ENDURING HAPPINESS: A STUDY OF ONLINE WELL-BEING INTERVENTIONS

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General Declaration

In accordance with Monash University Doctorate Regulation 17/ Doctor of Philosophy regulations the following declarations are made:

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes one original paper published in a peer reviewed journal and three unpublished publications. The core theme of the thesis is online well-being interventions. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the candidate, working within the Department of Psychology and Psychiatry under the supervision of Dr Dianne Vella-Brodrick and A/Prof Britt Klein. The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research. In the case of chapters 2, 3, 4 and 5 my contribution to the work involved the following:

Thesis chapter	Publication title	Publication status	Nature and extent of candidate's contribution
2	Positive psychology and the internet: A mental health opportunity	Re-submitted	Conceptual development, design, administration, data analyses and principal author
3	A randomised controlled trial of a self-guided internet intervention promoting well-being	Published	Conceptual development, design, administration, data analyses and principal author
4	Flourishing online: Prevalence of well-being and psychometric properties of the MHC-SF	Submitted	Conceptual development, design, administration, data analyses and principal author
5	A randomised controlled trial of online positive psychology interventions: Strengths and mindfulness	Submitted	Conceptual development, design, administration, data analyses and principal author

Signed:

Joanna Mitchell
13th December 2009

List of Publications Included in Thesis

(in order of appearance in thesis)

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List of Other Publications Completed During Candidature

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Kiropoulos, L., Klein, B., Austin, D. W., Gilson, K., Pier, C., Mitchell, J., & Ciechomski, L. (2008). Is internet-based CBT for panic disorder and agrophobia as effective as face-to-face. *Journal of Anxiety Disorders, 22*, 1273-1284.

Klein, B., Austin, D., Pier, C., Kiropoulos, L., Shandley, K., Mitchell, J., Gilson, K., & Ciechomski, L. (2009). Internet-based treatment for panic disorder: Does frequency of therapist contact make a difference? *Cognitive Behaviour Therapy, 38*(2), 100-113.

Klein, B., Mitchell, J., Gilson, K., Shandley, K., Austin, D., Kiropoulos, L., Abbott, J., & Cannard, G. (2009). A therapist-assisted internet-based CBT intervention for post-traumatic stress disorder: Preliminary results. *Cognitive Behaviour Therapy, 38*(2), 121-131.

Pier, C., Austin, D., Klein, B., Mitchell, J., Schattner, P., Ciechomski, L., Gilson, K., Pierce, D., Shandley, K., & Wade, T. (2008). Evaluation of internet-based behavioural therapy for panic disorder in general medical practice. Family *Medicine Mental Health, 5*, 29-39.

List of Abbreviations

CC	Complete case analysis
DASS-21	Depression Anxiety Stress Scale – Short Form
HLM	Hierarchical linear modeling
ITT	Intention to treat
LOCF	Last observation carried forward
MAAS	Mindful Attention Awareness Scale
MCAR	Missing completely at random
mDES	Modified Differential Emotions Scale
MHC-SF	Mental Health Continuum - Short Form
OPPI	Online positive psychology intervention
OTH	Orientations to Happiness
PANAS	Positive and Negative Affect Scale
PPI	Positive psychology intervention
PWB	Psychological well-being
PWI-A	Personal Well-being Index - Adult
RCT	Randomised controlled trial
SEM	Structural equation modeling
SWB	Subjective well-being
SWLS	Satisfaction With Life Scale
TIPI	Ten Item Personality Inventory

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I would like to acknowledge the man who inspired the start of my thesis but sadly is no longer alive to see it finished, Professor Jeff Richards. Jeff's protégée, Britt Klein, started as my primary supervisor and was joined a year or so later by co-supervisor Dianne Vella-Brodrick. Thanks to both Britt and Dianne for all their support and expertise. Dr Rosanna Stanimirovic has also been an amazing supporter of the Wellbeing Online project, contributing her wealth (via her AIS budget), work and wisdom throughout the project, all of which has been invaluable to me. Thanks to Denny Meyer (HLM guru) and Simon Moss for statistical feedback and support. Financial support was provided by a National Health and Medicine Research (NHMRC) PhD public health scholarship. The Wellbeing Online website (#1) was funded via a Monash University SPARN grant, and developed by Janison. The Wellbeing Online website (#2) was funded via the AIS and developed by David Shields and Donna Moore. Many PhD buddies, colleagues and mentors have given meaning to this journey by sharing ideas, cups of tea, frustrations, support and fun along the way. Thank you Jacci Norrish, Susana Marques, Kaveh Monshat, Shane Lopez and the Gallup Summer Strengths Research crew, Ally Mitchell, Acacia Parks, Gyongi Salvonez, Adrian Medhurst, Kat Page, Suse King, Clara Gaff, Ciaran Pier and the coffee shops on Flinders Lane. Thanks to my fabulous family – parents, siblings and niblings.

For Maggie and Stuart (the other kind of Dr)

Abstract

The central objective of this thesis was to explore the health promotion potential of interventions that enhance individual well-being and their delivery via the internet. The thesis started with a literature review integrating two fields of research, positive psychology and internet interventions (*Paper 1*). The review identified online positive psychology interventions (OPPIs) as having health promotion potential, through the enhancement of well-being and reduction of mental illness symptoms, but more research was required to clearly establish their efficacy. A randomized controlled trial (RCT) was conducted to test the efficacy of an OPPI (strengths intervention) compared to a problem solving intervention and a placebo control (*Paper 2*). Participants (N = 160, 83% female, mean age 37 years) completed measures of well-being and mental illness at pre-assessment, post-assessment and 3-month follow-up. Attrition from the study at 3-month follow-up was high (83%), highlighting a recurring issue in internet intervention research. The results provided some support for the enhancement of subjective well-being (Personal Wellbeing Index – Adult version; PWI-A), but not for illness symptoms reduction, via an online fully automated, self-guided, strengths intervention. The next study (N=623, 81% female, mean age 39.9 years) was a RCT measuring well-being and illness symptom outcomes for three intervention groups (strengths, eCoach and mindfulness) compared to a waitlist control (*Papers 3* and *4*). Self-report measures were administered at baseline, post-intervention, one and three month follow-up, and included the PWI-A, Satisfaction With Life Scale (SWLS), Modified Differential Emotions Scale (mDES) Psychological Well-Being (PWB), Mental Health Continuum – Short Form (MHC-SF), Depression Anxiety Stress Scale-21 item version (DASS-21), Ten Item Personality Inventory (TIPI), Mindfulness Awareness Attention Scale (MAAS), and physical health. The baseline data for the study was presented in *Paper 3*, which explored the prevalence of well-being and the psychometric properties of the Mental

