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# Towards Thriving: Extending Computerised Cognitive Behavioural Therapy

Cara Wilson Queensland University of Technology 2 George Street Brisbane, Australia cara.wilson@qut.edu.au Steve Draper University of Glasgow 58 Hillhead Street Glasgow, UK s.draper@psy.gla.ac.uk Margot Brereton, Daniel Johnson Queensland University of Technology 2 George Street Brisbane, Australia {m.brereton, dm.johnson}@qut.edu.au

# ABSTRACT

Positive Psychology suggests that every one of us has the potential to increase our psychological wellbeing, while Positive Computing endeavours to develop technologies to support wellbeing and human potential. One such technology, Computerised Cognitive Behavioural Therapy (CCBT), has been found to be effective in increasing wellbeing for individuals with diagnosed mental health conditions. However, its ability to improve wellbeing in people without pre-existing mental health conditions is less well understood. To explore use in this population, an 8-week long user trial of a CCBT programme was conducted. Results provided insight into CCBT's ability to; increase subjective wellbeing; increase empathy for individuals who do experience mental health conditions; enhance selfreflection; increase positive behaviour change; and increase motivation to action. In lieu of perpetually creating new health technologies, we suggest a design approach which explores the extension and repurposing of existing evidence-based technologies to support and enhance the wellbeing of previously unintended populations. We found CCBT to be a tool which could contribute to the wellbeing of wider society from a preventative, proactive and positive perspective.

#### CCS CONCEPTS

 $CCS \rightarrow$  Human-centered computing  $\rightarrow$  Collaborative and social computing  $\rightarrow$  Empirical studies in collaborative and social computing

# **KEYWORDS**

Computerised CBT, CCBT, Positive Psychology, Positive Computing, mHealth, eHealth

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## **1 INTRODUCTION**

Developments in areas such as Positive Psychology [55] and Positive Computing [9] have heralded a refocus of efforts in both Psychology and Design towards developing and implementing collaborative, positive mental health frameworks and systems to support the wellbeing of individuals, communities, and societies. Both of these areas of thought champion a refocus of interdisciplinary efforts to how to achieve optimal human functioning and subjective wellbeing, working from a wellnessenhancement model of wellbeing, as opposed to the dominant disease-remedy model more commonly addressed [31]. Many existing health technologies address health issues, not health opportunities, suggesting that there is scope to repurpose preventative technologies as enhancement technologies, with the aim to facilitate thriving among those without pre-existing mental health conditions.

CCBT has been found to be effective in decreasing anxiety and depression and in increasing wellbeing for individuals with diagnosed mental health conditions, often with clinical outcomes equivalent to those of face-to-face therapy [3, 45]. Thus far, the impacts of these systems are relatively underrepresented in the field of Human-Computer Interaction (HCI), save for some recent studies of CCBT 'in the wild' [48]. Importantly, there is little research into the potential presented in extending or repurposing technologies for those with mental health conditions to enhance the wellbeing of those without mental health conditions. The few studies which have investigated this in CCBT have done so from a largely quantitative, medical perspective [44]. This question leads to inclusive design considerations as per e.g. Newell [37] whereby we ask; Can CCBT become useful in supporting wellbeing in a greater and more diverse population without the need for special adaptation or specialised design?

This study contributes to growing the understanding of the intersection between; existing mental health tools, Positive Psychology, Positive Computing, and Interaction Design, suggesting that tools designed for one group of people can be of benefit to previously unintended groups. This study proposes that technology can play a key role in the process of preventative mental health support, and in strengthening the mental health of the general population through positive behaviour change, self-reflection and increasing empathy towards and awareness of mental health conditions. Further, a number of design implications are proposed, including; usability considerations such as need for personalisation and portability/accessibility; the repurposing of existing technologies for use in unintended populations; and the scope of health technologies to be proactive as well as reactive.

