

# Designing for Mental Wellbeing: Towards a More Holistic Approach in the Treatment and Prevention of Mental Illness

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## ABSTRACT

To date, HCI for mental health has primarily responded to challenges in the treatment of mental illness, with a focus on therapy access and engagement. However, approaches to improving and protecting people's mental wellbeing have received less attention. Prompted by recent discussions in Western Healthcare and Psychology, we argue for a more holistic approach to promoting mental health that expands the field's focus to include strategies for enhancing mental wellbeing. A closer consideration of mental wellbeing can increase the effectiveness of mental health interventions, help in preventing mental illness and relapse, and extend our knowledge as to how we can support people to flourish as individuals and enhance their quality of life more generally. Our aim is to encourage more research on positive aspects of mental health in the treatment and care provision of people with mental health problems, and to support preventive approaches. To this end, the paper provides a comprehensive definition of mental wellbeing as positive emotional, psychological and social health; presents a review of HCI literature illustrating how the field is beginning to respond to the mental wellbeing agenda; and proposes avenues for future design and research in this area.

## Categories and Subject Descriptors

• Human computer interaction (HCI) • Interaction Design • Health care information systems.

## Keywords

Mental health technology; mental wellbeing; healthcare; positive psychology; digital design; ethics.

## 1. INTRODUCTION

Good mental health and wellbeing is fundamental to our general health and quality of life, and enables us to build resilience against everyday stresses, to work productively, have fulfilling relationships, and to experience life as meaningful [22]. In 2000,

Seligman and Csikszentmihalyi popularized the term *Positive Psychology* [67] as the study of the conditions and processes that contribute to human 'flourishing' with a focus on what makes life worth living and determining the conditions for human wellbeing. Since, research and design in HCI increasingly incorporates positive strategies into system design to support peoples' general wellbeing (e.g. [15][16][25]).

However, such opportunities have so far been largely underexplored in the context of promoting the mental health of people suffering from mental health problems. In recent years, the topic of mental health has become a major concern to society due to an increase in the occurrence of mental illness and the devastating effects it has on both the individual and the economy worldwide [48]. Large-scale international surveys by the World Health Organization [83][82] indicate an increase in the prevalence of mental disorders with estimated rates across many countries ranging from 12-47% of the population being affected by mental illness at some stage in their lives.

Mental illness refers to more than 400 diagnosable mental disorders [2] including Major Depressive disorder, Bipolar disorder or Schizophrenia. These are mental health conditions that disrupt a person's psychological functioning, and are characterized by alterations in thoughts, emotions and behaviors. The often severe impact that mental illness has on people's lives highlights the need for effective treatment approaches and access to delivering services. Uptake of recommended treatment however can be challenged by social stigma, the cost-intensive nature of many therapies, and difficulties in adhering to treatment and accessing mental healthcare services [27]. This has led to a number of explorations as to how the field of HCI can improve access to, engagement with, and the outcomes of, therapeutic treatment (e.g. [7][59]).

While research in this area is still new, existing applications are designed to help with a wide range of mental disorders and build on a number of well-established therapies (e.g. Cognitive Behavioral Therapy) and techniques (e.g. self-monitoring). The majority of existing applications are informed in their understanding of mental health by the medical tradition where mental health is often pathology-defined as *absence of mental illness* (e.g. [29][82]) and operationalized through illness-related measures of depression, anxiety, distress or substance abuse. Moreover, due to a primary focus of the field on increasing access to therapy resources and facilitating treatment, little consideration has been given to applications for preventing mental illness. Only a small number of designs address the importance of offering post-therapy support to help avert relapse (e.g. [28][49]), or the promotion of mental wellbeing beyond the reduction of illness

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symptoms [73], and for people whose declined mental abilities cannot be cured such as in Dementia [78].

Increases in empirical reports demonstrating that an absence of mental illness does not ensure the existence of positive mental health, and vice-versa, means however that to effectively promote mental health requires both the treatment of any mental illness (*pathogenic focus*) and the presence of mental wellbeing (*salutogenic focus*) [48]. Although the HCI community is beginning to respond to the mental wellbeing agenda, research in this area is in its infancy. This can partly be explained by the fact that the concept of, and strategies to design for, mental wellbeing are less well understood, both in Healthcare and HCI. To contribute to a better understanding of mental wellbeing, this paper provides a conceptualization that defines it as positive emotional, psychological and social health; illustrates how HCI research is beginning to address important aspects of mental wellbeing; and presents strategies for incorporating a positive focus to the design and evaluation of future mental health interventions.

The paper begins with an overview of existing mental health interventions that are predominantly designed to assist in the treatment of mental health problems. The majority of these designs follows the format of traditional models of psychotherapy and is targeted at outpatients and adults with mild-to-moderate mental illness symptoms.