Health Continuum – Short Form (MHC-SF), a relatively new measure of well-being. The MHC-SF demonstrated good internal consistency, test re-test reliability, incremental and construct validity. The data supported a three factor structure of well-being, with a modified social well-being subscale. Based on the MHC-SF well-being categories, 'flourishing' participants (45.5%) had lower mental illness symptoms, and higher mindfulness and physical health outcomes compared to participants with moderate (46.4%) or languishing (8.1%) well-being. In *Paper 4*, the longitudinal findings and the potential moderating effects of human support (i.e., the eCoach group were offered email support as they completed the strengths intervention) and baseline levels of well-being and depression symptoms were presented. Compared to waitlist, the Strengths and eCoach participants had significant increases on a range of well-being measures; and the eCoach and Mindfulness groups had a significant reduction in depression and anxiety symptoms respectively. Moderating effects were found (e.g., increases in life satisfaction for Mindfulness group participants with elevated depression symptoms) highlighting the importance of tailoring interventions to individual characteristics. Overall, the thesis findings provide support for the notion that well-being can be intentionally enhanced and that evidence-based interventions can be effectively delivered online as part of an accessible and sustainable health promotion and illness prevention strategy.

Chapter 1: General Introduction

Thesis Background

This thesis was prompted by three key experiences, first, the author's experience working on clinical trials for the treatment of panic disorder, post-traumatic stress disorder and depression, using computer-based technology (Austin, et al., 2006; Kiropoulos, et al., 2008; Klein, Austin, et al., 2009; Klein, Mitchell, et al., 2009; Mitchell, Howell, Turnbull, & Murphy, 2005; Pier, et al., 2008; Pier, et al., 2005). This work highlighted the internet as a medium that had the potential to increase the accessibility and sustainability of mental health treatment in the community. Second, the author's experience working as a clinical psychologist in private practice led to the observation of an increasing number of clients seeking psychological counseling for non-clinical issues, for issues related to 'living well' rather than 'surviving'. Third, these two experiences were preceded by a career in sports performance, and working with a variety of development and elite level athletes. At that time in sports performance there was a clear agenda for developing the best possible physical self and a growing appreciation for developing the best possible mental self. In the general community no such agenda, or even language to describe mental well-being beyond the absence of mental illness, seemed to exist. While 'physical fitness' was a concept known and accessible to all, 'mental fitness' was reserved for the realm of elite performers, such as athletes and the armed forces. This thesis stemmed from a curiosity to understand more about well-being and to see if, like physical fitness, it was something that could be developed not just by elite performers but by anyone that chose. As Oscar Wilde said *"To live is the rarest thing in the world, most people exist, that is all"*. This thesis is an exploration into the science of enduring happiness and the development of an accessible and sustainable 'well-being workout'.

Research Overview

The research process commenced with two main aims, the first was to integrate two relatively young and developing research fields of positive psychology (Seligman & Csikszentmihalyi, 2000) and internet interventions (Ritterband, et al., 2003), to help clarify what was currently known about the health promotion potential of online positive psychology interventions (OPPIs). The second aim was to test the efficacy of OPPIs to enhance well-being and identify factors that influence intervention efficacy. As the research process progressed other relevant issues emerged such as well-being measurement, well-being prevalence and appropriate data analyses techniques. To achieve these aims and address the emerging issues, one literature review and two randomized controlled trials (RCTs) were completed, and resulted in four manuscripts being sent to peer reviewed journals (one published, one re-submitted, and two submitted).

The *first paper* is a literature review of two fields of research that had not previously been integrated, positive psychology and internet interventions. The paper provides background on positive psychology theory and research, prior to giving a definition of internet interventions and an overview of the advantages and disadvantages of delivering mental health interventions via the internet. The paper culminates in a literature review combining the two fields of research, and including a critique of five RCTs testing the efficacy of OPPIs as a means of enhancing well-being. The results indicate some support for OPPIs not just in enhancing wellness but also for illness prevention. This review paper provides the rationale for the subsequent two ensuing RCTs.

The *second paper* extends knowledge of OPPIs by presenting the results of a RCT testing the efficacy of two active internet intervention groups, strengths and problem solving, compared to a placebo control. The strengths intervention was included as an OPPI with demonstrated well-being enhancement efficacy (Seligman, Steen, Park, & Peterson, 2005)

and the problem solving intervention and placebo control were used as comparison groups. Problem solving was chosen as a cognitive behavioural intervention with demonstrated efficacy for stress and depression symptom reduction (Nezu & Wilkins, 2006), as opposed to wellness enhancement. Participants (n=160) completed measures of well-being and mental illness symptoms at pre-assessment, post-assessment and three-month follow-up. Measures included the Personal Well-being Index – Adult version (PWI-A), Satisfaction With Life Scale (SWLS), Positive and Negative Affect Schedule (PANAS), Orientations To Happiness (OTH), and Depression Anxiety and Stress Scale – 21 item version (DASS-21). Well-being increased for the strengths group at post- and follow-up assessment on one (i.e., PWI-A) but not all well-being measures. No changes in depression, stress or anxiety symptoms were detected by group or time. The study was limited by low power and a conservative approach to data analyses. However, it provided some support for the premise that well-being could be enhanced via an online strengths intervention. This study also highlighted issues relating to well-being measurement and prevalence, which was the focus of the next paper.

Well-being research is a relatively young field of scientific endeavor and as a result many of the theories, key constructs and measures are still being developed. Historically, well-being research has been dominated by two conceptual approaches – the hedonic and eudaimonic – which is reflected in the development of either subjective (hedonic) or psychological (eudaimonic) well-being measures. The *third paper* tested the psychometric properties of the Mental Health Continuum – Short Form (MHC-SF), a relatively new measure that integrates both hedonic and eudaimonic approaches. Participants (N = 623) also completed: hedonic measures including the PWI-A, SWLS and the modified Differential Emotion Scale (mDES); a eudaimonic measure, Psychological Well-Being – 42 item version (PWB-42); and measures of mental illness symptoms (DASS-21), personality (Ten Item Personality Inventory; TIPI), mindfulness (Mindfulness Attention Awareness Scale; MAAS)

and physical health. The MHC-SF demonstrated good internal consistency, test re-test reliability, incremental and construct validity. The data supported a three factor structure of well-being, with a modified social well-being subscale. In this study the MHC-SF was also used to categorise participants along a well-being continuum (i.e., languishing, moderate, and flourishing). Individuals categorised as flourishing had lower mental illness symptoms and higher levels of mindfulness, self-rated physical health and well-being (using alternate well-being measures), compared to the languishing and moderate well-being categories.

