eventually provide substantial control over mental processes [13].

3   Psychological

Digital distribution is transforming the delivery of positive interventions. A positive psychology MOOC on Coursera, for example, has already taught many times more students about positive interventions than years of in-person instruction in university settings. The vectors through which psychological findings related to mental health can now be conveyed to the public are unprecedented.

One major way of delivering positive interventions is through apps. Apps like BetterUp, Happify, and Headspace as well as websites like ClearerThinking.org deliver evidence-based well-being interventions to millions of people. In addition to delivery, apps in combination with wearables (or mobile technologies that record data throughout the day) are capable of collecting massive amounts of information [14]. As the interaction with, and integration of, apps and mobile computing devices continues, they will play an increasingly large role in the delivery of positive interventions. Additionally, they will contribute to the awareness of users' fluctuations across well-being relevant domains over seconds, minutes, hours, days, weeks, years, and decades.

Cognitive therapy itself is increasingly being distributed through digital means. The early example of ELIZA, the natural language processing program that allowed users to engage in a therapy-like process [15], has become a reality of clinical research and care. Some studies have examined new fully computerized courses of therapy while others have investigated recently developed computer-assisted courses of cognitive therapy [16]. There is little doubt that well-being interventions will be administered through similar means.

4   Social

Social media is ubiquitous in most western, educated, industrialized, rich, and democratic (WEIRD) countries. Companies like Facebook and Twitter provide massive corpora of language data to study. Viewing and interacting with these social media platforms is a normal part of the day for hundreds of millions of people.

Language data from social media platforms can be used to create highly accurate models of individual psychological characteristics [17]. These characteristics include heart disease [18], demographics like gender [19], personality [20], religious affiliation [21], as well as mental states like self-transcendent experiences (STEs) [22, 23]. Social media posts can also be used to predict mental disorders [24], as well as well-being (e.g. www.WWBP.org).

Initial positive psychology studies on social media tended to focus on the impact of social media use on well-being. This work has evolved to ask more nuanced questions about the surrounding circumstances, individual differences, and manner of interaction with social media [25]. In general, insights from positive psychology about social interactions will likely apply in social media interactions as well: toxic interactions will reduce well-being whereas supportive interactions will increase well-being.

Questions about the impact of social media on well-being will become increasingly important, because social media is on the cusp of becoming much more immersive. Virtual reality (VR) is capable of more than inducing intense states of awe [26, 27]; it is also capable of facilitating simulated face-to-face like social interactions through digital avatars [28]. The investment of large social media companies like Facebook in VR companies like Oculus Rift, and the reduction in price of high quality VR headsets, makes immersive virtual social media seem like a likely future reality. However, the well-being dynamics of these virtual social contexts is not yet known with specificity.

5   Conclusion

Positive psychology is at the cusp of moving beyond its cognitive roots to investigate other avenues of studying and enhancing well-being across the biopsychosocial model. Research questions in this domain are no longer of the form of, 'does X technology impact well-being?' but have rather become increasingly complex, now exploring the aims, surrounding circumstances, neurobiology, and ways in which technologies and their applications influence various aspects of well-being. It is imperative that the field of positive psychology integrates technological interventions across biological, psychological, and social influences on well-being. The technologies reviewed here, as well as others, may even go beyond transforming the science of well-being – to transforming the ways in which human beings conceive of and pursue well-being.

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