## 2. DESIGNS TO SUPPORT TREATMENT

One of the most important and widely applied approaches to treating mental illness is psychotherapy, a psychology-based intervention whereby the person with mental health problems engages in a collaborative relationship with a therapist, who employs different techniques to help her understand, overcome and prevent the re-occurrence of harmful thought patterns, feelings or behaviors. These technique can include the elicitation and questioning of automatic thoughts; relaxation strategies; exposure treatment; or the self-monitoring of events in-between therapy sessions to help the person identify important factors influencing their mood or actions, and to develop control by applying coping skills (cf. [8]).

### 2.1 Computerized & Online Therapy

Many early mental health designs replicated traditional therapeutic strategies with the aim to increase the capacity of available treatment services. Resulting electronic formats (e.g. as a desktop application) were similar to paper-based workbooks that were made available for people on waiting lists for, and to supplement face-to-face therapy sessions. While in particular online-based treatments offer a variety of advantages including convenience and ubiquitous access, adaptability to a wide range of mental disorders, and were demonstrated to be effective in controlled settings [1], they typically suffer high rates of attrition, meaning that users often do not complete the entire treatment program.

Aiming to address these high attrition rates research in HCI has recently begun to explore how engagement with online therapy interventions can be enhanced. To provide users with a more engaging online experience, existing designs including *Mind Balance* [28] or *Horyzons* [49] employ i.e. design strategies such as (i) providing a range of interaction opportunities with the system and more immediate feedback; (ii) creating a more personal experience by including a user profile page; (iii) offering therapist support through email contact and content sharing; (iv)

building a social community of peers who have similar difficulties; or (v) employing relational agents to engage the person in an empathic dialogue to engage them with the treatment (for examples of relational agents for mental health interventions see [12][11][51]). So far, early clinical pilots have shown positive effects of these strategies on treatment adherence.

### 2.2 Mobile Systems for Self-Management

As a platform to support individual management of mental health problems, mobile technology (mostly mobile phones) is becoming increasingly important. It allows for real-time self-monitoring of thoughts, feelings or behaviors; enables in-situ access to therapeutic guidance; can offer reminders (e.g. to take psychiatric medication); or aid in collecting contextual information to help identify distressing triggers (cf. [7][11][37]). Moreover, any collected data can facilitate important data review and analysis processes for therapists to adopt treatment approaches to each person's needs [64]. As a result, mobile devices have been used in a number of different ways ranging from daily self-assessment systems (e.g. [54]), whereby the person can enter and revisit data about their mood and daily activities, to technologically more adventurous propositions such as context-aware systems that use sensor data (e.g. activity levels, GPS location) to assist in automatically identifying the onset of mental health difficulties (e.g. [14]).

Despite their advantages and potential to increase adherence to important self-management tasks, variations in technology literacy skills can impact on the person's confidence in using a service, and also underlying concerns about the confidential treatment of monitored and potentially sensitive personal data can hinder uptake, despite user consent, secure servers, password protection and data encryption [37].

### 2.3 Addition to Traditional Psychotherapy

In contrast to standalone systems for the delivery of therapeutic strategies and mobile systems to assist in self-management (in-between therapy sessions), the following systems are designed to complement traditional psychotherapy activities.

#### 2.3.1 Virtual or Augmented Reality Exposure

One common strategy used in therapies for the treatment of anxieties or phobias is to 'expose' the person to their feared stimuli or context. To support this, virtual and augmented reality systems have been developed, whose effectiveness has been demonstrated to be comparable to traditional evidence-based interventions [58]. The use of virtual contents has a number of distinct advantages including the ability to adapt the stimuli (e.g. spider, flight simulation); stimuli control by therapists (e.g. their amount, size); and exposure performances within a safe environment [85]. Yet, such systems are expensive to deploy and some people do not emotionally react to the 'virtual' stimuli.

#### 2.3.2 Game Features to Support Self-Expression

To increase the motivation of particularly children and adolescents to engage in therapy and to support their self-esteem and self-efficacy, game play has been explored. This includes the design of 3D computer games for use within therapy that invite the person to playfully investigate and start resolving personal problems, and to talk them through with their therapist (e.g. *Personal Investigator*; *gNats*; [20]). Such games are often enjoyed by the player and act as an icebreaker in, and offer context for, interactions with the therapists. In contrast to these rather structured therapeutic games, *Magic Land* [59] is a system that encourages non-directive play. As a touch-based tabletop

application it invites children to explore a range of interactive toys to express themselves, which was found to enhance opportunities for creative play and storytelling beyond traditional therapy toys.