## 2 RELATED WORK

## 2.1 Positive Psychology

Over the past two and a half decades Positive Psychology, an emergent psychological discipline, has sought to bring about a disciplinary re-focus on positive aspects of human existence. Its central tenents posit that every individual has the capacity to lead not only an average life, but a life infused with meaning and wellness, or that which Aristotle referred to as eudaimonia, the thriving life (Aristotle in Owens [40], Seligman [55]). The 1999 Positive Psychology Manifesto (University of Pennsylvania, [62]) defined the then-fledgling discipline as "the scientific study of optimal human functioning". Seligman and Csikszentmihalyi [56, p.5] purport that, previous to this, the field of Psychology had become "a science largely about healing", working from a disease-centric model of human functioning. Thus, one of the main aims of this discipline is to replace the common diseaseremedy model of human functioning, with a wellnessenhancement model [31] and to increase the frequencies of positive emotions, behaviours, and cognitions [54]. Peterson [42] echoes this thinking in his work on strengths and virtues. He proposes that psychology should be as concerned with our strengths as with our weaknesses, with building the best aspects as with repairing the worst. Positive Psychology theory suggests that emphasis on these factors will not only increase psychological wellbeing, but also provide functional, social, and occupational advantages [34], discovering and nurturing that which allows individuals and communities to thrive.

Studies on the topic of positive interventions investigate the impact of "treatment, methods or intentional activities aimed at cultivating positive feelings, positive behaviours, or positive cognitions" [58, p.467] and have provided encouraging results in both the enhancement of wellbeing and the diminishing of depressive symptoms [54, 58]. Another study suggests that the process of actively considering one's wellbeing and engaging in intentional positive activities can in fact lead to increased happiness [35]. Thus, from a Positive Psychology perspective, we suggest there is value in proactively addressing the mental

health needs of non-clinical populations i.e. those with no diagnosed mental health conditions, as this may theoretically support greater mental resilience, strength and wellbeing in society.

# 2.2 Cognitive Behavioural Therapy (CBT)

Cognitive Behavioural Therapy (CBT) is the most prominent form of psychological talking therapy for individuals who present with mild to moderate mental health issues, such as anxiety or depression. This technique has an ever-expanding evidence base, reporting high efficacy [36]. Differing from traditional talking therapies, such as psychotherapy, which focus on past events and emotional history, CBT looks at the person as they are currently, and aims to understand issues and situations which may be impacting them negatively. The central theory of CBT posits that the way in which one thinks about a situation subsequently impacts one's actions in that situation and, as this repeats over time, one's negative thinking and actions become habitual behaviours, which can lead to anxiety and depression regarding the situation [61].

# 2.3 Computerised Cognitive Behavioural Therapy (CCBT)

CCBT has a recorded base of evidence in terms of positive clinical outcomes and online therapy, in general, has begun to build a significant evidence base over recent years in improving mental health outcomes [2, 66, 54, 44, 23, 32]. Proudfoot [45] notes that CBT is very well suited to delivery via computer and the Internet, as it is a structured therapy with many aspects which are congruent with computerisation, such as a very clear conceptualisation. Popular CCBT tools include Living Life to the Full (the online CCBT tool used in this research; Williams [64]) and MoodGYM (an interactive CBT self-help book available online; [7]). Reflecting its face-to-face counterpart, CCBT itself has been the focus of research regarding its efficacy in both HCI and Psychology [4, 16, 29], the majority of which describes it as effective and well received. It has been found to be largely clinically effective, with effect sizes equivalent to face-to-face interventions in conditions such as social anxiety disorder, panic disorder, depression and sexual dysfunction [4, 5].

New technologies are being generated at an exponential rate. The sheer amount of apps and systems which aim to improve our lives in some way is astounding. We observe, however, that uptake and integration of such apps into user's regular use repertoire is low for the vast majority of these apps, owing to phenomena such as novelty and attrition [36]. It follows that apps which provide structure and require accountability from the user have a greater probability of being integrated providing they are aligned with user values. Pullin [46] notes there is an increasing crossover between design and disability, whereby products, service and designs originally intended for largely medical use by a specific and often stigmatised population are adopted and used by the wider public.