The *fourth and final paper* presented the longitudinal results of the second RCT testing the efficacy of two OPPIs, strengths and mindfulness, compared to a waitlist control (WC). The strengths intervention was included in this study to test for the potential moderating influence of human support, hence two strengths groups were included in the study, one with the offer of human support via email (eCoach group) and one without the offer of human support (Strengths group, as per the first RCT). Mindfulness was included as a previously untested OPPI to explore its well-being enhancement potential. The RCT also tested the moderating effects of baseline levels of well-being and depression symptoms on OPPI outcomes. Given the data analysis limitations highlighted by the first RCT, this study took a new approach and used Hierarchical Linear Modeling (HLM) to test the longitudinal efficacy of the two OPPIs. The results supported the well-being enhancing qualities of the strengths intervention on a range of hedonic and eudaimonic measures, and while not significantly different, the addition of human support appeared to boost effect size for depression symptom outcomes. The moderating effect of baseline levels of well-being and depression symptoms were also apparent for both the strengths and mindfulness group. The mindfulness intervention had an anxiety symptom reduction role and, for specific participant groups, was also able to enhance well-being. The implications, applications and limitations of this research are discussed in the paper. There is an additional chapter in the thesis presenting

the Wellbeing Online program evaluation data. The evaluation data indicate above average scores from participants for program satisfaction, relevance, application and ease of website navigation. Over 79% of participants said they would recommend either the strengths or mindfulness program to other people. The thesis studies and papers are individually presented in the proceeding chapters and then discussed collectively in the General Discussion.

Chapter 2: Paper 1. Positive psychology and the internet: A mental health opportunity

Contextual information

Paper 1 was submitted to and received reviewers' comments from the *Review of General Psychology*. On the basis of this feedback the paper was revised, new information included and on the suggestion of the Editor the paper was re-submitted to the same journal. As a consequence of the time delay in the publishing process the first RCT was completed and *Paper 2* accepted for publication prior to *Paper 1*. As a result, the literature review in *Paper 1* references *Paper 2* and includes several research papers (e.g., Abbott, Klein, Hamilton, & Rosenthal, 2009; Parks, 2009; Shapira & Mongrain, submitted; Sin & Lyubomirsky, 2009) that were not available at the time of designing the pilot RCT and developing the Wellbeing Online website, which houses both the interventions (i.e., identifying and using your strengths, problem solving, information control) and research trial processes (e.g., informed consent, pre-, post- and follow-up-questionnaires). In summary, although *Paper 1* sets the scene for the subsequent RCTs, due to variations in timing of the publishing feedback process, it includes some information that postdates *Paper 2*.

Sustainable Well-being

This thesis tests the assumption that well-being can be enduringly enhanced over time. In support of the argument for the sustainable enhancement of well-being are findings from longitudinal studies that demonstrate well-being can be enhanced via interventions such as identifying and using your strengths (Seligman, et al., 2005), practising gratitude (Emmons & McCullough, 2003; Sheldon & Lyubomirsky, 2006b), committing acts of kindness (Lyubomirsky, Sheldon, & Schkade, 2005; Otake, Shimai, Tanaka-Matsumi, Otsui, & Fredrickson, 2006) and visualizing best possible future selves (Sheldon & Lyubomirsky,

2006b). The argument that well-being cannot be enduringly enhanced comes from a variety of sources (Lyubomirsky, et al., 2005). Evidence from twin and adoption studies (Lykken & Tellegen, 1996) indicates that well-being is 80% heritable, suggesting a genetically determined *set-point* for well-being, with any fluctuations away from this set-point likely to be temporary. Subsequent research indicates that 50% heritability is a more realistic estimate (Diener & Lucas, 1999), which still explains a large component of well-being. Additional evidence supporting the set-point hypothesis has been provided by a range of researchers (Cummins, Gullone, & Lau, 2002; Headey & Wearing, 1989; Suh, Diener, & Fujita, 1996), although Headey (2008) recently suggested revisions to set-point theory to account for evidence of long term change in subjective well-being for some groups of people (i.e., those who score high on personality traits of extraversion and/or neuroticism). These revisions are interesting given that one of the proposed sources of evidence for the stability of well-being also comes from personality research. Personality traits (i.e., Big-five: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) are considered to be heritable (50%) and stable over time (McCrae & Costa, 1990). A close relationship has been identified between well-being and personality, in particular extraversion and neuroticism (Cummins, et al., 2002), hence the conclusion that well-being is also largely stable over time.

Another source of evidence contributing to the argument against the possibility of enhancing well-being in the long term comes from research on the concept of adaptation and the hedonic treadmill (Brickman, Coates, & Janoff-Bulman, 1978). Adaptation theory explains how people adjust to upward and downward changes in well-being following positive and negative life events, with a return to hedonic neutrality. The classic example is the study of well-being, lottery winners and car accident victims by Brickman, Coates and Janoff-Bulman (1978). This study demonstrated that a year after their lottery win, the winners were no happier than a control group; and car accident victims had higher happiness than was

expected. The researchers surmised that this rebound effect of well-being was due to the process of adaptation, and an indication that efforts to enduringly enhance well-being were futile. This conclusion gained widespread acceptance until a more recent critique of the adaptation theory (Diener, Lucas, & Scollon, 2006). This critique integrated over twenty years of research conducted since the Brickman et al. (1978) study and concluded with five revisions to adaptation theory. First, happiness set-point is non-neutral, in fact most people are happy most of the time (Cummins, et al., 2009; Diener & Diener, 1996). Second, individual set-points, if they exist, vary across individuals, with the evidence suggesting differences are largely due to personality factors (Diener & Lucas, 1999). Third, evidence suggests that separate well-being components (e.g., life satisfaction, positive affect and negative affect) move in different directions over time (Lucas, Diener, & Suh, 1996), suggesting that there is more than one possible set-point. Fourth, there appear to be individual differences in the rate and extent of adaptation, for example, Lucas and Clark (2006) observed individual variability in rates of adaptation to marriage. Fifth, and most relevant to the current thesis, Diener et al. (2006) posit that despite adaptation effects, happiness levels can change over time, with evidence coming from cross-sectional data on well-being differences across nations (Diener, et al., 2006) and, as mentioned at the start of this chapter, longitudinal studies (Emmons & McCullough, 2003; Fujita & Diener, 2005; Lyubomirsky, et al., 2005; Seligman, et al., 2005).