Despite these important contributions to supporting the treatment of mental disorders, we argue that to more effectively promote people's recovery from mental illness we need to also focus our efforts more strongly towards identifying and incorporating strategies for enhancing mental wellbeing into our technology design and evaluations.

### 3. CONCEPT OF MENTAL WELLBEING

Over the last 50 years, there have been many attempts to define mental wellbeing, a concept that presents itself as rather complex, multi-faceted and dynamic [63]. In social and psychological sciences, mental wellbeing has mostly been operationalized under the rubric of 'subjective wellbeing' (SWB), which is based on an individual's own, internal evaluation of their quality of life; this makes it distinct from externally assessed, objective measures such as a person's wealth or education level. The literature on SWB further distinguishes two main and closely interwoven perspectives: the hedonic perspective equates wellbeing with positive 'feelings' towards life (*emotional wellbeing*); and the eudemonic perspective considers wellbeing in terms of a person's level of 'functioning' in life, including the extent to which they can realize their true potential (*psychological wellbeing*) and their social needs (*social wellbeing*) [48][62]. While these perspectives are primarily informed by Western Psychology research, we suggest adding to it the concept of *mental balance* from Eastern Zen Buddhism, whose spiritual tradition has a 2500 year old history of cultivating and sustaining people's wellbeing [77], and whose meditation approaches find increasing and successful incorporation in clinical practice for the treatment of mental illness (e.g. [6][32]). Each perspective and related important components of, and contributors in, achieving mental wellbeing are detailed on in the following.

#### 3.1 Hedonia: Pleasure

The hedonic perspective regards wellbeing as resulting from the attainment of pleasure. It is informed by a long tradition in philosophy (e.g. Hobbes, DeSade) that regards the pursuit and experience of a maximum of pleasures as the goal of life, with happiness resulting from the accumulation of hedonic moments [62]. These pleasures can be related to the body (e.g. food, sex) as well as to the mind (e.g. fulfilled self-interests). Within the hedonic perspective exists a predominant view that wellbeing is constructed from the difference between pleasures versus displeasures, and how satisfied one feels with life [26]. This perspective therefore suggests that all human beings should strive for maximum pleasures whilst avoiding pain.

#### 3.2 Eudemonia: Realizing One's Potential

The eudemonic perspective questions pleasure and happiness as a key criterion for wellbeing [63]. Instead, it proposes that experiences of wellbeing are gained by leading a 'virtuous' life, whereby the person attains a sense of self and lives in accordance with their true self [26][62]. It suggests that if people's activities in life are in agreement with their deeply held values and beliefs and they fully engage in these activities, then eudemonia occurs as a feeling of intense aliveness and true authenticity [79]. In this perspective, simply attaining pleasures could be a gratification of 'wrong' desires such as striving for wealth or fame that may in reality increase discontentment. Instead, wellbeing is achieved by finding meaning in life and in realizing one's potential [63]. Thus, activities that relate to eudemonia afford opportunities for

personal growth and may be experienced as challenging or effortful.

#### 3.2.1 Positive Sense of Self, Purpose & Growth

Following a review of developmental, humanistic and clinical psychology literature on positive human functioning (e.g. Carl Roger's *fully functioning person* [60]), Ryff [63] identified six wellbeing dimensions that have withstood extensive empirical testing over the last two decades. These include: the extent to which the person believes her life has meaning; a sense of continued development and growth; the possessions of strong social ties; the competence to manage life situations; positive evaluations of self; and a sense of self-determination.

The assumption that all individuals have a natural tendency for personal growth (unless hindered due to social-environmental factors) has also been embraced in Ryan and Deci's [62] self-determination theory, which suggests that for personal growth three universal psychological needs have to be fulfilled: *autonomy*, feeling that one can initiate one's own behavior and act in one's own interest; *competence*, feeling effective in one's interactions with others and experiencing opportunities for expressing one's capabilities; and *relatedness*, feeling connected to others and feeling cared for. Their fulfilment is considered to lead to optimal personal wellbeing and social development, enabling the person to feel intrinsically motivated; capable of fulfilling their potential; and to seek out greater challenges in life.

A person's motivation to grow is closely linked to their understanding of themselves, their *self-concept*. Through self-expressions via the narratives that the person tells about their self, their identity gets constructed [61]. Thus, a person's self-image is informed by their life experiences, which brings attention to the interconnected role between identity and a person's memory. Particularly those memories that relate to emotionally relevant experiences and auto-biographical events form part of our identity. As life experiences can become autobiographical memories, these memories, when recalled, allow the person to (re-) experience facets of their past self and to integrate it with their active self-image. Hence, through the construction and retrieval of personal memories, as a 'resource' of the self, aspects of self can be defined, sustained or adapted, which can aid in the creation of a coherent self-image [19].

