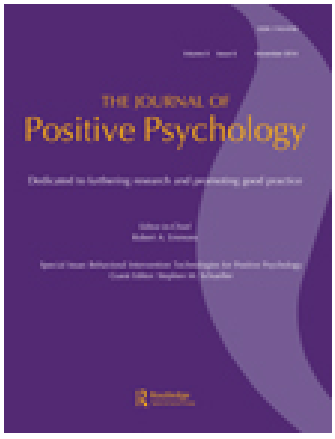

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Positive impact by design: The Wales Centre for Behaviour Change

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Positive impact by design: The Wales Centre for Behaviour Change

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The Wales Centre for Behaviour Change is a research project that aims to integrate positive psychology with emerging technologies and behavioral science to promote prosperity and well-being. The behavioral focus emphasizes choice architectures and environmental triggers in their influence on positive change. This paper describes the background for this project, as well the theory and design of the center and its work. We review behavioral intervention technologies that the center is employing, or plans to employ, to augment the decision-making capabilities of its target audience. Technologies can be positioned in the behavioral stream to reduce complexity and distraction and in so doing help individuals make optimal decisions.

Keywords: nudge; innovation; intervention; design thinking; multidisciplinary; well-being

Introduction

Positive psychology builds individual and social capital to promote prosperity and resilience. In real terms, it provides a framework for adopting and maintaining healthy values, beliefs, attitudes, and behaviors, enabling individuals to flourish and achieve their goals (Seligman, Steen, Park, & Peterson, 2005). In recent years, the science of behavior and of change has grown in importance in government policy. For example, the UK Government created a Behavioural Insights Team (the 'Nudge Unit') in 2010, the remit of which was to employ behavior theory to help meet Government targets, save public money, and help people improve their lives (cf. Dolan, Hallsworth, Halpern, King, & Vlaev, 2010; Sunstein & Thaler, 2008). The Wales Centre For Behaviour Change (WCBC) follows this lead and is funded by the Welsh Government. It is a multidisciplinary venture with a primary goal of integrating the best of positive psychology, behavioral science, and design thinking and technology in order to promote resilience and well-being through positive behavior change.

The main goal of the WCBC is to achieve change through focusing on decision-making. Decision-making is a valuable target because an individual's behavior does not always reflect stated intentions; a discrepancy known as the 'value-action gap' (see Darnton, 2008 for review). This gap has been variously attributed to a breakdown of willpower, motivation, or knowledge (Evans, 2008; Kahneman, 2011). One explanation for this gap is that multiple brain systems contribute to behavior (generically termed 'dual-process models:' for example Evans, 2008; Kahneman, 2011). While one system supports explicit intentions (values), another underlies the control of pre-potent, stimulus-driven or spontaneous behavior (actions). Addressing this value-action gap requires augmenting the ability of individuals to implement and adhere to their intended goal-directed behavior.

According to dual-process accounts of behavior, some situations present distracting cues and behavioral alternatives which compete with and override an individual's original intention. For example, even with a prior commitment to make a healthy food choice, an individual may give in to temptation when presented with an unhealthy option. In dual-process terms, the implicit system has a stronger drive to control behavior, or is triggered automatically by local cues in the environment. Furthermore, when a situation becomes too complex or overwhelming for cognitive capacity, a default or prepotent response is often produced. In this case, the explicit system cannot resolve a response and so yields to the implicit system. Broadly speaking then, maladaptive behavior predominantly stems from situations in which implicit tendencies override explicit values and goals.

Behavioral intervention technologies (BITs) can support and scaffold the human decision-making process. An overarching principle of the work of the Centre is that optimal decision-making can be achieved through using BITs to (1) reduce distractions in order to support explicit intentions and goals and to (2) simplify complex choices (Mohr, Burns, Schueller, Clarke, & Klinkman, 2013). This then enables an individual to focus on meaningful activities and thoughts. Technology, and

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specifically BITs, can provide clear and timely information to an individual, raising awareness of vulnerable situations and prompting appropriate actions in given contexts. Smartphones are able to utilize a range of features for local information capture, processing, and display. With increased access and bandwidth of cellular networks, information can now be uploaded, integrated, and processed on a massive scale. This allows rapid computation to help reduce perceived complexity and distraction through 'intelligent' software agents that tailor available options (Thomas et al., 2013).