In an attempt to integrate these paradoxical findings, Lyubomirsky, Sheldon and Schkade (2005) created the *model of sustainable happiness*. This model proposes three key factors that influence sustainable well-being: (1) a person's genetically-determined set-point for happiness which accounts for approximately 50% of the variation in sustainable well-being (e.g., personality traits); (2) circumstantial factors which account for 10% (e.g., income, location, education level and marital status); and (3) intentional cognitive,

motivational, and behavioural activities (e.g., practicing gratitude, using your strengths), accounting for 40%. It is proposed that this last factor, with its focus on individual psychological processes, is most amenable to change and most able to counteract the downward pull of adaptation (Lyubomirsky, et al., 2005). This model appears somewhat akin to a physical fitness model, whereby genetics determine baseline fitness level (e.g., motor skills, metabolism), and individual circumstances (e.g., access to a gym or park, manual labour versus desk based job) and intentional activity (e.g., going for a jog, playing a sport, walking to work, choosing a healthy diet) combine to influence enduring levels of fitness. The key point of interest from this model is that while there is no, or limited control, over individual set-point or circumstances, intentional processes are largely within individual volition if motivated and willing to make the effort (Lyubomirsky, et al., 2005; Sheldon & Lyubomirsky, 2006a). Lyubomirsky et al. (2005; Sheldon & Lyubomirsky, 2006a) posit that intentional activity can thwart the process of adaption if people continue to vary what they do and how they do it. Again this is akin to physical fitness, whereby fitness levels stagnate when there is no variation in type of activity, timing or effort. The model of sustainable happiness and the potential to enduringly enhance well-being via intentional activity form the basis of the following literature review and two longitudinal research trials.

Declaration for publication

Mitchell, J., Vella-Brodrick, D., & Klein, B. (Submitted). Positive psychology and the internet: A mental health opportunity. *Review of General Psychology*.

Declaration by candidate

The nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Initiation of publication, instigator of key ideas, conducted the literature review, prepared the draft manuscript, incorporated other authors comments in final manuscript, prepared and submitted for publication.	90%

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

Name	**Nature of contribution**
Britt Klein	Feedback on draft manuscript
Dianne Vella-Brodrick	Feedback on draft manuscript

Candidate's Signature _____ **Date** _____

Declaration by co-authors

The undersigned hereby certify that:

(1) the above declaration correctly reflects the nature and extent of the candidate's contribution to this work, and the nature of the contribution of each of the co-authors.
(2) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(3) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(4) there are no other authors of the publication according to these criteria;
(5) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(6) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

Location(s) Monash University, School of Psychology and Psychiatry, Caulfield campus

Signature 1 _____ **Date** _____

Signature 2 _____ **Date** _____

Reprint of the submitted manuscript

Positive Psychology and the Internet: A Mental Health Opportunity

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Abstract

This paper reviews two relatively young fields of research - positive psychology and internet interventions – and aims to discuss the potential of online positive psychology interventions (OPPIs) as an effective and sustainable health promotion tool within a comprehensive approach to mental health care. The paper starts with a review of positive psychology, in particular well-being theory and contemporary research, and then followed by an overview of the advantages (e.g., accessibility and sustainability) and disadvantages (e.g., digital divide) of delivering mental health interventions via the internet. Finally, the results of a literature review combining the two fields of research are presented. Five randomised controlled trials were identified testing the efficacy of OPPIs as a means of enhancing well-being, with three studies demonstrating increased well-being compared to a control group. In the three studies that had populations with mild to moderate depression symptoms at baseline, there was significant symptom reduction, suggesting that well-being interventions, while primarily targeted at improving wellness, may also have an illness treatment and prevention function. While this review is limited by the small number of studies currently available, researchers, practitioners and consumers are asked to consider the opportunities and benefits of delivering well-being interventions online.

Keywords: Positive psychology; internet interventions; well-being; health promotion; online

This paper explores the integration of positive psychology and internet interventions as a health promotion opportunity within a comprehensive approach to mental health care. An overview of well-being, a key concept in positive psychology, and internet intervention theory and research is provided. Finally, the results of a literature review of online positive psychology interventions (OPPIs) are discussed.

Historically the mental health system has primarily focused on treatment of mental health disorders, however, it is acknowledged that this treatment-oriented approach cannot adequately address the growing social and economic burden of mental illness (Andrews, Issakidis, Sanderson, Corry, & Lapsley, 2004; Cuijpers, van Straten, Smit, Mihalopoulos, & Beekman, 2008; WHO, 2003). As a consequence greater attention has been invested in mental health prevention and promotion. Mental health promotion focuses on the population as a whole and seeks to address the underlying social and economic determinants of illness as well as promote positive mental health in individuals and communities. This approach has the dual benefit of not only reducing the incidence of mental illness, but also increasing the presence of positive mental health in individuals and the community (WHO, 2001a, 2004).

The World Health Organisation (2001a) defines mental health as *"…a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her own community"* (p.1). This definition emphasises well-being and positive functioning, and clearly indicates that mental health is more than the absence of illness. A growing body of scientific knowledge demonstrates that contrary to prior beliefs, well-being and illness are not simply flip sides of the same coin or opposite ends of a single continuum; rather they are independent but moderately correlated constructs (Bradburn, 1969; Keyes, 2005b; Ryff, et al., 2006). The implication for mental health is that alleviation of symptoms of illness cannot guarantee the presence of wellness. To gain a complete picture of mental

health an understanding of both illness and wellness is necessary. However, until recently mental health has been dominated by a psychopathology model focussed on the reduction of illness and with scant attention to wellness. Even work in health promotion has been conducted largely in the context of mental illness rather than mental health (Sainsbury, 2000). In contrast the physical health equivalent to well-being (i.e., physical fitness) has an established body of research from which mental health researchers and practitioners could learn (Secker, 1998).