#### 3.2.2 Mental Balance

Especially in the last 5-10 years, the fields of Healthcare and Psychology increasingly draw on the spiritual tradition of Buddhism, in which skillful mental training is regarded to free the mind of any imbalance (as a source of distress) and enables the person to realize their "*fullest potential in terms of wisdom, compassion, and creativity*" (p.691) [77]. In this tradition, an authentic sense of wellbeing reflects the inner state that remains when all external, pleasurable stimuli disappear, highlighting the importance of mental balance and the cultivation of meaningful commitments to life.

To achieve mental balance, *mindfulness* meditation practice has grown in popularity and finds successful incorporation in health and clinical care practices [6][32]. According to Kabat-Zinn [44], a major pioneer of this meditation approach in the Western medical community, mindfulness "*means paying attention in a particular way: on purposes, in the present moment, and nonjudgmentally. This kind of attention nurtures greater awareness, clarity, and acceptance of present-moment reality*" (p.4). Mindfulness is not about accomplishing or changing something; it is simply about *being* by stopping to notice whatever

happens in the moment [17][45]. As such, mindfulness allows the person to tune into their body and mind, to find inner strength, and to feel more in control.

### 3.2.3 Social Wellbeing

Included in most wellbeing conceptualizations is the consideration of a person's integration in social structures and communities. Baumeister and Leary [9] for example highlight a strong connection between *belongingness* and a person's general health and mental wellbeing. They found however that mere affiliation alone, without a sense of caring cannot satisfy this need. Instead, they suggest that individuals have to have frequent personal contact with at least one other person and that these interactions have to be perceived as pleasant and to provide an interpersonal bond that is marked by stability, continuation and care. Extending previous wellbeing conceptualizations, Keyes [47] also brings importance the following social wellbeing components: feeling as being part of a society; feeling valued by and to contribute to others; having the ability to understand and predict the dynamics of a social group; feeling that one's social group can develop; and feeling comfortable with and trusting others; all of which contribute to a person's self-perception as a valuable social resource and to feel safe and cared for by others.

## 4. DESIGN FOR MENTAL WELLBEING

Whilst we have described and synthesized important mental wellbeing concepts that assist in the identification of key factors contributing to mental wellbeing, how to enable people to function well and flourish still presents a challenge. In the following we present examples of how HCI is beginning to respond to a positive mental health and wellbeing agenda. Although some of the described applications were not explicitly designed with a focus on mental wellbeing or for use within health or care contexts, their underlying concepts and functionalities help illustrate the potential for technology design to support important mental wellbeing factors, and may further assist in clarifying the various mental wellbeing dimensions.

### 4.1 Design for Pleasure

Pleasure can result from engaging in enjoyable activities such as play, entertainment, appreciation of the beauty of things, or their novelty. HCI research concerned with pleasurable experiences has brought forward concepts and disciplines such as *funology*, *emotional design*, or *hedonomics*. In this area, it has been argued that for technology to be pleasurable, designers need to take into account the *aesthetics* of a system in terms of appeal, feel or sound (e.g. [56]), and consider people as human beings with rich senses and a body, who enjoy qualities such as *tangibility* and *physicality* that offer texture, weight, and possibilities to have a sense of physical control. Some have argued that *usability* is a prerequisite for pleasurable technology use (e.g. [43]); others describe how certain disruptions can feel enlivening, or be enchanting [55]. This brings value to qualities such as *ambiguity* [34], *slowness* and *expressiveness* [36] for their thought-provoking potential. Finally, whether a person experiences a technology as pleasurable is determined by their *relationship* with it: how they interpret the technology, incorporate it into their everyday life, and how it can help in fulfilling their wider emotional and social needs.

Although experiences of pleasure are subjective, there have been large efforts in industry and research in HCI to design for entertainment and fun. Computer games appear at the forefront due to feelings of joy that often result from a sense of control, mastery and achievement. In the context of mental health, we

described earlier how game play is explored as part of therapy interventions. We also find playful engagements in designs for children with Autism or special needs. For example, *ReacTickles* [46] present a set of applications designed as cause-and-effect activities whereby colorful visuals would playfully respond to gestural interactions (e.g. pulling or stretching abstract shapes) by autistic children. These are described to enable moments of surprise and for creative, playful self-expression; to reduce challenging behaviors; and to make the child feel happy and to increase their self-confidence.