# 2.4 Preventative Capacities of Online Mental Health Resources

the reactive capacities of online mental health While interventions are relatively well understood, it is less clear how impactful such interventions are as preventative tools. Stice et al [60] note that the search for proactive healthcare is an increasingly digital endeavour and express the need for an interaction design agenda for proactive, preventative digital health care. Rowe and Rapaport [51] found that psychosocial interventions were an effective treatment approach for individuals with 'sub-threshold' depression, i.e. those who were not currently diagnosed but were at risk of developing depression. Boyle et al. [7] note that self-help CBT intervention can significantly reduce the rate of progression to a major depressive illness. This suggests, therefore, that if self-help CBT is efficacious for non-clinical populations, so too can computerised versions of it be. Indeed, studies relating to this topic have determined online interventions and therapy to be efficacious in preventing development of conditions such as depression and anxiety [28, 57], eating disorders [60] and alcohol misuse [41]. These studies advocate an early-intervention approach to mental health precursors and suggest providing this online to be effective.

However, Rogers [50, p.406] discusses that the demand for proactive computing should perhaps be shifted to one for proactive people, whereby technologies are not designed to simply help humans "do things" but instead to help them actively engage in the things they do. Supporting the development of proactive people is ultimately the core ambition of Positive Psychology and this is in line with Rogers' vision of the engaged life, enabled through technology but not solely dependent on it. We would argue that enabling proactive people is the ultimate goal of the proposed repurposing of CCBT, however, to arrive there, we must first encourage thinking around achieving proactive computing in a specific mental health technology context. Currently, health technologies focus largely on monitoring and alleviating existing health issues, as opposed to enhancing health opportunities through technology. Thus, the suggestion in this context may be to achieve proactive people through proactive technologies.

# 2.5 Positive Computing

The past two decades have given rise to convergence of several schools of thought on the good that technology can do in our lives and the positive impacts it can produce. Rosalind Picard [43, p.1] asserted that we need to treat emotions scientifically, proposing Affective Computing as "computing which relates to, arises from, or deliberately influences emotions". Meanwhile, Fogg's [19, 20] concept of Persuasive Technology discusses the design and development of interactive computing products, created to intentionally change beliefs, attitudes and behaviours in a non-abrasive manner. Young and Kempf [67] discussed the increasing trend in computing in developing persuasive technologies to motivate behaviour change. More recently, such

technologies have taken the form of Assistive Technology [19, 20] and Alternative and Augmentative Communication (AAC) technologies designed to support those with disabilities to interact with technology and with others to the same capacity as those without disability [37]. Inclusive Design is another area which champions this comprehensive approach to technology design and dissemination, defined by the British Standards Institute [in 37, p.5] as "the design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible ... without the need for special adaptation or specialised design."

Thus, in the areas of Positive Psychology [53], Cyberpsychology [49] and HCI [9] alike, researchers have begun work towards a centralised notion of the overlap of their disciplinary boundaries, a nascent area of research named Positive Computing. Calvo and Peters [9, p.9] define this as the "study and development of technologies designed to support wellbeing, wisdom and human potential", suggesting a move from human-centred design to humanity-centred design. Through combining interdisciplinary knowledge, we can practice Positive Computing and define guidelines for the implementation of technology for wellbeing [15, 16, 18, 53]. Mindfulness technologies are another branch of mental wellbeing technologies being addressed in HCI research [17] and their growing popularity is a testament to the role they also play in the support of wellbeing. We suggest that mindfulness apps can be complemented by tools such as CCBT, providing both tools which attempt to alleviate deep-rooted thoughts, feelings and behaviours as well as tools which provide moments of calm and peace. Indeed, this is in line with Mindfulness Based Cognitive Therapy, which combines mindfulness with CBT-like therapies [58].

Given evidence of the effectiveness of CCBT as a reactive tool, the benefits associated with improving wellbeing as preventative measure and the value of Positive Computing, this study aims to explore an opportunity for repurposing technology in order to further explore this area. Specifically, we aim to assess the effectiveness of a CCBT tool in enhancing psychological wellness and human flourishing in individuals without existing mental health conditions.

# 3 METHOD

This research centred on use of an eight module Computerised Cognitive Behavioural Therapy (CCBT) programme called *Living Life to the Full* (hereafter referred to as LLTTF), developed by Dr Chris Williams of the University of Glasgow [64] and delivered online via desktop computer. The design itself consisted of a website with eight modulated content slideshows with audio voiceover from a trained CCBT therapist. The user is encouraged to "play" the slideshows to listen and watch to each consecutively, each lasting for roughly one hour. The topics covered in the course began with 'Why Do I Feel So Bad?' and progressed to 'How to Fix Almost Everything', encouraging participants to consider how they feel in five keys areas; people and events around them, altered thinking, altered feelings, altered physical symptoms, and altered behaviour (the Five Areas approach). Boyle et al. [7] suggest that, although designed for those with mental health disorders, the LLTTF tool may be feasible as a preventative life-skill intervention.