BITs to reduce distraction

The WCBC is currently developing BITs to support individuals in making healthier choices by reducing distraction and reminding them of their intentions (i.e. values and goals). Essentially, the rationale is that one's intentions are an insufficient signal when compared to the noise of environmental stimuli and behavioral cues. As a great deal of our behavior is triggered covertly by salient cues (Aspden, Ingledew, & Parkinson 2012), BITs can be designed to raise the salience or effectively time the presentation of 'healthy' cues. This raises the signal-to-noise ratio of one's desired behaviors and intentions against the distractions of the environment. We are developing a Three Good Things smartphone app (Shanks & Parkinson, 2013), which expands the standard positive psychology intervention (e.g. Seligman et al., 2005) with automated reminders and progress tracking. The app has separate tabs for background information, assessment (well-being and other questionnaires), three good things diary, and results. Background information serves as a portal to find out more about positive psychology (through links to Internet resources). The app can also be set to a 'control group' mode in which the diary prompts users to enter neutral events rather than 'good things.' As part of an ongoing PhD project (Shanks & Parkinson, unpublished), an initial prototype phase has helped refine the app design for the positive psychology intervention. For example, whereas individuals using a pen and paper version often fail to complete the diary (through distraction; Shanks & Parkinson, unpublished), the custom reminders and accessibility of the diary on a smartphone should help reduce distraction and increase the 'signal' of using the diary. We are currently finalizing the smartphone app with the intention of a running a study in undergraduate participants comparing the smartphone app, a standard pen and paper version of three good things, and a control group.

A separate BIT being developed by the WCBC looks at the experience of 'flow' (Csikszentmihalyi, 1990) and its relationship to optimal functioning. Csikszentmihaly describes flow as inducing a powerful attentional focus on the current task as demonstrated by a resistance to distraction. As such, a flow state can help individuals achieve their current goals (Csikszentmihalyi, 1990; pp. 18–21). To begin to explore this, we conducted a study with university undergraduates who either played a videogame designed to induce flow or watched a wildlife documentary for 20 min, and compared the impact on their divergent thinking and creativity (Tomlinson, Bailey & Parkinson, unpublished). The flow condition used the PlayStation game *Flower*, which requires users to navigate ('fly,' from an egocentric, first-person perspective) an animated natural landscape incorporating footpaths, flowers, boulders, and other natural features. During gameplay

> … the player controls the wind as it blows a single flower petal through the air. Changes in the pitch and roll of the floating petal are accomplished by tilting the PlayStation 3 controller. Pressing any button blows the wind harder, which in turn moves the petal faster. The camera generally follows just behind the petal, though it sometimes moves to show a new objective or consequence of the player's actions. Groups and lines of flowers are present in each level; approaching these with the petal causes them to bloom and a new petal to trail the first. When the player approaches certain flowers or groups of flowers, changes are made to the game world. These can range from opening new areas, transforming dead grassy areas to bright green fields, or turning on wind turbines. These changes generally result in new flowers sprouting for the player to interact with. (Retrieved 12th May 2014 from http://en.wikipedia.org/wiki/Flower_(video_game))