Games in particular are activities that can enable the experience of *flow*, defined by Csikszentmihalyi [24] as an optimal feeling of pleasure, where the individual feels strong; alert; in effortless control; unselfconscious; and at the peak of their abilities. Yet, flow is not a passive experience. It needs to be cultivated through an activity that is controlled by the person and that sets challenges which are neither too simple nor too difficult to achieve [26]. Associated developments of skills, feelings of personal growth and mastery that characterize flow distinguish it from the simple attainment of pleasures. Thus, experiences of flow sit in-between formulations of hedonia and eudemonia, which highlights the interwoven nature of the wellbeing perspectives. In fact, *emotional wellbeing* as described in the hedonic tradition is often regarded as a by-product of engagements in activities described in the eudemonic tradition, such as the joy that can arise from partaking in challenging activities, meeting friends, or engaging in reminiscence; and thus often presents an outcome of how the technology finds appropriation within peoples social and emotional lives.

### 4.2 Design for a Positive, Strong Sense of Self

Personal memories and their (re-)construction are fundamental to a person's self-concept. Conceptualizations of self are expressed through narratives, as the person either internally reviews their life and discovers a trajectory within it; or shares their life stories with others. As such, narratives and opportunities for self-expression have increasingly received attention in mental healthcare (e.g. *Narrative Therapy* [61][80]).

Technology offers a wide range of possibilities that allow people to capture, make sense of, or pass on their personal stories including tools to promote self-awareness and reflection (e.g. *Affective Diary* [69]; *SenseCam* [39]); media contents for reminiscence (e.g. *CIRCA* [5]; *PhotoStroller* [33]); technology heirlooms (e.g. [57]); interfaces for constructing and revisiting self-portraits (e.g. online profiles on social network sites [50]); or those that assist in forgetting personal stories [65]. There have also been large efforts to enable people to live autonomously such as assistive technologies in the field of pervasive and ubiquitous computing (e.g. [3]); and a multitude of computerized tools in education (e.g. [41]), supporting personal development through the learning of new skills [68]. See also Baumer's [10] approach to the conceptualization, theoretical grounding and study of reflection within HCI, and what it means to design for reflection.

While there are many technology applications that could be employed to support people in the construction of a positive self-image, this topic has received little attention so far within HCI research on mental health or wellbeing. Exceptions include research by Isaacs *et al.* [40], whose smartphone application *Echo* invites users to record everyday life events through photo, audio or video snapshots, text labels and happiness ratings, and encourages them to revisit and reflect on these later. Study findings revealed improvements in participants' wellbeing, who enjoyed capturing and reminiscing about positive events and

described to have benefitted from analyzing negative events or emotions; as it helped identify recurring patterns or habits, and plans for changing those.

Demonstrating not only the value of technology design to support internal sense-making and reflection processes, but exploring opportunities for socially constructing and enhancing a person's self-image, Clarke *et al.* [18] worked with a group of women survivors of domestic violence, which often severely impacts on their self-esteem (i.e. causes feelings of shame) and affects their relationships with other people. Thus, to rebuild a life, an understanding of self, and trust and confidence in new social bonds after such a life disrupting experience is challenging. Clarke *et al.* invited the women to partake in a series of group-based 'digital portrait workshops' to collect, create and share photo- and video representations of their personal experiences through which the women would reflect about and share their experiences of 'moving on'. Some of these stories emphasized the importance of newly formed friendships; others visualized transitions in their life. The photo-sharing practices became a vehicle to explore and (re-) construct their self-image with others, and assisted in forming and maintaining new social bonds.

Another interesting example of how technology can assist in maintaining and re-constructing a person's sense of self is the interactive art piece *Tales of I*, by Wallace *et al.* [78] for people who have moderate-to-severe Dementia. The piece is a two-part furniture comprising of a wall cabinet with a selection of resin globes that, when placed on top of a bespoke TV cabinet, trigger the playback of a short film showing footage of a specific theme (e.g. nature, football) and different periods. Interactions with the films were found to not only enable pleasant experiences of reminiscence; in referencing to self-relevant materials in the films, they stimulated conversations with caregivers and thereby helped the person with Dementia to recognize and preserve a sense of their identity (e.g. being part of a family or particular community), even if only for a short period. This also provided a way in for both staff and family members to form and strengthen their relationship with them.

### 4.3 Design for Mental Balance: Mindfulness

Mindfulness can be cultivated in many different ways. It is most often practiced through formal meditation exercises that guide the individual in how to enhance their awareness [30]. Initially, these are usually concentration-based, and for example direct the person to focus their attention on a specific stimulus like their breathing [6], and to repeatedly redirect their attention to this stimulus, should they get distracted [44]. To become more aware of oneself however does not imply that the person becomes more involved in the content of their life, but that they become more attentive to their direct, in the present moment, experiences. For example, to bring mindful attention to the body does not mean to *think about* the body, but to *be aware* and observant of one's sensations in the body [81].