Figure 1. Screenshots from the LLTTF website depicting the eight modules

Participants were required to be over 18 years old and to have no current or previously diagnosed mental health conditions, i.e. 'non-clinical'. Participants were recruited locally in Glasgow, UK, via email and social media. Twenty individuals (9 male, 11 female, aged 22 to 70, who lived in Glasgow and spoke fluent English) undertook the trial. Data was collected via email and Typeform (an online questionnaire design website; www.typeform.com). The research was approved by the University of Glasgow Ethics Committee and adhered to the British Psychological Society's ethical practice guidelines. It was deemed suitable to be undertaken with non-clinical participants, given that they were provided with information about where to seek support if any of the themes which arose in the course of the research began to cause any sort of mental distress.

There were three main forms of qualitative data provided by participants; weekly mini-diary entries, the pre/post-study interviews, and a post-project questionnaire. Participants were asked to complete a 'mini-diary'. This involved answering four qualitative questions relating to the course and their own subjective wellbeing. Firstly, they were asked to indicate whether they thought that their happiness had increased, decreased, or stayed the same, since the last session. Secondly, they were asked "are you able to explain why, including some examples if possible?" Thirdly, participants were asked to write down some keywords relating to how they have been feeling since the last session (positive or negative). Finally, they were asked whether they had applied any of the techniques from the last module and to give examples if possible.

Participants began by completing the Initial Happiness Questionnaire (IHQ), which obtained information on demographics and history with mental health conditions, thus providing a screening mechanism. Eligible participants were then emailed a registration document, including a welcome letter, information on how to access and register with the LLTTF website and a researcher-created Participant Handbook. Participants were encouraged to start the CCBT programme and then to complete the corresponding open-ended 'mini-diary' questions and send these to the researcher. This pattern was repeated weekly with the subsequent modules using a weekly email template. Participants were encouraged to set a reminder at the same time each week on their mobile phone or elsewhere. A reminder process was in place, whereby if participants had not returned the module within a 3-day window, a reminder email was sent to them. Once participants had completed all eight modules, they were asked to fill out the final Post-Project Questionnaire (hereafter referred to as PPQ), to provide feedback on their experience with the programme. Qualitative analysis was conducted using a Thematic Analysis approach, which provides a framework from which to identify, analyse and report themes and patterns within data [8]. In addition, semi-structured interviews were undertaken, both pre- and post-project. The preproject interviews provided scope and direction to the subsequent weekly mini-diary questions and feedback questionnaires. The post-project interviews were conducted in person with the intent of securing additional narrative understanding to support the findings and these results are included in the following section.

#### 4 FINDINGS AND DISCUSSION

Five main themes are identified and initial discussion is provided in conjunction with these findings as follows.

## 4.1 Overall Perceptions of Use of CCBT

#### **Increases in Happiness**

Participants reported they felt an overall increase in happiness upon completion of the LLTTF programme. For example, one participant notes "I think it made me happier in the way that I always used to feel I was powerless to change. I feel like I now know I can take control of everyday situations, to bit by bit improve myself and become an easier going, happier person" [P3].

Empowering individuals to make choices and changes in their lives to rectify aspects which are causing them stress or unhappiness is a central tenent of the theory of Positive Psychology [55] and in Positive Computing [53]. And indeed, positive experience, positive emotion, positive environments and human strengths and virtues are considered to be the central sources of human wellbeing [35].

#### "Dipping a Toe"

Participants found the course was private and flexible. As one participant put it, CCBT allowed one to "*dip* [*a*] toe into CBT" [P13].

"I feel that the online approach is a very viable tool for people who perhaps don't require an intense CBT course but perhaps want to concentrate on one or two key areas and also not having to be tied down to complete the modules at a certain time in a certain place makes the course more accessible to all." [P13].