In order to help address the shortcomings in our understanding of well-being and the contribution it makes to mental health, the 1998 American Psychological Association presidential address called for the establishment of Positive Psychology - the scientific study of well-being and optimal human functioning (Seligman & Csikszentmihalyi, 2000; Snyder & Lopez, 2002). The launch of the positive psychology movement served as a catalyst, drawing together previously disparate lines of research and creating enough research momentum for exponential growth in this field of scientific endeavour. As an indicator of the growth in well-being research, a search of the PsychINFO database (April 2009) for peer reviewed journal articles from 1900 to 2009 with the keyword 'well-being' found a total of 9,301 articles, with only 2,935 of these published prior to 1998. The establishment of positive psychology created an agenda for a comprehensive understanding of mental health – illness and wellness – for individuals and communities. So what does current theory and research tell us about well-being?

Well-Being

What is Well-being?

The term well-being is a multifaceted construct with no single, clearly accepted definition in psychological research. In broad terms, Ryan and Deci (2001) describe well-

being as a construct concerned with optimal experience and functioning. Two major conceptual approaches to defining and measuring well-being have emerged based on the hedonic and eudaimonic approaches (for a review of the philosophical origins see Kashdan, Biswas-Diener & King, 2008) and resulting in a dual category approach to well-being research in contemporary psychology. Theories of well-being derived from the *hedonic* approach have at their core the subjective experience of happiness or pleasure (i.e., a person's appraisal of their own experience), hence the term *subjective well-being* (SWB). SWB has been defined as how an individual evaluates his/her own life and incorporates both affective (e.g., positive and negative emotions) and cognitive (e.g., satisfaction judgements) components (Diener, 1984; Snyder & Lopez, 2002). SWB, also referred to as happiness or emotional well-being (Snyder & Lopez, 2002), has dominated as the primary measure in well-being research to date (Kashdan, Biswar-Diener, & King, 2008; Ryan & Deci, 2001). The two components of SWB, affective and cognitive, are most commonly measured using self-report surveys such as the Positive and Negative Affect Scale (PANAS) (Watson, Clark, & Tellegen, 1988) and the Satisfaction With Life Scales (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985).

In contrast to the hedonic approach, theories of well-being derived from the *eudaimonic* approach focus on the degree to which a person is fully functioning and highlights personal growth and meaning (Ryan & Deci, 2001). The emphasis is on fulfilling one's potential, rather than affect and satisfaction judgments. Ryff (1989) has labelled this somewhat broad definition of well-being as *psychological well-being* (PWB). More specifically, Ryff operationalises PWB in terms of six dimensions of functioning: *self-acceptance* - a positive attitude towards oneself and one's past life; *personal growth* - being open to new experiences; *purpose in life* - believing that one's life is meaningful; *environmental mastery* - the ability to manage one's life; *autonomy* - independence and self-determination; and

positive relations with others - having satisfying high quality relationships (Ryff, 1989; Ryff & Keyes, 1995). Ryff has designed a self-report scale to assess PWB at a particular moment in time within each of these six dimensions called the Psychological Well-being scale (Ryff, 1989; Ryff & Keyes, 1995).

Although most research to date has taken place in the context of either hedonic or eudaimonic theory, there has been repeated debate over the usefulness of this dual category approach. Some theorists have suggested that these models are not mutually exclusive (Kashdan, et al., 2008; Keyes, Shmotkin, & Ryff, 2002; Ryan & Deci, 2001) and combined models have emerged. An example of an integrated model is Keyes (2005b, 2007) mental health continuum. This model is comprised of three factors of (i) emotional well-being (i.e., positive affect and life satisfaction); (ii) psychological well-being (i.e., self-acceptance, personal growth, purpose in life, environmental mastery, autonomy, and positive relations with others); and (iii) social well-being (i.e., consisting of five dimensions of social acceptance, social contribution, social coherence, social integration, and social actualisation). Essentially it combines SWB and PWB and adds a third factor, social well-being. Keyes has developed a self-report measure of his three-factor model of well-being called the mental health continuum (MHC), the most recent version is a brief 14-item questionnaire (MHC-SF) (Keyes, 2005b; Keyes, et al., 2008). There is data supporting this three factor-model of well-being (Gallagher, Lopez, & Preacher, 2009) and the psychometric properties of the MHC-SF (Keyes, et al., 2008).

Another integrated model is Seligman's theory of happine*ss* (Seligman & Csikszentmihalyi, 2000; Seligman, Steen, Park, & Peterson, 2005). This model deconstructs happiness (i.e., the authors refer to well-being as happiness in this model) into three components or orientations - pleasure, engagement and meaning. The first orientation, (i) pleasure, refers to the hedonic notion of increasing positive emotions. These emotions can be

about the past (e.g., satisfaction, contentment, pride), present (e.g., satisfaction from immediate pleasure) or future (e.g., hope, optimism). The second orientation to happiness is (ii) engagement, or the pursuit of gratification. The key characteristic of engagement is that it fully occupies or directs one's attention when undertaking an activity (e.g., reading a book, playing golf or listening to music). It is proposed that engagement in an activity involves developing and applying an individual's personal strengths (e.g., creativity, perseverance, social intelligence). Engagement is thought to result in *flow*, the psychological state experienced during engaging activities characterised by a feeling of energised focus, full immersion, and success in the process of the activity (Csikszentmihalyi, 1990). The final orientation to happiness, as described by Seligman et al. (2005), is (iii) meaning. Meaning refers to applying one's personal strengths (e.g., team work, loyalty, social intelligence) to belong to and serve something larger than the self (e.g., institutions such as family, community, or religion). While the pleasure orientation appears to equate to SWB, the latter two orientations, engagement and meaning, align most closely with the eudaimonic school of PWB. Seligman, et al., (2005) have operationalised their model through the creation of the Steen Happiness Index (SHI), a 20-item self-report questionnaire. The SHI is intended to be more sensitive to upward changes in happiness levels compared to other happiness or well-being measures. The SHI appears to have good internal consistency but limited published validity data. There is an updated, 24-item version of the SHI in use, namely the Authentic Happiness Inventory (AHI), which reports good internal reliability but no apparent published validity data (Schiffrin, Rezendes, & Nelson, 2008). The theoretical description of the orientations to happiness model and measures in the published literature lacks clarity. A criticism directed at positive psychology research by Kashdan et al., (2008) is the use of abstract or generic terms (e.g., happiness) when defining constructs. Compared to SWB and PWB, integrated models of well-being are in early stages of development but it is essential

that that clear theoretical models and precise terminology are used when labelling constructs and describing research outcomes (Kashdan, et al., 2008).

