

Using technology to boost employee wellbeing? How gamification can help or hinder results

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ABSTRACT

Research can help improve the lives of employees by revealing ways in which technology can be leveraged to progress innovative, time and cost-effective ways to promote their wellbeing. However, even with the trends of building “positive organizations” and promoting employees’ wellbeing using the latest technologies in today’s best companies worldwide, there has been a lack of rigorous research to provide solid evidence for these decisions. In this review, we present a call for future research to integrate and test technologically facilitated positive psychology interventions with gamification elements to better understand how to minimize harm and promote user benefits. We review the current online positive psychology intervention research, which we argue provides a critical guide for the development of future wellbeing technology. We also explore how gamification shows promise for promoting the benefits of positive psychology interventions (e.g., user enjoyment, autonomous motivation), as well as areas where gamification can pose a threat to wellbeing. There may be a fine line between harmful and helpful wellbeing solutions in our connected and technologically driven world of work; research now needs to uncover where to draw that line.

Author Keywords

Wellbeing, positive psychology, positive organizations, gamification.

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J.4. Computer Applications: Social and Behavioral Sciences—Psychology; K.4.3. Computers and Society: Organizational Impacts.

INTRODUCTION

In the modern working world, employees face the burden of “telepressures,” or the endless stream of emails, adapting to ever-changing technologies, and constant pressure to be available online [5]. However, if wisely applied, technology can instead be leveraged to facilitate employees’ wellbeing. This can be accomplished by using technology to apply a range of feasible, evidence-based wellbeing interventions from the burgeoning field of positive psychology [39].

Positive psychology is the study of optimal human potential and wellbeing, or what is called flourishing in life [39]. Many techniques from positive psychology—from showing gratitude to practicing mindfulness meditations—are quick, easy to learn, and can be self-practiced by employees [42]. Combining positive psychology with technology is advantageous for health promotion because it can further help with cost-effectiveness, accessibility, motivation, and customization for users as compared to in-person programs.

Organizations worldwide have been investing increasing amounts of time and money into the latest wellbeing technologies to promote their employees’ wellbeing and performance [9,29]. For example, in 2015 alone, 580,000 companies in the United States implemented wellness programs involving wearable health and wellbeing trackers for employees [20]. Moreover, it is expected that organizations will implement 13 million Workplace Self-tracking Technologies (WSTT) between 2014–2019 [2]. However, there is currently an absence of rigorous research to ground this hype around WSTT in promoting positive employee and organizational outcomes [30]. This trend towards wellbeing technology in organizations now requires evidence-based guidance more than ever before. Despite evidence from randomized controlled trials that online positive psychology interventions can be effective over and above controls, such as with online mindfulness programs [10,23] and online positive reflection journals and exercises [8,11], much more research is needed to explore how and why different types of technologies and software elements can help or hinder users’ long-term benefits [17].

One promising avenue for discovering and understanding improved ways to deliver positive psychology interventions via technology is with the addition of gamification: the use of game design elements in non-game contexts [14]. Adding gameful elements to digital applications can help to increase users’ motivation and engagement with the system [19,38], but research in this area is still preliminary. There is promise that gameful applications may help motivate users to adopt positive behaviour change that could benefit their health and wellbeing [25]. Conversely, research also suggests that certain aspects of gamification, in particular extrinsic rewards, may inadvertently thwart motivation and sustained improvements for positive behaviour change [1,9]. In this review, we present a call for future research to

integrate and test technologically facilitated positive psychology interventions with gamification elements to better understand how to minimize harm and promote user benefits. We begin by reviewing the current online positive psychology intervention research to date, deducing key elements to help guide future technologies to promote employee wellbeing. Further, we critique the preliminary research on gameful wellbeing technology. We end with implications for future research and use of gameful wellbeing technology in organizations.

ONLINE POSITIVE PSYCHOLOGY INTERVENTIONS FOR EMPLOYEE WELLBEING PROMOTION

Positive psychology interventions aim to teach positive psychology activities, known as the “simple, intentional, and regular practices meant to mimic the myriad healthy thoughts and behaviors associated with naturally happy people.” [28, p. 57]. Because these activities are simple, cost-effective, and easy to learn, there has been an increase in positive psychology interventions implemented with employees via technology, mainly in the form of websites and mobile applications. These programs are broadly referred to as Online Positive Psychology Interventions (OPPIs; [7]), and show benefits over and above control conditions, with some interventions finding effects comparable to traditional in-person wellbeing and stress-management programs [31]. Overall, a large amount of randomized controlled trials have shown that OPPIs and related wellbeing promotion online interventions are beneficial and produce small to moderate effect sized improvements in wellbeing (for meta-analyses, see van Genugten et al. [18] and Sin and Lyubomirsky [42]). Many OPPIs have been tested with employees across various organizations and sectors, showing wide promise for application outside of the lab.