There is no explicit goal, but the gameplay is designed to focus attention on following paths and triggering changes in the landscape. The progression in difficulty of following paths across levels provides a challenge-skill balance in keeping with flow theory (Csikszentmihaly, 1990). In our study, following the experimental manipulation, participants completed a measure of affect (Positive Affect Negative Affect Scale, PANAS; Watson, Clark, & Tellegen, 1988) and flow (Flow State Scale, FSS-2; Jackson, Martin, & Eklund, 2008). Whilst there were no significant differences in affect between the two groups, participants who played *Flower* showed significantly higher levels of flow. Following the induction of flow, participants completed the alternative uses task, a measure of creativity, which requires participants to think of multiple and divergent uses for a target object such as a paper clip (Guilford, 1967). Participants in the flow group showed significantly higher levels of creativity compared to control**.** In a parallel study, we introduced a 20-min delay between playing the game and completing the questionnaires and test of creativity. Following the delay, the experimental group still showed increased flow and an increase in creativity compared to controls. Although 'Flower' was not developed by the WCBC, we are exploring an extension of this work with the aim of

inducing flow using a smartphone application. The smartphone app will induce flow by requiring the user to focus attention and track a target stimulus displayed on the screen. The app will adjust the difficulty of the task in response to improvements in the user's ability and thus maintain the challenge-skill balance that is essential for flow states (Csikszentmihaly, 1990; see also http://www.jenovachen.com/flowingames/thesis.htm retrieved 12th May 2014). The smartphone application is in the design stage at the present time.

Flow can also be induced through engagement with the arts, such as visiting museums (Harvey, Loomis, Bell, & Marino, 1998). Harvey et al. (1998) found that the design (including interactive features) of a museum can influence the extent to which visitors would experience flow and feel immersion with exhibits. The WCBC is currently developing a smartphone app, 'What's Your Story?' that is based on the traditional 'audio tours' that are a feature of many cultural establishments. The novelty lies in enabling visitors to create their own 'tours' by taking pictures and recording stories and thus contributing both to the exhibits and to the experience of other visitors. For example, a visitor might recognize a museum artifact and recall a past memory. With the app, they could narrate a story relating to their memory and upload the story to be associated with the exhibit. Subsequent visitors could listen to these narratives, thus sharing memories and cultural heritage, and promoting a deeper engagement with museum artifacts. This digital humanity project adds value and transforms cultural heritage resources (Howe, 2006). Increasing people's involvement in the creation of content can promote a sense of agency, empowerment, and ownership. When using the app, visitors report their well-being after recording or listening to audio, providing additional research data to the WCBC on the value of deploying the 'what's your story' application.

BITs can also be used to help reduce maladaptive behavior. A collaborator with the WCBC has developed a gamified smartphone app to retrain attention away from alcohol cues (Cox, Fadardi, Intriligator, & Klinger, 2014). The goal within the game is to respond to a target stimulus as quickly as possible while ignoring non-target stimuli. Alcohol cues serve as the non-target stimuli and so the game covertly biases attention away from alcohol-related stimuli. Earlier work has shown that heavy drinkers show an attentional bias towards alcohol, and that attentional retraining can reduce alcohol consumption (Fadardi & Cox, 2009). The gamified version attempts to make this retraining process fun and engaging. The center is collaborating with these researchers to determine whether attentional retraining could benefit other motivation domains (for example, unhealthy eating). The first stage will be to demonstrate that highly motivating food stimuli produce similar attentional biases on a comparable task. Then food stimuli will be used in the smartphone application to assess whether these biases can be retrained.

BITs to simplify choices

Mohr et al. (2013) state that a key challenge for research is the need for new models to understand, test, and evaluate BITs. Understanding complexity and choice dynamics is a key element of the Cynefin model of knowledge (Snowden, 2005), which the WCBC has employed to design and evaluate BITs. Cynefin is a Welsh word that broadly translates as habitat or environment. It provides a framework for understanding cause and effect relationships across different experiential contexts and thus provides a basis for determining the best course of action for a given situation (Snowden & Boone, 2007). As a decision space becomes more complex, humans rapidly run out of processing capacity (Evans, 2008). In such situations, an individual's pre-potent and habitual behaviors tend to dominate. BITs can 'step in' and either help prevent a maladaptive habit being triggered or can facilitate and support adaptive responding. In essence, the processing power of a BIT can analyze a complex data-set of an individual's behaviors and choices looking for important patterns. These patterns can then reveal which behaviors are more likely to lead to positive (or negative) outcomes in subsequent behavior and so provide a mechanism to help simplify choice. Such patterns might reflect behaviors, or combinations of behaviors, that lead to ill health (for example, risk of obesity or type II diabetes) or those that build resilience and well-being. As such, a BIT can reduce the apparent complexity of lifestyle choices in order to identify a 'healthy' path through everyday decisions – which are tailored to the individual in a given situation.