Well-being outcomes and prevalence

Worldwide there is a growing body of research demonstrating the benefits of subjective and psychological well-being (for a review of correlational and longitudinal research see Lyubomirsky, King, & Diener, 2005). Some key benefits identified by Lyubomirsky et al., (2005) include greater work productivity, longer lasting and more satisfying marriages, greater social support, richer social interactions, increased activity, energy, flow and better physical health (e.g., strengthened immune system, less pain, lowered stress levels, and greater longevity). Well-being is also related to increased individual creativity, prosocial behaviour, self-confidence, self-regulation and ability to cope (Lyubomirsky, King, & Diener, 2005). Less well understood are the negative consequences of low levels of well-being or what Keyes (2005b, 2007) terms *languishing.* Keyes (2007) explores the negative consequences of languishing as well as the benefits of high well-being, or *flourishing*, using data from a telephone and postal population survey of American adults ($N = 3032$). The Composite International Diagnostic Interview Short Form Scales (CIDI) (WHO, 1990) was used to categorised participants as with or without a mental illness. Well-being was measured using the MHC and participants were categorised as having low, moderate or high well-being (i.e., Keyes terms these languishing, moderate well-being and flourishing, respectively). An interesting finding from the research was that languishing adults without a mental illness reported the same level of dysfunction in terms of daily living (e.g., missed days of work) and worse levels of psychosocial functioning (e.g., helplessness, goals in life, resilience and intimacy) when compared with adults with a mental illness and moderate or flourishing well-being. In a similar study, Keyes (2005a) found that the absence of well-being (with or without the presence of mental illness) was related to increased risk of chronic physical

disease. In contrast, complete mental health (i.e., flourishing and absence of mental illness) was negatively correlated with physical illness, with this group reporting the fewest chronic conditions, fewer health limitations of daily living and lower health care utilization than languishers or the moderately mentally healthy (Keyes, 2005a). In summary, while the well-being data is limited by its primarily cross-sectional and correlational nature, it provides preliminary support for the idea that even if an individual is free from mental illness it does not mean that they are functioning well in life. Well-being levels vary and higher levels of well-being appear to have more positive implications for quality of life, psychosocial functioning and physical health.

In an exploration of prevalence rates of the different categories of well-being Keyes (2007) found that 20% of the adult American population are flourishing, and only 17% are what he terms completely mental healthy (flourishing and no mental illness). The prevalence of mental illness at 21.5% is similar to other research findings; however Keyes also identifies the subset of the population who have no mental illness and are languishing at 10% (this is the previously mentioned group who function as poorly as or worse than people with a mental illness). Additional research is needed to identify if these prevalence rates generalise to non-American populations and address the possibility of increasing the prevalence of flourishing mental health. The growing body of well-being intervention literature has begun to address some of these issues.

Well-being interventions

Lyubomirsky, Sheldon and Schkade (2005) propose a theory of the determinants of well-being (they refer to well-being as enduring or chronic happiness). Their theory identifies three key factors that influence happiness: (i) a person's genetically-determined set-point, or set range, for happiness; (ii) circumstantial factors (e.g., income, location, education level and

marital status) and; (iii) intentional cognitive, motivational, and behavioural activities that can influence well-being. Research on this theory suggests that these three factors contribute 50%, 10% and 40% to happiness respectively. Lyubomirsky et al., (2005) propose that the third factor, with its focus on individual psychological processes, is most amenable to change. In support of this, data from longitudinal research (Fordyce, 1977; Lyubomirsky, 2006; Lyubomirsky, King, et al., 2005; Lyubomirsky, Sheldon, & Schkade, 2005; Sin & Lyubomirsky, 2009) have demonstrated that well-being can be enhanced via interventions that promote intentional cognitive and behavioural activities, such as: practising gratitude; committing acts of kindness; visualizing best possible selves; processing positive life experiences; identifying and using personal strengths; mindfulness; goal setting; forgiveness; hope therapy; positive psychotherapy (PPT); and well-being therapy.

A meta-analysis of 51 independent positive psychology intervention (PPI) studies demonstrated a significant increase in well-being (49 studies; $r = .29$; Cohen's d = medium) (Sin & Lyubomirsky, 2009). The meta-analysis also measured symptoms of illness and found a significant reduction in depression symptoms (25 studies; $r = .31$, d = medium). The interventions that were included in the meta-analysis focussed on cultivating positive feelings, behaviours or cognitions, as opposed to interventions that addressed pathology or deficiencies. The results demonstrated that it is possible to enhance well-being via PPIs. Sin and Lyubomirsky (2009) also identified a number of moderators of intervention effectiveness including intervention duration, intervention format, participant age, and participant depression status. The duration of the interventions varied from 1-week to over 12 weeks, with greater well-being effects for longer interventions. This effect is possibly due to participants having more time to practice the interventions and therefore process and integrate them into their life, creating lasting changing in cognition and/or behaviour (i.e., creating new habits). This idea is supported by several other studies that found the more effort put into

practicing an intervention, the greater the improvement in well-being (Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2008; Seligman, et al., 2005). A second moderator of effectiveness identified by Sin and Lyubomirsky (2009) is the intervention format; they found face-to-face individual delivery was most effective, followed by group delivery, and then self-administered interventions. These data are difficult to interpret, as causality cannot be determined without random assignment, however the differences may have occurred because participants in the individual and group format had direct human contact and support; or perhaps because presumably the group and individual face-to-face formats had pre-scheduled and specific time allocated to explain and practice the interventions. Both of these factors, human contact and scheduling sessions, may have had a positive impact on participant commitment to the intervention and motivation to complete the assigned tasks. The third moderator identified was participant age, with increased age resulting in greater well-being benefits from the intervention. The authors suggested this may be due to increases in self-regulation and emotional control as people age. Alternatively it may be that as people age they place greater value on well-being and happiness and as a result are more motivated to put effort into the intervention. The fourth moderator identified was depression status, with depressed participants more likely to see greater effects from the interventions. This finding could be accounted for by depressed participants having more room to improve compared to their non-depressed peers (i.e., floor effect). This finding suggests a potential role for PPIs in mental illness treatment and prevention as well as well-being promotion.

In summary, there is a mounting body of information indicating well-being can be enhanced both immediately and in the long term through a range of cognitive and behavioural PPIs. There are a number of moderating factors, relating to both the participant and intervention program characteristics, which influence the effectiveness of PPIs. More research is required to understand exactly what these moderators are and how they operate so

that PPI effectiveness can be maximised. If as this early research indicates, PPIs can effectively enhance well-being, how can they be integrated into an effective health promotion strategy? This is where the internet can play an important role as a mechanism for delivery of PPIs.