In a recent example of a brief OPPI with employees, Clauss et al. [11] randomly assigned 90 caregivers to a 5–10-minute positive reflection intervention practiced on an iPad for only 10 days, or a control exercise. The intervention was simple; participants were guided to select a positive and meaningful work-related event that took place that day, establish deep breathing and a mindful state, and reflect on the meaningful and positive details of the event. The iPad sent a reminder to employees to practice the exercise every day during a break. Results showed reductions in emotional exhaustion and fatigue in the intervention group, and increased hope and optimism in employees who indicated they needed more recovery from work the most at baseline. Similar effects have been found with a multitude of brief online mindfulness training programs with employees. For example, Hülshager et al. [23] found that compared to a waitlist control, education and healthcare employees who participated in a brief 2-week online mindfulness intervention showed significantly less emotional exhaustion and increased job satisfaction.

Not surprisingly, longer OPPIs tend to show more substantial results and involve training in a range of wellbeing skills via modules, videos, and guided exercises. In one 8-

week intervention, training was provided to employees on a number of core positive psychology topics taught one week at a time: self-awareness, positive emotions, self-compassion, strengths, autonomy, meaning, positive relationships, and savouring positive moments [24]. Each week, participants received a 9–10-minute introductory video on a topic, as well as a 10-minute daily guided meditation and a 2-minute daily experiential activity (e.g., expressing gratitude or bringing loving kindness to daily interactions). Results showed that intervention participants showed significant increases in wellbeing indicators (e.g., self-compassion, engagement, mindfulness, and positive relationships) and decreases in ill-being (e.g., stress and depression) over time compared to the waitlist control, and these effects held true one month later. Overall, it appears that grounding technology in positive psychology principles is a practical and evidence-based way to promote wellbeing in organizations.

BEST PRACTICES LEARNED FROM ONLINE POSITIVE PSYCHOLOGY INTERVENTIONS AND BEYOND

Given the substantial meta-analytic evidence in support of OPPIs and related online wellbeing programs [18,42], the question now becomes, which elements of OPPIs work best and why? Exemplary interventions and meta-analyses help uncover this question to show that certain core elements can improve the effectiveness of OPPIs: longer programs, frequent and varied practice, enjoyment and person-intervention-fit, user-friendliness, and virtual support.

Longer interventions, frequent practice, and variety

In general, longer interventions and more frequent practice of OPPIs promote greater effectiveness. One study found that although a 2-week gratitude “count your blessings” intervention practiced daily led to increases in positive affect, a longer 10-week version practiced on a weekly basis led to psychological wellbeing improvements as well as lowered physical health complaints [15]. In another intervention with over 3,000 participants using the “Live Happy” mobile application providing a number of grounded positive psychology exercises, the frequency of application usage was significantly related to increased mood over time [33].

Of course, it should be noted that increasing the sheer frequency of exercise practice can be futile or may even harm user engagement. Another intervention randomly assigned participants to savour (i.e., think about positive aspects) of one through 10 events from the day, generating 10 conditions of varying savouring frequency. Unexpectedly, higher frequency of events savoured did not have any effect on decreasing negative affect [3]. This is why intervention variety, in addition to practice length and frequency, has been deemed necessary for OPPIs to be effective [28]. Exemplifying the importance of activity variety, the “Live Happy” mobile application intervention results also found that the number of different types of activities that participants engaged in was related to increased mood and happiness scores. This is in line with research from the broader

health promotion literature showing the importance of variety. For example, using a variety of physical activities [44] and positive thinking strategies in daily life [34] is associated with greater wellbeing and health.

However, it should also be cautioned that other OPPI research has shown that increased options and variety may actually overwhelm participants. Schueller and Parks [37] witnessed this counter-effect when exploring empirically-supported positive psychology exercises (e.g., gratitude, strengths, savouring) randomly assigned in toolkits of two, four, or six exercises, or a control. Results showed no difference between the 6-exercise condition and control, with only the 2–4-exercise conditions showing improvements. Overall, although further research is required to explore some of the mixed findings, most of the studies suggest that a moderate amount of exercise versatility can help reduce habituation and promote intervention benefits, in addition to longer-term and frequent practice.

Enjoyment and person-intervention fit

Another key insight from OPPI research is the importance of exercise enjoyment and person-activity fit [28]. In one study, Schueller [36] found that users' higher preference for various positive activities, as indicated by enjoyment, perceived benefits, and perceived ease of exercise completion, were related to greater use of these activities and subsequent improvements. Similar results were found in a study of a mindfulness smartphone application—Headspace On-The-Go's "Take 10" program—in which participants practiced 10 minutes of guided mindfulness exercises for 10 days and learned about the science behind mindfulness [22]. Results showed that the "Take 10" program led to increases in positive affect and decreases in depressive symptomology in the intervention but not in a placebo condition using a list-making mobile application. Importantly, ratings of task enjoyment were positively correlated with the increases in positive affect in the intervention but not in the placebo group.