The increasing popularity of mindfulness as a means to maintain or restore mental balance and cope with everyday stresses, has led to a multitude of commercial software applications (e.g. *Buddhify*<sup>1</sup>, *Stillness Buddy*<sup>2</sup> or *Head Space*<sup>3</sup>) that remind their user to take regular breaks to engage in specific exercises (i.e. focused

breathing). Within HCI we only find few and mostly theory-informed designs that tend to utilize sensor technology to measure a person's internal physiology (e.g. galvanic skin response, heart rate) or body movements (e.g. depth of breath), and translate these creatively into visualizations or sounds. Existing designs differ in the extent to which they offer participants guidance, whereby some introduce mindfulness through experiential exploration, other designs actively guide the user through a specific mindfulness exercises (e.g. movement instructions) or are intended to be used with a mindfulness coach.

For example, *Sonic Cradle* [75] is an interactive piece that comprises a hammock chair placed inside a dark chamber (to remove any visual distraction) and enables the person sat in it to shape the soundscape in the room through variations in their breathing, as assessed by respiratory bio-sensors attached to their chest. As such the system invites the person, without any additional guidance, to bring continued awareness to either their breathing, or the sound. By inviting the user to bring attention to both their bodily responses and/or the related audio feedback, mediation novices can learn how to concentrate on certain stimuli. Simultaneously, however, it increases opportunities for distraction and immersion that differ from a mindful state of being focused and alert. More research is needed to better understand how technology can be used effectively to assist in the learning and practice of mindfulness, and thus people's mental wellbeing.

Moreover, to learn mindfulness skills and to experience their beneficial effects requires regular practice and time, which present key challenges. Most existing designs present art installations and have so far only been explored and evaluated in one-off sessions; usually involving novices rather than experienced meditators; and outside health and care contexts. One exception can be found with Thieme *et al.* [71][73], who introduced the *Mindfulness Sphere* – a ball-shaped artefact that upon touch assesses and reflects the person's heart rate through colorful lights to invite focused attention – to women who suffered from borderline personality disorder. Nevertheless, the design and potential of utilizing mindfulness technologies for promoting mental health is largely under-explored especially for people with mental health problems.

### 4.4 Design for Social Wellbeing

A powerful determinant of mental wellbeing is the human need for positive and stable social relationships. Within HCI, a significant body of work has sought to support, augment and extend intimate experiences (cf. review by Hassenzahl *et al.* [38]). Many of these designs address the sensual character of intimacy (e.g. touch, hugging, warmth); support a sense of social connectedness between separated people (e.g. between parents and hospitalized children [76]); or mediate social interactions using for instance Skype or online social network sites (SNSs).

Moreover, robots have been designed to act as social companions to children or care home residents. Such robots are commonly equipped with sensors and motoric abilities that allow them to be responsive if talked to or touched, and are designed to engender play, social interactions and relaxation. Despite their limited abilities, robots are often experienced to be 'alive enough' to be loved and cared for [74]. It remains subject to future work to explore to what extent robots can provide fulfilling social interactions or help overcome feelings of loneliness, as they cannot truly understand or care about a person. Robotic companions also raise moral concerns in particular for the care of children and the elderly, whether engagements with the

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<sup>1</sup> <http://buddhify.com/>

<sup>2</sup> <http://www.stillnessbuddy.com/>

<sup>3</sup> <https://www.getsomeheadspace.com/>

technology compensate for a lack of human attention; and may take away from more meaningful social interactions.

In addition, SNSs have become very popular for providing social and emotional support, particularly to people who suffer from stress or mental health problems. These can be standalone online wellbeing support communities such as *BigWhiteWall*<sup>4</sup>, *BeatBullying*<sup>5</sup> or *Time-to-Change*<sup>6</sup>, or implementations within wider SNSs such as Facebook. In an attempt to investigate the relationship between peoples' uses of Facebook and their social wellbeing, Burke *et al.* [13] for example found that directed communication with friends such as leaving wall comments or liking their photos related to greater feelings of social bonding and less loneliness, whereas users who primarily consumed contents of others (e.g. read stories about their friend's activities) reported less social bonding and greater loneliness. Thus, although Facebook use generally correlated with greater overall wellbeing, the quality of interactions within SNSs determined if and how social bonds were maintained or strengthened.

Although technology can help create opportunities for initiating, mediating or recreating social interactions, more research is needed to investigate for example: how social ties can be promoted, exploring more deeply the importance of frequency, person-directedness, mutual investment and a sense of caring in our interactions with others; or how technology can lower barriers to becoming part of a community and enable the person to feel socially accepted and supported, particularly in the context of mental health.