The Internet

Internet advantages, disadvantages and opportunities

A key objective of mental health promotion is to deliver interventions that are accessible to as many people as possible and sustainable to deliver. Delivering well-being interventions via the internet has the potential to enhance accessibility and sustainability (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009) as well as providing a range of other advantages such as: personalisation; tailoring; multi-media options; interactivity; reliability; convenience; anonymity; and consumer empowerment (Ahern, Kreslake, & Phalen, 2006; Christensen, Griffiths, & Evans, 2002; F. Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006; Korp, 2006; Ritterband, et al., 2003). In terms of *accessibility*, internet access varies greatly from country to country, with global internet usage estimated at 23.8% (IWS, 2009). For people living in westernised, English speaking countries such as Australia (74.3% estimated internet usage), United States (73.1%) and United Kingdom (70.9%) the internet plays a central role in the work, study and personal lives of the majority of people (IWS, 2009).The internet is also accessible at any time and from a variety of locations, allowing users to access information at their own convenience and pace. As the efficiency of internet technology increases, costs decrease and people become familiar with the technology, ever growing numbers of people are gaining access to the internet from a variety of locations (e.g., at home, work, public libraries, internet cafes and mobile phones) (ABS, 2006; Ybarra, 2005). The internet also has the ability to reach traditionally underserved

populations such as those: who live in rural or remote areas; without easy access to health services or; who wish to remain anonymous (Christensen, et al., 2002; F. Griffiths, et al., 2006; Korp, 2006; Ritterband, et al., 2003; Ybarra, 2005). The internet offers the opportunity to assist in addressing the large and unmet need for mental health services in our community (Christensen, et al., 2002).

The internet also has the potential to provide a *sustainable* means of mental health delivery. The health literature provides several examples of the cost-effectiveness of internet interventions for the prevention and treatment of specific disorders (Crone, et al., 2004; de Graaf, et al., 2008; Mihalopoulos, et al., 2005). For example, a study by Crone et al. (2004) estimated that internet interventions for anxiety and depression could reduce the cost to between one third and one sixth, relative to other forms of psychological treatment. Less is known about cost-effectiveness for mental health promotion interventions, however after initial development costs these types of interventions are likely to be fully or partially automated, reducing the need for, and expense of, direct one-on-one professional-consumer interaction. In addition, information on the internet can be accessed at no or minimal cost to the consumer. Internet interventions appear to require minimal financial and human input to sustain them beyond the initial development phase; however research is required to test this observation for health promotion interventions.

The ability to personalise and tailor a web-site is another advantage of this medium. *Personalisation* refers to the provision of specific content aimed at increasing user identification with the material presented, for example, making content culturally or gender specific based on participant characteristics. *Tailoring* of information is the provision of content that meets the specific needs of the user based on their responses to certain questions, for example, providing questionnaire feedback. Importantly, there is a small but growing body of research indicating that personalisation and tailoring enhance program engagement

and adherence (Brug, Oenema, & Campbell, 2003; de Vries & Brug, 1999; Ritterband, Thorndike, Cox, Kovatchev, & Gonder-Frederick, in press).

While most web-based interventions are predominantly text based, other *multimedia formats* can be incorporated such as audio, video, animation, pictures and graphics. Using a variety of multi-media formats is thought to be advantageous because it appeals to a range of learning styles and makes the intervention more dynamic and engaging for the user (Abbott, Klein, & Ciechomski, 2008; Barak, Klein, & Proudfoot, in press). Again research is limited, however, a study of a web-based program for paediatric encopresis found that users positively received and preferred the addition of multi-media formats (i.e., case audio and graphics) to the text-based program (Ritterband, Cox, et al., 2006). Although many health websites provide static information only, the internet can be highly *interactive* (e.g., the user completes a survey and is provided with immediate feedback; or the user can move objects on the screen). Interactivity is theorised to enhance interest in and understanding of content and program adherence (Abbott, et al., 2008; Barak, et al., in press; Ritterband, et al., in press; Stevens, et al., 2008).

The internet provides a *reliable* delivery medium with information remaining the same across repeated presentations (F. Griffiths, et al., 2006). Computers are immune to fatigue, illness, boredom or other similar human traits. The internet offers the user access to information while maintaining their *anonymity* and it can be accessed from the *convenience* of their own home without need for human interaction. Several authors have identified that some people feel more comfortable and are more candid in disclosing information online than face-to-face, particularly for highly stigmatised issues such as mental illness (Christensen, et al., 2002; Evers, 2006; F. Griffiths, et al., 2006; Pier, et al., 2005; Ybarra, 2005). Lastly, the internet can be *empowering* for the consumer, as they can take an active role in engaging and directing their own learning and behaviour change process (Christensen, et al., 2002).

The disadvantages of using the internet for mental health care are similar to those of the more traditional approaches (e.g., face-to-face therapy, self-help books). Although recent statistics indicate that the digital divide (i.e., the gap between sections of the population that do or do not have access to the internet) has reduced (ABS, 2006), there are still groups of people in the community who have low levels of internet access (e.g., unemployed and elderly). There are also a vast number of health related websites and the quality of the information is variable (Proudfoot, Klein, & Barak, under revision; Ybarra, 2005). Furthermore, basic computer and literacy skills are required to access the internet; downloading information from the internet can be slow, depending on the modem speed and type of website; and the internet does not appeal to all consumers (e.g., some people may prefer face-to-face contact or reading a book). Delivering mental health interventions via the internet also raises a range of ethical issues, such as confidentiality of information (e.g., security of data provided via the web) and duty of care (e.g., how to establish the age of participants so you know if you are dealing with a minor). As this field of research and practice grows, professional standards and guidelines are being developed to address many of these issues (Barak, et al., in press; Proudfoot, et al., under revision; Ritterband, Andersson, Christensen, Carlbring, & Cuijpers, 2006).

In summary, the internet as a health promotion tool offers a range of advantages, most notably it has the potential to enhance accessibility in a sustainable manner compared to traditional delivery mechanisms. However, the internet is only useful if the interventions it is delivering are efficacious. So what does the internet intervention research tell us about the efficacy of mental health internet interventions?