"I've always wanted to try a self-help programme... going through this programme within my own time with flexibility, without any judgment from anyone, is kind of nice... something that we can reach out [to] whenever we want, with easy access" [P12]. This concept of "dipping a toe" into CCBT appeared to resonate with many participants. We suggest that the flexibility and privacy offered by CCBT can provide individuals with unprecedented access to their own mental wellbeing, through resources which are usually unavailable to them or which they may often feel unable to ask for. Stigma in the context of seeking therapy is separated into two distinct categories, social stigma defined as the fear of being judged by others for seeking mental health support (e.g. labelling, stereotyping, discrimination) - and self-stigma - the internalisation of wider sociocultural ideas (usually negative) relating to seeking mental health support which are then adopted as the individual's own opinions [13, 14, 39, 63]. Here, participants were enabled to try out CBT-like thinking and to apply this to their own lives and issues, without any social or financial pressure to can come from face-to-face therapy [14]. There was no 'stigma' involved, no physical commitment to attend a therapy session once per week, no social implications of building a relationship with a therapist. The perceived stigma of attending a therapist [13] was abolished though the inherently unobtrusive use of an online system.

## 4.2 Behaviour Change

#### **Motivated to Action**

Many participants reported making proactive changes based on the advice they received from the CCBT programme. For example, one participant bought a bicycle to encourage herself to exercise more: "I bought a bicycle! Decided to act on something that I enjoy but for some reason didn't make time for, so I bought myself a gem of a second hand bicycle. It definitely bought me some energy and optimism last week" [P7].

One participant began cooking again, another cleaned out her attic and donated much of the contents to charity, while yet another "followed [her] big plan to improve [her] relationship with [her] parents" [P3]. Increasing exercise was the intentional change reported most frequently in the mini-diaries. This positive behavioural change was summarised by one participant: "I started exercising again which made me feel good" [P1]. Overall, the behavioural change brought about through use of the course was a clear benefit of its use. As one participant puts it, she felt "motivated to action" [P8] by the course.

These intentional activities are illuminating in that they show the breadth of impact that involvement in the CCBT course had on participants' daily lives, empowering them towards positive change. This is supported by research from Consolvo et al. [12] who discuss that design strategies for lifestyle behaviour change technologies can encourage positive change. Indeed, previous research by Lyubomirsky et al. [34, 35] found that actively engaging in intentional positive activities can lead to increased happiness. As Fogg [19] advises, a technology that can successfully change a behaviour or attitude, regardless of how small, is a 'milestone' and should present ample opportunity for scaling up and future design directions.

#### **Future Intentions**

In terms of self-reported intentions to continue with these behaviour changes over time, the majority of participants noted that they would change things or do something differently following their involvement with the programme. Examples of the intended changes offered by participants include: intentional change in actions and behaviours ("I will drink less as I know this causes some of the issues I want to change" [P3]), change in thought patterns ("I will think about my behaviour a bit more and perhaps try and put into practice as much of LLTTF as I can" [P4]), self-reflective changes ("At a basic level, I shall certainly examine my daily attitudes and behaviour more closely" [P20]) and happiness-related changes ("I will take stock of happiness levels on a regular basis" [P11]).

This shows an increase in motivation to positive change and a shift to focus on their subjective wellbeing. Indeed, this is in line with previous research by Lyubomirsky and Layous [13] who found that actively considering one's wellbeing can in fact lead to increased happiness. As Fogg [20] discusses, the goal of persuasive technology is a design which persuades someone (not necessarily everyone) to adopt a behaviour change. Fogg's [19] behaviour model for persuasive design suggests that in order for a person to undertake a behaviour they must be motivated, have the ability to undertake the behaviour, and also have experienced some sort of trigger to encourage them to undertake the behaviour. In this case, the CCBT could be considered as the trigger which lead to positive changes in behaviours.

#### 4.3 Self-Reflection

#### Increased Self-Reflection and Awareness of Mental Wellbeing

Participants reported that the tool had considerably increased their reflection on and awareness of their mental wellbeing. Participants expressed that they were notably more aware of their own mental wellbeing, thought of their mental wellbeing more often and reflected on their mental wellbeing more often. Indeed, all participants reported that having the opportunity to reflect on their own mental wellbeing as one of their preferred features of the course. For example, one participant notes: "*I think the opportunity to take time out and reflect was really valuable. Actually this isn't something we do often*" [P7]. Another observed "*This project has given me the chance to really take a step back and think about what's making me happy*" [P19] and that this was "*something which I've never actively reviewed*".