## 5. DISCUSSION

In this paper we have argued that research in HCI for mental health should expand its focus from the development of applications that predominantly address the treatment of mental health problems, to include more positive approaches to the promotion of mental health. Although initial examples have emerged in response to this more holistic agenda (e.g. [49][73]), the field needs to increase its effort to include strategies that can positively contribute to peoples' mental wellbeing in both the design and evaluation of future technology. An explicit consideration of mental wellbeing promises to enhance the effectiveness of our designed interventions in combating mental illness and in preventing relapse or the onset of mental health difficulties. It also improves our knowledge as to how we can support people's quality of life and provide appropriate care for those populations, who cannot recover from their mental health problems, such as in Dementia (cf. [23][78]). Although this paper is especially targeted at the mental health community in HCI, our call for more research on positive emotional, psychological and social health implicates other health and social care communities as well as society and policy makers more generally.

### 5.1 Understanding Mental Wellbeing

The term 'wellbeing' is widely used in academic literature and across many disciplines where it is often treated uncritically as something that is well-known and fixed. Conversely, wellbeing

presents a rather complex, multi-faceted and dynamic concept that is still under-theorized and under-explored. Thus, the need to gain a more in-depth understanding of mental wellbeing and how to explicitly design for it has become a recent and increasing concern in HCI research on mental health – see for example workshops at DIS 2012 [72] and CHI 2012 [21] and 2015 [68] – and for design more broadly (e.g. [25]). In an effort to structure and consolidate existing research, to provide guidance for and inspire future work, and help develop a vocabulary for HCI researchers to articulate how their designs relate to different aspects of mental wellbeing; we presented a framework that is informed by the hedonic and eudemonic tradition in Western Psychology and the Buddhist concept of mental balance, and illustrated how technology design has the potential to contribute to identified mental wellbeing components.

We have to acknowledge however that our component based description of mental wellbeing is reductionist and may not account very well for the complexity and fluidity of the subjective experiences that accompany a person's process of self-realization and flourishing. While we have brought attention to the interwoven nature of the wellbeing perspectives presented in this paper, our list of wellbeing factors and approaches to achieve wellbeing is by no means exhausted. Moreover, a variety of moderating factors that can impact on a person's mental wellbeing such as personality traits, individual needs, context factors, or physical health have not been extended on in this paper.

We therefore regard our conceptualization of mental wellbeing as a 'working definition' that is intended for other researchers to build on, critique and adapt; aiming to invite more research and debate on the topic. We believe that technology design can become a useful vehicle for researchers to explore and test their assumptions as to how interactions can be configured to nurture aspects of mental wellbeing, which can help clarify and develop our understanding of this concept. Moreover, since mental health has mostly been talked about in healthcare and (clinical) psychology literature, little consideration has been given so far to how the general public understands mental health and wellbeing promotion. To start filling this gap, we propose that more research is needed that meaningfully involves people in research and design activities on positive mental health.

### 5.2 Foregrounding the Person not the Illness

Social stigma associated with experiences of mental health problems can hinder individuals in accessing mental healthcare services and in adhering to treatment [27]. Matthews and Doherty [54] for example, reported how the title of their *Mobile Mood Diary* application meant that some of their adolescent participants did not install it on their phone since they were afraid their friends would see it. Moreover, in building on traditional healthcare practices, many existing technology applications directly or indirectly prompt the 'patient' to be 'compliant' with their 'treatment', reminding them of their 'problem behaviors' and the necessity to monitor and record their 'illness symptoms' (cf. [29]); all of which can feel disempowering and contribute to disengagement. Thus, how mental health interventions are framed and the language that is used to introduce interactions to the person presents an important design consideration. Particularly for mental health designs for people who experience difficulties, it is crucial to break-off any self-invalidating cycles and foci on the vulnerabilities and limitations of the person, and to regard them instead as individuals with strengths, interests and talents, who possess the skills and ability to progress and develop.

<sup>4</sup> Online mental wellbeing service:  
<https://www.bigwhitewall.com/>

<sup>5</sup> Advice and help by online counsellors for adolescents and children that experience bullying: <http://www.beatbullying.org/>

<sup>6</sup> Online service to challenge mental health stigma and mental health discrimination, and for organizing community activities and events: <http://www.time-to-change.org.uk/>

More consideration should also be given not only to reward users for engaging with a technology, but to accept that they may dis-engage and to offer strategies for re-engagement that are respectful of potential feelings of self-guilt in this regard.

### 5.3 Foregrounding the Human, not the Technology

For the design of mental health promoting interventions, we further argue that careful attention should be given to the role that technology generally can or should fulfill in providing appropriate support.

For example, Lupton [52] critiques solutionist and instrumental approaches to the application and study of digital health technology that often focus on the efficacy of the system (e.g. usage statistics), privacy and confidentiality issues, and the accuracy of the information provided. She brings emphasis to the importance to gain a better understanding of peoples' experiences of selfhood and embodiment as they are engaging with the technology and how they appropriate and make sense of it within their everyday life. Especially in the context of interventions to address symptoms of mental illness, there is a risk that a naïve deployment of for example self-monitoring devices and the metrics that these provide of collected personal data may nurture obsessions or anxiety to do and stay well. More research in this area is needed.