Given the importance of enjoyment, how can technology appeal to users best when there are so many different positive psychology exercises to choose from? One solution is to personalize an intervention to each user to promote person-activity fit. Schueller [36] randomly assigned participants to one of three empirically-supported positive psychology exercises administered online (i.e., active-constructive responding, gratitude visit, and counting your blessings) and asked them to rate whether they liked the exercise. In the second phase of the study, participants were randomly assigned to either a "matched" or an "unmatched" activity group. The matched activity group received a second exercise that was most likely to suit their preferences, based on their feedback on the first exercise, whereas the unmatched group received a randomly assigned second exercise. Results showed that matched participants reported significantly greater enjoyment and perceived benefits with their "personalized" exercise compared to the unmatched group. Moreover, matched participants showed a trend of

greater changes in subjective wellbeing over the course of the week-long intervention (i.e., lower negative affect, higher positive affect and life satisfaction) than the unmatched group with a medium-sized effect. Interestingly, there were no differences in time spent practicing between the two groups, suggesting that differences in wellbeing were attributable specifically to the exercise enjoyment factor. Therefore, over and above exercise practice, it appears that user enjoyment is fundamental for users to reap the most benefits from their wellbeing technologies.

User-friendliness and virtual support

Beyond creating enjoyable interventions that fit each user, developers of wellbeing technology should also remember to make content easy, clear, and informative to ensure that the most benefits are reaped. Although an absence of OPPIs to date have examined the incremental benefits of user-friendly software and virtual social support, implications can be drawn from the multitude of interventions conducted in the online health behaviour and clinical psychology literature. One meta-analysis of 52 internet-based interventions aimed at improving health behaviours found that interventions that were rated as more "efficient," meaning that they required less time to understand and were easier to use, were more likely to produce behaviour change and benefits than interventions that were rated as less efficient [18]. Another randomized controlled intervention for hepatitis prevention examined how various website elements influence outcomes. Results found that users visited more webpages, spent more time on, and scored higher on a hepatitis knowledge questionnaire after one week of using a "tunneled" website with a pre-set flow of modules and information as opposed to a "freedom-of-choice" version in which participants freely explored all of the same information but on their own [12]. These findings solidify the importance of putting substantial effort into user-friendly and simple design of wellbeing technology. This is essential to help users learn materials easily on their own, given that most online wellbeing interventions do not involve any in-person training.

Aside from making clear and concise materials to ensure user-friendliness, an innovative way to help users learn is by providing options for virtual social support. A meta-analysis of online mindfulness interventions found overall larger effect sizes in improvements in interventions providing users with access to therapist guidance via telephone, online chat, or email as compared to unguided interventions [43].

Moreover, research suggests that automated support and reminders may be just as effective for health behaviour change as support from a romantic partner. In a 10-day randomized controlled intervention, participants received information on physical health recommendations (i.e., to engage in 30 minutes of physical activity per day in at least 10-minute intervals) along with either an automated daily text message reminder to engage in the activity, or the same daily reminder text message but received from their roman-

tic partners in a more personalized way [6]. Both messages involved goal awareness, self-monitoring, and encouraged self-regulation. Results found that in both conditions participants achieved their recommended amount of physical activity on 32% of the days as measured by a wearable activity tracker, as compared to only 21% of the days in a control condition with the same health information but no text message reminders. Importantly, no significant differences in physical activity were found between the automated text messages and the personalized text from a romantic partner. Implications show that automated reminders may not actually be as much of a nuisance to participant as they may appear; in fact, they are a feasible and cost-effective strategy to help individuals engage in goal-oriented health behaviours.

APPLYING GAMIFICATION TO POSITIVE PSYCHOLOGY PROGRAMS: HELPFUL OR HARMFUL?

Given what is known from the OPPI research to date—that longer and more engaged practice, variety, enjoyment, user-friendliness and virtual support are beneficial for improvements—researchers can now examine ways to further promote these helpful elements in new technologies. One innovative way forward is with the application of gamification to OPPIs. Theory on gamification and emerging interventions suggest that adding playful or gameful¹ elements such as fun rewards, stories, and interactive games has potential to increase intervention effectiveness [4,9]. However, most health-related gameful applications only focus on physical health, nutrition, or disease management [25]. Another limitation is that unlike the OPPI literature, there are fewer randomized controlled trials testing specific gamification elements, making implications for practice less clear with many questions left unanswered. Nevertheless, several notable wellbeing applications and technologies using gamification elements have been tested in recent years showing positive user feedback, high engagement, and some preliminary wellbeing benefits [25].