Participants also found tracking their progress and documenting their thoughts to be beneficial: "*I would say that documenting this has really helped me benchmark my emotional progress*" [P10]. It is worth mentioning that this narrative on self-reflection was unprompted by any information or questions from the researcher, yet many participants explicitly reported experiencing it.

This increase in self-refection and the discussed subsets of reflective thinking (evaluation, appreciation, habituation,

documentation) suggests a connection to the Aristotelian concept of eudaimonia, in which those who partake in *reflective action* have the highest wellbeing and therefore are the most likely to experience happiness [40]. Thus, as discussed by Steing and Grant [59], one's subjective wellbeing may increase in conjunction with one's reflective abilities. Indeed, work by Fredrickson [21, 22] suggests that experiencing positive emotions relating to oneself can expand our cognitive, attentional and psychological resources, while negative emotions achieve the opposite. Thus we suggest a further benefit in the use of CCBT; a more reflective, informed, and insightful general population.

## **4.4 Social Impacts**

#### **Increased Empathy and Reduced Stigma**

In being provided with a lens through which to examine their own mental health, participants reported being more aware of, and empathetic towards, the mental health needs of others, specifically reporting an increased empathy for those who do suffer from clinically-diagnosed mental health conditions. Participants perceived an increase in their understanding of mental health issues and awareness of the stigma surrounding mental health. Further, many noted that they now discuss mental health with others more often, while also finding themselves thinking of the mental wellbeing of others more often. Participants reflected on this through comments such as:

"Listening to some of the more depressing modules made me feel great empathy for people who are actually in these situations and who find it difficult to be positive about anything in their lives" [P13].

"This programme makes me reflect on not just my own mental wellbeing but also others that might suffer from mental illnesses" [P12].

This points to the possibility that regular consideration of one's own mental wellbeing, through a course or otherwise, can lead to increased consideration for the mental wellbeing of others too. Additionally, it was reported to be successful in increasing understanding of mental health conditions. Engaging nonclinical individuals in CCBT may serve to reduce stigma towards clinical patients, through education on the features and treatment of mental ill health, thus leading to a more informed and empathetic general population. This is in line with what Haidt and Keyes [24] report as two of the major aims of Positive Psychology, to engage with and relate to other people and to look beyond the self to help others find lasting meaning.

Within Positive Computing, Calvo and Peters [9] note the importance of insight into the self, others and the world, as well as the emotional intelligence and motivational desire to help others. Indeed, Ryan and Deci [52, p.46] suggest that happiness is fostered by "reflective, purposive living in accord with deeply held social values" and, as Seligman [55] notes, wellbeing cannot

exist solely in one's head, but also as a reflection of one's social world. Positive Psychology recognises that inherent human capacities for growth, fulfilment, and wellbeing are often thwarted by psychological, sociocultural, and external environmental factors [47]. If the previously discussed literature is to be believed, wellbeing can be derived from building good relationships with others and a meaningful place in society. Indeed, one's social context is deeply intertwined with one's happiness and thus, working towards a society which understands and respects mental health may help to increase happiness, wellbeing and thriving.

#### **Enabled Conversations**

More than simply being aware of others' mental health struggles, participants reported that engagement with the course encouraged them to actively engage with others to discuss mental health issues.

"As a result, I have been able to discuss modules with my mum who suffers from depression" [P19].

"After writing the diary...,it made me phone my dad and arrange to visit him the next day" [P8].

"The course has made me more aware of other people's mental health and I have shared some techniques with them" [P8].