The Cynefin framework helps a BIT designer to understand, and predict, situations that are likely to result in working memory overload and hence automatic or intuitive responding – the sort of situations that will benefit from a reduction in complexity. Therefore, using Cynefin to design and implement BITs enables individuals to structure choices and simplify them in order to allow the best choice to be made in a given situation (Figure 1).

Cynefin has four primary informational domains: simple, complicated, complex, and chaotic. Effective behaviors in each informational domain are organized into three steps, with each ending in a response from the user. Figure 1 depicts each of these domains and the corresponding steps. In the simple domain, behavior flows most directly from information and explicit knowledge. An individual merely needs to sense information, categorize the information, and respond. In the chaotic domain, individuals act first, sense information second, and form

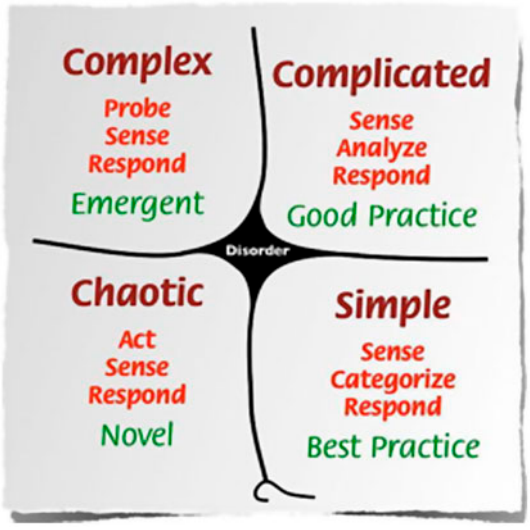

Figure 1. The Cynefin model of knowledge. From Snowden, D. (2013) Cynefin framework, http://en.wikipedia.org/wiki/File:Cynefin_framework_Feb_2011.jpeg.

a resultant response last. This leads to responses that are disorganized and novel, flowing from implicit processes rather than an individual's explicit intentions. Thus, with respect to dual-process theory, domains on the right half of the model (simple and complicated) conform to rational, knowable, explicit information, while domains on the left half (complex and chaotic) reflect knowledge that can only be understood in intuitive and implicit ways.

A WCBC project (in collaboration with Snowden, author of Cynefin) which demonstrates the value of this analysis uses a mobile application called Sensemaker (Snowden, 2010; cf. http://www.sensemaker-suite.com/smsite/index.gsp). Sensemaker is an app that runs on most media devices (smartphone, tablet, and weblink) which captures narratives and allows the writer to then index the content of their story against predetermined criteria. The narrative can be entered as text, recorded as audio, or simply represented by a photograph. Participants receive access to the system to use without the direction of a clinician or researcher. As such, individuals work as their own ethnographers free from any influence of the research team. Depending on the study, a single narrative can be collected or a series over time and individuals can be prompted to write a narrative at a prearranged time or they can simply be given access to the system and asked to record as and when one comes to mind. Within the app, once a narrative is entered, the participant is asked a series of questions about it. These questions help index the narrative according to themes that are important to the underlying research questions. Thus, producing quantitative data in the form of the indexed values and qualitative data in the form of the narratives.