Promoting user enjoyment with games, stories, and virtual worlds

One of the most fruitful uses for gamification in wellbeing technology is to increase user engagement and enjoyment with stories, games, and other playful and gameful elements. Several such interventions have been tested. For example, Baranowski et al. [4] found 27 studies involving video games aimed at promoting a variety of health behaviours, such as diet, exercise, and medication adherence. Although large idiosyncrasies between the studies prevented a meta-analysis, Baranowski et al. [4] did conclude that the majority of studies showed pre-post increases in various health-related outcomes, including change in health behav-

¹ In the context of gamification research, *playful* elements refer to unstructured, free-form activities, such as narratives, comic visuals, or animations, whereas *gameful* elements refer to activities structured around goals and rules, such as challenges, points, levels, and leaderboards. [14]

iours, knowledge, and psychological wellbeing variables. The two most common elements across the video games were the use of a health-behaviour storyline and health-behaviour goal-setting. However, given the single-group studies in this review, the added benefit of such game elements compared to controls or other game elements was not clear.

Other studies show that users give positive feedback for wellbeing interventions incorporating gameful elements such as fun and engaging storylines, metaphors, and visuals. One digital gameful application—“This Is Your Life!” [26]—was aimed at teaching positive psychology exercises to primary school teachers. The users’ path towards optimal wellbeing was presented through a metaphor of an interactive “flourishing journey” on a map with topics presented as different locations. Initial feedback data demonstrated that users found the application and the metaphor motivating for promoting their wellbeing.

Some gameful technologies take the playful element even further and develop interventions involving a physical toy. In an innovative example, Roo et al. [35] designed a mixed-reality sandbox to train mindfulness meditation. The system featured a sandbox with real sand that users could play with to express their feelings. Gathering information from the movements users created in the sandbox and their breathing patterns as tracked by physiological sensors, the system created a virtual world simulation with water, vegetation, and wildlife all seen through a virtual reality headset. The weather and water levels in this virtual world fluctuated in sync with the users’ breathing. This generated a form of biofeedback to help users enter a deep and meditative breathing pattern. Although results are preliminary, an evaluation with 12 participants showed that most users enjoyed the experience and felt that it could help them meditate and reach a calm and mindful state. In a similar playful light, Ludden and Meekhof [27] designed the “Break Trigger”: a small lighting device for employees to use on their desks as a fun, playful reminder to take regular breaks. The Break Trigger would slowly fade to dark at the end of every hour to encourage users to get up and out of their desks for a short respite every hour. Results showed that users of the Break Trigger scored higher on positive affect and motivation and lower on negative affect and frustration after taking a break. Overall, despite small sample sizes and mostly feedback-based findings, it appears that various playful and gameful technologies and programs can help bring users more enjoyment.

How motivating is “winning” at wellbeing?

Although there is much promise that incorporating more play, games, and stories into wellbeing interventions can be helpful and engaging for users, another element worth noting is the very purpose of many games: to win. Winning at games used for leisure is often seen as harmless and fun, but does this hold true when a game aims to improve wellbeing? This question seeps into a major topic of debate in the positive psychology and health behaviour change litera-

ture on motivation: how do we motivate users to gain sustainable benefits? The grounding theory behind much of this research is Deci and Ryan's [13] Self-Determination Theory, which suggests that humans are more likely to engage in, persist at, and develop positive physical and psychological health behaviours when they experience more autonomous and less controlled motivation. According to Deci and Ryan [13, p. 14], "Autonomous motivation involves behaving with a full sense of volition and choice, whereas controlled motivation involves behaving with the experience of pressure and demand towards specific outcomes that comes from forces perceived to be external to the self." Research from positive psychology shows that users' degree of autonomous motivation to engage in their assigned exercises leads to more frequent exercise practice and subsequently greater improvements in wellbeing outcomes [41]. The question for research now becomes, how can we apply gameful design to wellbeing interventions to promote more autonomous, and less controlled motivation?

Various elements of gameful design promote "winning," such as badges and trophies for achievements, increasing levels, and competitions against other players. A case can be made for or against these approaches in promoting autonomous, controlled, or both forms of motivation for wellbeing. On the one hand, these gameful elements can promote users' psychosocial needs deemed essential for promoting autonomous motivation, according to Self-Determination Theory [13]: (1) relatedness with other users (e.g., competing in a game for fun with a group of friends), (2) competency (e.g., seeing one's skill development progress), and (3) autonomy (e.g., choosing which awards and levels to strive towards). However, these very same psychosocial needs and subsequent autonomous motivation can just as easily be thwarted with extrinsic gameful rewards, such as those that breed continuous comparison with others, discouraging difficulty, unwanted pressure, a "gimmicky" feel, or too much focus on the benefits of the health behaviour instead of the actual process.