In Section 4.4, we further talked about the role of robotic companions in the care of children and elderly people and the ethical and moral concerns that are associated with them potentially serving as a substitute for human interactions (cf. [12][12][74]). In addition to risks of reduced human contact, Sharkey and Sharkey [66] also bring close attention to ethical concerns related to: increases in feelings of objectification and loss of control, privacy and liberty; deception and risks of infantilisation; and the extent to which the person (e.g. elderly person or child) has control over the robot. To address concerns such as these and to contribute positively to peoples' lives, the authors suggest a careful introduction of the technology to ensure that it is sensitive and benefits the person rather than a focus on technology deployment to reduce i.e. the costs of care provision.

We share this sentiment and believe that more consideration should be given to how technology intended to promote peoples' mental health can find meaningful incorporation into their life. This likely extends the scope from technology design as an end-goal or solution to a problem behavior toward the design of 'services' for, and 'activities' around, the use of technology that help bring balance and satisfaction to life; enable people to have fulfilling relationships; and fosters a sense of self and purpose.

Considering the importance of human relationships and support in the promotion of mental health (cf. [4]), there is scope here to more actively involve a person's extended care team in design processes and as technology enablers. Often, we find examples of parents wishing to support their child's wellbeing (e.g. [76]), or of family members showing concern for their relative with Dementia. Matthews and Doherty [54] for example described how many parents would complete complex mood-charts for their children. Involving those people that are close to the individual into the design of activities that evolved around or are prompted through a technology may further contribute to the creation of mental health promoting activities that are perceived as personal rather than as generic, medical or technical.

## 5.4 Designing & Evaluating Mental Health and Wellbeing Technologies

To inform and evaluate the design of mental health and wellbeing technologies and to gain an in-depth understanding of people's experiences and how they are unique to each person through their own interpretations, feelings, value judgments and abilities, requires an empathic approach [84]. Within the mental healthcare field, the application of traditional user-centred, participatory and iterative design methods however is often constraint by strict ethical considerations and procedures that regulate access to sensitive care settings or direct contact with populations that are perceived as vulnerable (e.g. because of their mental health problems; cf. [27]). This has considerably limited end-user involvement particularly in the design of new technologies (for rare exceptions see [7][49]), which instead are often informed by mental health professionals and build on traditional healthcare approaches. This requires us to identify sensitive, ethical and socially responsible approaches to working with our end-users. Marshall *et al.* [53] for example, recently described how engaging vulnerable populations (i.e. adults with a mental disorder) in co-design activities that involved 'creative making', in itself helped to empower the person and positively contributed to their mental wellbeing.

While approaches and strategies for supporting mental wellbeing can principally contribute to reductions in mental illness symptoms and vice versa [48], or may even overlap as we find it in the case of mindfulness practice; it is important that assessments of positive aspects of mental health are explicitly included in evaluations of mental health designs. In addition to common qualitative methods (e.g. interviews, observation) that are employed to gain a rich understanding as to how interactions with a technology relate to mental wellbeing; there are also a variety of quantitative tools to assess positive aspects of mental health. In the Healthcare and Psychology domain, we find increasing use of scales such as Ryff's *Psychological Well-Being Scales (PWBS)* [63] that encompass items for each of her six identified wellbeing dimensions; the *Psychological General Well-Being Index (GPWBI)* [35] that measures self-representations of affective and emotional states, or the positively worded *Warwick-Edinburgh Mental Well-Being Scale (WEMWEBS)* [70] that assesses hedonic and eudemonic aspects of mental wellbeing. Keyes [47] too developed a scale to assess his five dimensions of social wellbeing, the *Social Well-Being Scale (SWS)*; and there are measures specifically for mindfulness such as the *Mindfulness Attention Awareness Scale (MAAS)* [42] and the *Cognitive and Affective Mindfulness Scale-Revised (CAMS-R)* [31].

## 6. CONCLUSION

In this paper we have argued that to effectively enhance people's mental health and support their recovery from (or prevent the onset of) mental illness, HCI for mental health must explicitly incorporate positive approaches in the design and evaluation of technology mediated interventions. To this end we have: (i) provided a framework for mental wellbeing which describes it in terms of positive emotional, psychological and social health; (ii) presented examples of how HCI is beginning to respond to this more holistic mental health agenda; and (iii) proposed avenues for future designs and research in this area. As such, the paper is intended to help guide and inspire future work that can help clarify and extend our understanding as to how we can enable people to flourish as individuals and enhance their quality of life.

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