WCBC is currently working with a local community organization to use Sensemaker to understand attitudes and behavior relating to age and ageing. In North Wales, many isolated rural communities with an aging population exist, creating a concern about how to maintain quality of life in these communities. Themes of 'empowerment,' 'dignity,' and 'loneliness' are relevant for this population and have been used as indices for the Sensemaker project. Community residents with the app are asked to record any significant experience. They then rate their story with respect to empowerment, dignity and loneliness. Using the indexed narratives collected through Sensemaker, we can explore patterns that occur within the population – for example, most people believe that loneliness is the responsibility of the individual. The patterns and narratives can be shared with stakeholders to inform potential actions for community groups and individuals. At this stage, the behavioral element of the project will be implemented by providing tailored advice to organize community groups. However, the next iteration of this work will develop the Sensemaker app to enable the researcher to send tailored behavioral messages based on narratives entered and patterns uncovered directly to individuals via their mobile device.

Designing multidisciplinary BITs

The organizational structure of the WCBC was designed to support a collaborative, multidisciplinary approach to intervention development (Goodman, Pierce, & Owen 2013). The structure, termed "MUD(BASE)," uses a Multidisciplinary User-centered Design (MUD) process, incorporating specialists from Business, Arts, Science and Engineering (BASE). As Schueller, Muoz, and Mohr (2013) note, this approach is critical to the design of BITs, as many are currently designed solely by psychologists and are merely digital translations of existing evidence-based interventions (Figure 2).

Informed by Design Thinking (Brown, 2008), novel BIT interventions and research methodologies are developed through an iterative process. Each iteration includes: (1) problem identification, (2) solution ideation, and (3) solution critique and selection. Initially, sketches, diagrams, and low fidelity, physical prototypes are used to represent solutions, prioritizing speed and quantity over production quality. Key advantages of this approach, particularly when followed during the early stages of development, include: (i) rapid development of shared mental models and language for subsequent decision-making, and (ii) reduced investment and emotional attachment to proposed directions reduces discord among collaborators. Figure 2 provides a graphical representation of the various specialist academic domains that combine (the BASE)

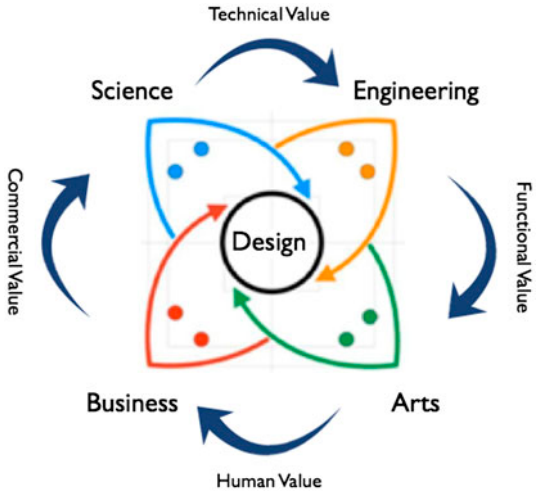

Figure 2. The MUD(BASE) prototypology (Goodman et al., 2013), which underlies the multidisciplinary structure and process followed by the Wales Centre for Behaviour Change. Each petal represents a specialist domain and the team as a whole functions to use a design thinking approach to developing positive behavioral solutions through multidisciplinary innovation. This organizational structure is specifically designed to provide a balanced and creative contention among specialist collaborators. The value ultimately created by meeting user requirements, defined at the center of the structure, exceeds that created by the BASE specialists working independently.

with the WCBC in order to design and add value to a BIT. With multidisciplinary experts in the team, there is a significant breadth and depth of knowledge available to the multidisciplinary design process (Schueller et al., 2013). The ultimate output is evidence base of what works in different implementation domains. Importantly, when designing a BIT the end-user is included in process. Such a co-design approach means that solutions are filtered and shaped by the individuals that will be using the technology and so the research tends towards solutions that are much closer to implementation than is normally the case (Eccles et al., 2009).

Conclusions

The WCBC is designed around the need to respect many factors of importance to successful academic collaboration and application of research in the real world. Its remit can be considered to extend positive psychology into the design, technical, and behavioral domains. It embeds behavioral intervention technologies in its user-design and uses a novel framework (Cynefin) to understand and shape research and BIT development. The basic rationale of the center's work is to help individuals make optimal choices in a complex and distracting world. Its work is on the scale of individual behavior change, but its scope is societal.

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