Unfortunately, there is an absence of rigorous research to date examining how various forms of "winning" and rewards in gameful technologies can help or hinder autonomous motivation and subsequent benefits. Given that technology with gameful rewards may seem like a standard practice in the world of workplace technology (e.g., Fitbit², MUSE³, and Headspace⁴ provide points, levels, prizes, etc. for users' health improvements), it is surprising that so little research has actually examined the specific effects of these elements. Studies that have examined this area present a cautionary tale. For example, Ahtinen et al. [1] tested a mental wellness mobile application, grounded in acceptance and commitment therapy [21] and guided mindfulness ex-

ercises, which showed improvements in users' stress and life satisfaction after one month. However, when participants were asked their opinion on the possibility of future iterations of the application including gamification elements such points, achievements, and rewards, feedback was not supportive. Overall, participants felt these features would not fit well with the context of the application and would be detrimental to their autonomous motivation for self-improvement due to focus on external rewards. In another study, Orji et al. [32] investigated participants' preferences for different persuasive strategies frequently used in games and gameful applications for health behaviour change. While strategies such as competition and social comparison were deemed motivational for some participants, others reported that they would actually feel demotivated by these elements, mentioning that they would feel stressed, discouraged, and less self-confident in case of a lower performance in comparison with their friends.

Outside of gamification research, studies in health behaviour change further caution against too much focus on external rewards and outcomes, which may thwart autonomous user motivation. Fishbach and Choi [16] examined how health behaviour change may be promoted with experiential goal pursuit, defined as focusing on the activities of the goal itself, as opposed to instrumental goal pursuit, in which the focus is on the outcome of the goal. Grounded in Self-Determination Theory [13], the researchers posited that experiential goal pursuit would channel more autonomous motivation, whereas instrumental goal pursuit would channel more controlled motivation. They conducted four experiments to show that across a wide range of wellbeing behaviours such as physical exercise, dental care, and practicing yoga, having participants think about instrumental goals (e.g., to lose weight, to boost health) as compared to experiential goal pursuit (e.g., I will first stretch, then run on the treadmill) led to more negative experiences and lower intentions to continue the health behaviour in the future. Thus, while much more research with long-term outcomes, randomized conditions, and wellbeing technology is required, caution against too much of a "winning" focus is warranted.

IMPLICATIONS FOR GAMEFUL POSITIVE PSYCHOLOGY DESIGN AND FUTURE RESEARCH.

It is time for technology to be leveraged to improve the lives of employees. Research has recently begun to show that innovative, time and cost effective online positive psychology programs and gameful technologies can reduce stress and promote employees' well-being. In this paper, we summarized key insights from the online positive psychology intervention literature to help guide future wellbeing technologies: longer program length, frequent practice, activity variety, enjoyment and person-intervention fit, user friendliness, and virtual support. We also reviewed the literature on gamification in wellbeing technology to see how gamification can promote the beneficial elements of positive psychology interventions. From the research to date, it appears that new technologies with various gameful ele-

² <https://www.fitbit.com>

³ <http://www.choosemuse.com>

⁴ <https://www.headspace.com>

ments (e.g., stories, interactive games, virtual reality experiences) show promise in increasing user enjoyment, engagement, and wellbeing. Some exemplary studies have even integrated gameful technology with positive psychology exercises such as practicing mindfulness and savouring positive moments (e.g., [26,35]), showing positive user feedback. However, lack of placebo-controlled experimentation curtails us from claiming that gameful versions of wellbeing programs and technologies are necessarily better or worth the investment in organizations.

Thus, many questions are still left unanswered. Rigorously evaluating gameful technology's added benefit over and above current programs, potential burdens, and areas for improvement is needed more than ever in our tech-driven world of work. Despite progress to show that gameful technologies can be effective, researchers now need to test the incremental benefits of various gamification elements in randomized controlled trials aimed at promoting psychological wellbeing. There has been an increase in the online positive psychology intervention research showing that various elements such as user choice and customized exercises can provide incremental benefits over and above standard online interventions without these elements [7,36]. The same level of methodological rigor would now be helpful to guide future gameful technology development by better understanding which elements should be applied, when, and with whom.

Of course, there may be good reason for the lack of randomized controlled trials in the wellbeing technology literature; researchers face many challenges in conducting rigorous, long-term and large-scale interventions using new technology, such as limited access to prototypes of the latest technology and the fact that technology may change before the study even concludes [29]. However, while it is understandable why the efficacy of each new mobile application or technological breakthrough cannot be feasibly tested with an experiment, there should be ample opportunity to conduct randomized controlled trials to test core gamification elements and guiding theories that stay constant even as technologies change. Thus, we encourage future researchers to rigorously test specific gamification principles (e.g., rewards, points, social networks) with randomized trials to confirm whether they are truly beneficial over and above standard versions without these elements.