Corrigan [13] suggests that stigma is a major obstacle to mental health recovery as it diminishes self-esteem, reduces social opportunities, and can lead to untreated mental health conditions. Bentall [6] further suggests that, in order to produce thriving individuals, everyone needs liberation from restrictions, stigma, and prejudice. Research has outlined that patients perceive high levels of stigma, ostracism, and embarrassment surrounding their mental health condition and an aversion to talking to others about it [13]. However, previous studies have shown that positive intervention can be successful in reducing the stigma related to seeking help for a mental health problem, changing policies relating to this, and enhancing social understanding and acceptance of mental health conditions [30]. We see this reflected in the findings of this study, whereby participants were instilled with increased understanding of mental health issues, so much so that they felt confident in 'broaching' the subject with loved ones who experience mental health conditions. This builds on the relatedness aspects of Seligman's three pillars of the good life and Riva et al.'s [49] social level of positive technology - both relate to the interpersonal aspects of life and creating meaning beyond the self.

# 4.5 Usability

## Ease of Use

The CCBT course was found to be easy to use in everyday life and the advice within it was perceived to be easy to implement into routines and daily practices. One participant reveals "There are things within these lessons which are quick and easy to do and don't require much of a lifestyle change but could be a step in changing my behaviours" [P4]. Further, reports that the computerised tool could "fit very easily into regular daily life" [P17] and was "less intimidating [than therapy]. If I can solve something with a little information and self-knowledge without relying on a third party, I would like to do so self-reliantly, using the online resource" [P20].

#### **Accessibility Augmentations**

Upon participant evaluation, the LLTTF programme permits room for improvement such as availability as a mobile app as opposed to a purely desktop-based intervention. One participant notes: "But nowadays we want everything fast, reachable, light, and small, something mobile and accessible" [P12] while another expresses a desire to "stick your headphones in on your lunchbreak or quite easily do a module at home on the sofa" [P11]. Further, the layout and design was described as "clunky", with one participant noting "Whilst it is very easy to follow I would've thought that the whole layout could be a lot better. Maybe it just needs updating?" [P7]. As discussed by Consolvo et al. [12], a lifestyle technology's design must be aesthetically pleasing in order to sustain interest and be comfortable to users and should also be unobtrusive, i.e. available when and where it is needed without being interruptive. This points to a design opportunity in the form of a mobile app version of the current CCBT programme.

#### **Need for Customisation**

Participants noted disinclination towards the 'one size fits all' approach of the programme. "I feel the one size fits all approach is the biggest flaw in this programme. It fundamentally fails to recognise the nuances of each individual and their circumstances" [P6].

"[It] lacks the ability to personalise the discussion to an individual" [P4].

Ultimately, participants typically created a mixed intervention for themselves, using some modules thoroughly and disregarding others entirely, according to their own needs. As noted by one participant: "Some weeks it was particularly useful, and I could identify quite easily with the information being given and apply it to certain scenarios in my life, and my own attitudes. Other times it felt a little bit off the mark, a bit patronising, and not something which I would really integrate" [P7].

Participant reports on their discontent with the 'one size fits all' approach to the programme may have suggested that LLTTF failed to resonate with users' individualized concerns. Despite complaints on the rigidity of the 'one size fits all' approach, all twenty intervention group participants persisted in their use of the programme through to completion of the trial. Participants noted that their subjective wellbeing did indeed increase, thus, it may be concluded that the benefits experienced eclipsed their discontent towards the generalised approach. That said, there is a clear design opportunity here to improve the design of such systems to include customisable aspects, such as the ability to input current concerns and be provided with context-specific advice. Indeed, Consolvo et al. [12] discuss the importance of giving the user as much control as possible over the design and data of the technology they are using. People are increasingly time-poor (indeed this might be an issue impacting on their mental wellbeing), thus providing functions which allow customisation of design through demographic data or perhaps user feedback after each step might satisfy participant need to feel the tools remain relevant and convenient to them.

As an explorative study, there were several limitations experienced. Firstly, as the study progressed, it became clear that there were underlying theoretical factors which would be highly useful to measure. For example, the concepts of self-reflection, optimism, motivation, and resilience emerged as interesting subthemes warranting further attention. Future research could measure all four factors both pre- and post-trial. Secondly, although it was suggested that participants complete one module per week to provide consistency, in practice, this often did not occur, with some participants completing one module every few days, and others completing one every few weeks. Fortunately, LLTTF's creator, Dr Chris Williams assured the first author that this does not waive any comparability with his own previous studies, and that, in fact, completing the modules under their own impetus most likely provides the best service for participants, as some take longer to learn and internalise the process than others (personal communication, April 15, 2015).