One area in particular that requires more rigorous randomized trials is that of gameful rewards and the idea of "winning" at improving one's wellbeing. This includes testing various elements such as badges, levels, and points, and whether or not adding a social comparison element to these rewards is helpful or harmful for promoting users' autonomous motivation, engagement, and benefits. Previous randomized controlled trials in OPPIs and other wellbeing technology studies showcase the added benefits of creating a social environment, such as in the form of virtual support [43] and text message reminders [6]. However, it is still unknown the extent to which sharing one's rewards and

rankings with other users, and making social comparisons across rankings in a virtual world promotes or hinders wellbeing across various conditions and different types of users.

Moreover, because Self-Determination Theory [13] is a guiding theory behind the design of many technologically facilitated health behaviour and positive psychology interventions [9], the extent to which gameful technologies can foster autonomous versus controlled motivation is a critical question for future research. Future research should explore if different types of virtual reward environments, such as providing options and customization for rewards, or a more social "team" winning environment, can help mitigate against controlled motivation and promote users' sense of autonomous motivation. In addition to answering these questions with empirical evidence (such as measuring autonomous motivation across different gameful conditions), richer qualitative accounts of users' intervention experiences using interviews and focus groups can help tap into the more complex and nuanced ways that wellbeing technology influences motivation, enjoyment, and benefits seen in real life.

Finally, how effective are technologies and gameful interventions in promoting wellbeing long-term? Findings from online positive psychology literature show that users continue to see benefits up to six months after interventions end [40]. However, long-term study of most wellbeing technologies, particularly gameful technologies, is lacking. To prevent the wellbeing technology trend from being cast as just a "quick fix," future interventions are encouraged to analyze cost-effectiveness and long-term sustainability in addition to pre-post effect sizes and immediate user feedback [9]. In all, we encourage researchers to pursue these important questions on more nuanced and contextual aspects of wellbeing technologies and how they affect employees' lives. There may be a fine line between harmful and helpful wellbeing solutions in our connected and technologically driven world of work. If we do not discover where to draw that line soon, the wellbeing technology craze may just as quickly fade from our workplaces.

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REFERENCES

1. Aino Ahtinen, Elina Mattila, Pasi Välkkyne, et al. 2013. Mobile mental wellness training for stress management: Feasibility and design implications based on a one-month field study. *JMIR mHealth and uHealth* 1, 2: e11. <http://doi.org/10.2196/mhealth.2596>

2. Allied Business Research. 2013. Corporate Wellness is a 13 Million Unit Wearable Wireless Device Opportunity. *ABI Research*. Retrieved September 29, 2017 from <https://www.abiresearch.com/press/corporate-wellness-is-a-13-million-unit-wearable-w/>
3. Štěpán Bahník, Marek Vranka, and Jana Dlouhác. 2015. X good things in life: Processing fluency effects in the “Three good things in life” exercise. *Journal of Research in Personality* 55: 91–97. <http://doi.org/10.1016/J.JRP.2015.02.005>
4. Tom Baranowski, Richard Buday, Debbie I. Thompson, and Janice Baranowski. 2008. Playing for Real. *American Journal of Preventive Medicine* 34, 1: 74–82.e10. <http://doi.org/10.1016/j.amepre.2007.09.027>
5. Larissa K. Barber and Alecia M. Santuzzi. 2015. Please respond ASAP: Workplace telepressure and employee recovery. *Journal of Occupational Health Psychology* 20, 2: 172–189. <http://doi.org/10.1037/a0038278>
6. Corina Berli, Gertraud Stadler, Jennifer Inauen, and Urte Scholz. 2016. Action control in dyads: A randomized controlled trial to promote physical activity in everyday life. *Social Science & Medicine* 163: 89–97. <http://doi.org/10.1016/j.socscimed.2016.07.003>
7. Linda Bolier and Katherina Martin Abello. 2014. Online Positive Psychological Interventions: State of the Art and Future Directions. In *The Wiley Blackwell Handbook of Positive Psychological Interventions*, Acacia C. Parks and Stephen M. Schueller (eds.). John Wiley & Sons, Chichester, UK, 286–309. <http://doi.org/10.1002/9781118315927.ch16>
8. Joyce E. Bono, Theresa M. Glomb, Winny Shen, Eugene Kim, and Amanda J. Koch. 2013. Building Positive Resources: Effects of Positive Events and Positive Reflection on Work Stress and Health. *Academy of Management Journal* 56, 6: 1601–1627. <http://doi.org/10.5465/amj.2011.0272>
9. Rafael A. Calvo and Dorian Peters. 2014. *Positive Computing: Technology for Wellbeing and Human Potential*. MIT Press.
10. Kate Cavanagh, Clara Strauss, Lewis Forder, and Fergal Jones. 2014. Can mindfulness and acceptance be learnt by self-help?: A systematic review and meta-analysis of mindfulness and acceptance-based self-help interventions. *Clinical Psychology Review* 34, 2: 118–129. <http://doi.org/10.1016/J.CPR.2014.01.001>
11. Elisa Clauss, Annetkatrin Hoppe, Deirdre O’Shea, M. Gloria González Morales, Anna Steidle, and Alexandra Michel. 2016. Promoting personal resources and reducing exhaustion through positive work reflection among caregivers. *Journal of Occupational Health Psychology*. <http://doi.org/10.1037/ocp0000063>
12. Rik Crutzen, Dianne Cyr, and Nanne K de Vries. 2012. The role of user control in adherence to and knowledge gained from a website: randomized comparison between a tunneled version and a freedom-of-choice version. *Journal of Medical Internet Research* 14, 2: e45. <http://doi.org/10.2196/jmir.1922>
13. Edward L. Deci and Richard M. Ryan. 2008. Facilitating optimal motivation and psychological well-being across life’s domains. *Canadian Psychology/Psychologie Canadienne* 49, 1: 14–23. <http://doi.org/10.1037/0708-5591.49.1.14>
14. Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart E Nacke. 2011. From Game Design Elements to Gamefulness: Defining “Gamification.” *Proceedings of the 15th International Academic MindTrek Conference*, ACM, 9–15. <http://doi.org/10.1145/2181037.2181040>
15. Robert A. Emmons and Michael E. McCullough. 2003. Counting blessings versus burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology* 84, 2: 377–389. <http://doi.org/10.1037/0022-3514.84.2.377>
16. Ayelet Fishbach and Jinhee Choi. 2012. When thinking about goals undermines goal pursuit. *Organizational Behavior and Human Decision Processes* 118, 2: 99–107. <http://doi.org/10.1016/J.OBHDP.2012.02.003>
17. Caroline Free, Gemma Phillips, Leandro Galli, et al. 2013. The Effectiveness of Mobile-Health Technology-Based Health Behaviour Change or Disease Management Interventions for Health Care Consumers: A Systematic Review. *PLoS Medicine* 10, 1: e1001362. <http://doi.org/10.1371/journal.pmed.1001362>
18. Lenneke van Genugten, Elise Dusseldorp, Thomas Llewelyn Webb, and Pepijn van Empelen. 2016. Which Combinations of Techniques and Modes of Delivery in Internet-Based Interventions Effectively Change Health Behavior? A Meta-Analysis. *Journal of Medical Internet Research* 18, 6: e155. <http://doi.org/10.2196/jmir.4218>
19. Juho Hamari, Jonna Koivisto, and Harri Sarsa. 2014. Does gamification work? - A literature review of empirical studies on gamification. *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, 3025–3034. <http://doi.org/10.1109/HICSS.2014.377>