# **5 CONCLUSIONS**

This study has established that existing online mental health tools for clinical populations may be extended and repurposed to fit the needs of a non-clinical population. The increasing prominence of Positive Psychology and Positive Computing, coupled with general public interest in healthy minds and selfdevelopment, suggest the opportunity for supportive, interactive, and positive mental health care through technology. We suggest such technologies may enable a move away from mindlessness in engagement with technologies [1] and "bovine design" [33], towards a universal understanding of mental wellness and the care which ought to be taken in our mental lives.

Several design considerations are proposed. As documentation and reflection were aspects of the course valued highly by participants, design opportunities here might include facilitation of interactive note-taking functionalities within the programme, in order to present the individual with a reflective narrative of what they have learned through the course. Another design consideration here would be to enable some form of social networking system (SNS) which allows real-time discussion of experiences with mental health between people with and without mental health conditions. Indeed, such systems have been successful across settings, such as in supporting independence for people with Autism Spectrum Conditions [26]. There is also potential here to harness the educational potential of CCBT and to apply this to the problem of stigmatisation towards those with mental health conditions. Indeed, some studies have already investigated its use in schools as an educational tool (e.g. [7]). Design considerations here may include a tool which can be easily used by teachers to encourage children to interact with a CCBT programme (e.g. interactive classroom iPad app).

In summary, the design implications highlighted in our discussion include the following:

- Where possible, allow users to 'dip a toe' into the content being presented (allow them to explore content without the need for a major initial investment of time/effort)
- Provide opportunities for users to document their thoughts about target attitudes and behaviours (e.g., through interactive note-taking) and equally, encourage users to self-reflect
- Where de-stigmatisation of mental illness is a goal, designers might consider facilitating discussion through social networking systems
- Aim to maximise portability and accessibility to support users in being able to engage as and when they choose
- Allow users to customise mental health tools as much as possible (for example by allowing them to input current concerns or receive context-specific advice).

The qualitative results provide initial support for the effectiveness of repurposing an existing mental health technology for the needs of people without mental health conditions. As highlighted by Fogg [19, 20], our own desire to be creative and present something entirely new may not result in the most effective technology for the population we are attempting to support. As Fogg [19, 20] suggests, in order to design effective persuasive technologies, designers should imitate successful example of existing technologies. This rings true with the overall theme of this paper, that our own desire to be creative and present something entirely new may not result in the most effective technology for the population we are attempting to support. According to Carroll [10, p.5], users appropriate a technology innovation, adapting it to their needs and finding novel uses. Despite concern that this reflects failure on the part of designers, Carroll argues that this is an essential element in the design cycle and that, in fact, designers should attempt to design "malleable technologies that can be adapted to users' organisational, social and personal practices", suggesting that technologies are "rarely adopted and used as fixed and unmodified objects." A technology may be interpreted different ways by different people, suggesting there exists no deterministic route for any one technology to follow in terms of its design, its use, and its subsequent impacts. Each of these is personal to the user. Research has examined the appropriation of mobile technologies, noting the differences in way that

individual users select, explore and modify technologies in line with their own needs, thus taking possession of it, noting distinction between Technology as Designed vs. Technology in Use [25].

More broadly, our findings highlight the potential for CCBT tools to be used as a means to help de-stigmatise mental health issues and the cope of health technologies to be proactive as opposed to reactive. Many existing health technologies address health issues, not health opportunities. That participants reported increases in subjective wellbeing, positive behaviour changes, motivation, self-reflection and empathy would suggest that such a tool is an effective preventative health technology in terms of mental health. This provides a preventative measure against the deterioration of mental wellbeing, serving to strengthen societal mental resilience.

By providing resources to empower and inform individuals, communities, and societies about mental wellbeing, it may be possible to instil an understanding and resilience in the individual to facilitate effective handling of their own and others' mental health needs. It would appear that there is great benefit to be found in strengthening our overall subjective wellbeing, in a proactive rather than reactive manner, through the repurposing of existing mental health technologies. This focus would also lessen the strain on mental health funding and resources, becoming a bright, modern beacon for the old adage that 'prevention is better than cure'. The increased subjective wellbeing and awareness it presents could benefit not only the individual, but society as a whole.

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