20. Matt Hamblen. 2015. Wearables for workplace wellness face federal scrutiny. *ComputerWorld*. Retrieved September 29, 2017 from <https://www.computerworld.com/article/2937721/wearables/wearables-for-workplace-wellness-face-federal-scrutiny.html>
21. Steven C. Hayes, Jason B. Luoma, Frank W. Bond, Akihiko Masuda, and Jason Lillis. 2006. Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy* 44, 1: 1–25. <http://doi.org/10.1016/J.BRAT.2005.06.006>
22. Annika Howells, Itai Ivztan, and Francisco Jose Eiroa-Orosa. 2016. Putting the “app” in Happiness: A Randomised Controlled Trial of a Smartphone-Based Mindfulness Intervention to Enhance Wellbeing. *Journal of Happiness Studies* 17, 1: 163–185. <http://doi.org/10.1007/s10902-014-9589-1>
23. Ute R. Hülshager, Hugo J. E. M. Alberts, Alina Feinholdt, and Jonas W. B. Lang. 2013. Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job satisfaction. *Journal of Applied Psychology* 98, 2: 310–325. <http://doi.org/10.1037/a0031313>
24. Itai Ivztan, Tarli Young, Janis Martman, et al. 2016. Integrating Mindfulness into Positive Psychology: a Randomised Controlled Trial of an Online Positive Mindfulness Program. *Mindfulness* 7, 6: 1396–1407. <http://doi.org/10.1007/s12671-016-0581-1>
25. Daniel Johnson, Sebastian Deterding, Kerri-Ann Kuhn, Aleksandra Staneva, Stoyan Stoyanov, and Leanne Hides. 2016. Gamification for health and wellbeing: A systematic review of the literature. *Internet Interventions* 6: 89–106. <http://doi.org/10.1016/j.invent.2016.10.002>
26. Geke D. S. Ludden, Saskia M. Kelders, and Bas H. J. Snippert. 2014. “This Is Your Life!”: The Design of a Positive Psychology Intervention Using Metaphor to Motivate. *PERSUASIVE 2014: International Conference on Persuasive Technology*, Springer, 179–190. http://doi.org/10.1007/978-3-319-07127-5_16
27. Geke D. S. Ludden and Linda Meekhof. 2016. Slowing down: introducing calm persuasive technology to increase wellbeing at work. *Proceedings of the 28th Australian Conference on Computer-Human Interaction (OzCHI '16)*, ACM, 435–441. <http://doi.org/10.1145/3010915.3010938>
28. Sonja Lyubomirsky and Kristin Layous. 2013. How Do Simple Positive Activities Increase Well-Being? *Current Directions in Psychological Science* 22, 1: 57–62. <http://doi.org/10.1177/0963721412469809>
29. Lisa Marsch, Sarah Lord, and Jesse Dallery (eds.). 2014. *Behavioral healthcare and technology: Using science-based innovations to transform practice*. Oxford University Press.
30. Phoebe Moore and Lukasz Piwek. 2017. Regulating wellbeing in the brave new quantified workplace. *Employee Relations* 39, 3: 308–316. <http://doi.org/10.1108/ER-06-2016-0126>
31. Thomas J. Morledge, Didier Allexandre, Emily Fox, et al. 2013. Feasibility of an Online Mindfulness Program for Stress Management—A Randomized, Controlled Trial. *Annals of Behavioral Medicine* 46, 2: 137–148. <http://doi.org/10.1007/s12160-013-9490-x>
32. Rita Orji, Lennart E. Nacke, and Chrysanne DiMarco. 2017. Towards Personality-driven Persuasive Health Games and Gamified Systems. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '17)*, ACM, 1015–1027. <http://doi.org/10.1145/3025453.3025577>
33. Acacia C. Parks, Matthew D. Della Porta, Russell S. Pierce, Ran Zilca, and Sonja Lyubomirsky. 2012. Pursuing happiness in everyday life: The characteristics and behaviors of online happiness seekers. *Emotion* 12, 6: 1222–1234. <http://doi.org/10.1037/a0028587>
34. Jordi Quoidbach, Moïra Mikolajczak, and James J. Gross. 2015. Positive interventions: An emotion regulation perspective. *Psychological Bulletin* 141, 3: 655–693. <http://doi.org/10.1037/a0038648>
35. Joan Sol Roo, Renaud Gervais, Jeremy Frey, and Martin Hachet. 2017. Inner Garden: Connecting Inner States to a Mixed Reality Sandbox for Mindfulness. *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*, ACM, 1459–1470. <http://doi.org/10.1145/3025453.3025743>
36. Stephen M. Schueller. 2011. To each his own well-being boosting intervention: using preference to guide selection. *The Journal of Positive Psychology* 6, 4: 300–313. <http://doi.org/10.1080/17439760.2011.577092>
37. Stephen M Schueller and Acacia C Parks. 2012. Disseminating self-help: Positive psychology exercises in an online trial. *Journal of Medical Internet Research* 14, 3: e63. <http://doi.org/10.2196/jmir.1850>
38. Katie Seaborn and Deborah I. Fels. 2014. Gamification in theory and action: A survey. *International Journal of Human-Computer Studies* 74: 14–31. <http://doi.org/10.1016/j.ijhcs.2014.09.006>
39. Martin E. P. Seligman and Mihaly Csikszentmihalyi. 2000. Positive psychology: An introduction. *American Psychologist* 55, 1: 5–14.

40. Martin E. P. Seligman, Tracy A. Steen, Nansook Park, and Christopher Peterson. 2005. Positive Psychology Progress: Empirical Validation of Interventions. *American Psychologist* 60, 5: 410–421.
41. Kennon M. Sheldon and Sonja Lyubomirsky. 2006. How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves. *The Journal of Positive Psychology* 1, 2: 73–82. <http://doi.org/10.1080/17439760500510676>
42. Nancy L. Sin and Sonja Lyubomirsky. 2009. Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: a practice-friendly meta-analysis. *Journal of Clinical Psychology* 65, 5: 467–487. <http://doi.org/10.1002/jclp.20593>
43. M.P.J. Spijkerman, W.T.M. Pots, and E.T. Bohlmeijer. 2016. Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical Psychology Review* 45: 102–114. <http://doi.org/10.1016/J.CPR.2016.03.009>
44. Benjamin D. Sylvester, Martyn Standage, A. Justine Dowd, Luc J. Martin, Shane N. Sweet, and Mark R. Beauchamp. 2014. Perceived variety, psychological needs satisfaction and exercise-related well-being. *Psychology & Health* 29, 9: 1044–1061. <http://doi.org/10.1080/08870446.2014.907900>