Internet intervention research

Ritterband et al., (2003) define internet interventions for mental health as interventions that promote knowledge and behaviour change via web-based programs that are typically theory driven, self-paced, interactive, tailored to the user and utilise the multimedia opportunities provided by the Internet. Most of the research to date has been undertaken in the context of mental illness treatment and prevention rather than wellness. The number of internet interventions available for mental health treatment and prevention is growing rapidly and these interventions have demonstrated efficacy (e.g., reduction in symptoms or number of people meeting clinical criteria for diagnosis of a disorder) for a range of mental health disorders and health behaviours (e.g., depression, anxiety, smoking and weight loss) (Cuijpers, van Straten, Andersson, & van Oppen, 2008; Cuijpers, van Straten, Smit, et al., 2008; K. Griffiths, Farrer, & Christensen, 2007; Klein, et al., 2009; Mitchell, et al., 2009). There is enough quality research to indicate that internet interventions for mental health treatment can be effective, but it is unknown if this finding generalises to online well-being interventions.

Literature Review of Online Positive Psychology Interventions (OPPIs)

While there are a range of web-based well-being programs available to the public, most have not been rigorously evaluated. A literature review conducted in May 2009 of the PsychINFO database for randomised controlled trials (using the following *search terms:* positive psychology, well-being, happiness, internet and website) identified two peer-reviewed studies (Mitchell, et al., 2009; Seligman, et al., 2005). Consultation with international experts in the area identified three additional studies: one peer reviewed journal article (Abbott, Klein, Hamilton, & Rosenthal, 2009); one unpublished doctoral thesis (Parks, 2009); and one journal article currently under peer review (Shapira & Mongrain, under review). A summary of selected features of these five studies are presented in Table 1.

<Insert Table 1 about here>

Findings relating to the efficacy of OPPIs have been mixed with the clearest support emerging from the Seligman et al. (2005) study. In this study participants were randomly assigned to one of five active interventions or a placebo control. The results found that two of the interventions, *using signature strengths* and *three good things*, produced significant change in the expected direction on the happiness and depression outcome measures, with benefits apparent at six months. The *gratitude visit* intervention was also effective in improving happiness and depression ratings, however this change lasted only one month. It is important to note that at baseline participants were, on average, mildly depressed; and to access the research study had actively sought out Seligman's widely publicised authentic happiness website, so were likely to be highly motivated. In addition, participants who reported continued adherence to the happiness intervention beyond the required one-week, scored higher on happiness scores at all times points and lower on depression scores at one-month follow-up, compared to those who did not continue to adhere. This supports previous research findings that effort moderates PPI outcomes (Sin & Lyubomirsky, 2009).

A study by Mitchell et al., (2009) extended the Seligman et al., (2005) study by taking one of their effective 1-week interventions, *using your strengths*, and creating a 3-week web-based intervention; and comparing it to a *problem solving intervention* and an *information only* placebo control. This study found significant improvement for the *using your strengths* group compared to the placebo for the cognitive component of SWB as measured by the personal well-being index (PWI-A), but not the affective component measured by the PANAS. Unlike the Seligman et al., (2005) study, no change was found on the measure of

illness symptoms from baseline to follow-up. However, baseline scores were all within the normal range compared to the mildly depressed sample in the Seligman et al., (2005) study, leaving little room for illness symptoms improvement (i.e., floor effect).

The study by Parks (2009) examined a six-week multi-component intervention called positive psychotherapy (PPT) that is based on Seligman's theory of happiness (i.e., pleasure, engagement and meaning) (Seligman, 2002). PPT combines six positive psychology exercises with previously demonstrated efficacy, including: three good things (gratitude) (Emmons & McCullough, 2003); identifying and using your strengths (Seligman, et al., 2005); a gratitude visit (Emmons & McCullough, 2003; Seligman, et al., 2005); active-constructive responding (Gable, Reis, Impett, & Asher, 2004); savoring (Bryant, Smart, & King, 2005); and life summary (based on goal setting research) (Parks, 2009). Parks conducted a pilot study using an online version of PPT with mild to moderately depressed adults. The sample was primarily female (75.7%) and a mix of US (55.1%) and non-US participants (44.9%). Primary outcomes measured were SWB and depression symptoms. Assessments were conducted at baseline, and at 1- and 3-month follow-up, with assessments planned for 6-month and 1-year follow-up but the data was not yet available. The study design was a randomised controlled trial, with participants allocated to either a 6-week online PPT program (n =125) or an assessment-only control condition (n =142). The key outcome findings from the research were that PPT led to significant decreases in depressive symptoms compared to the control group at 3-month follow-up. Contrary to studies examining the efficacy of face-to-face, group PPT (Parks, 2009; Seligman, Rashid, & Parks, 2006), the online version did not demonstrate the hypothesised increase in SWB compared to the control group. The author suggests that the discrepancy in well-being outcomes between online PPT and face-to-face, group PPT is due to a mixture of intervention factors. The group intervention provided an opportunity for participants to re-schedule any missed sessions;

there was the expectation of attending a group program where attendance was recorded; and weekly summaries of participant experience of the assigned tasks were collected from the group. These factors are likely to have created greater adherence to group PPT, compared to online PPT where there was no human contact, group processes, or submitting weekly assignments to prompt adherence to the task. While it is interesting to explore reasons for the different well-being outcomes between face-to-face group PPT and online individual PPT, it is impossible to draw any meaningful conclusions without conducting research that directly compares these two formats, ideally via a randomised controlled trial. Parks also measured self-reported adherence to the various exercises within PPT and noted that there was greater adherence by participants to exercises that required a few minutes on a daily basis (i.e., three good things; savoring; and active-constructive responding), as opposed to exercises that require a larger one-time time commitment (i.e., gratitude visit; and life summary) or were more complex and demanding daily tasks (i.e., identifying and using strengths).

Abbott et al., (in press) conducted a randomised waitlist controlled trial in a workplace setting of a 10-week, multi-component intervention called Resilience Online. The program consisted of seven resilience components, including: emotion regulation; impulse control; optimism; causal analysis; empathy; self-efficacy and; reaching out. The results indicated no improvement on happiness, quality of life or work performance. There was also no improvement on scores for depression, anxiety and stress symptoms; however like the Mitchell et al., (2009) study, illness symptoms were all within the normal range at baseline, leaving little room for improvement. The authors note that the lack of significant change may be due to insufficient time interval by post-assessment, and that change may be evident at 3-month follow-up (data currently unavailable). The study limitations included small sample size, low intervention adherence and high study attrition, making it difficult to detect significant change.

The fifth study (Shapira & Mongrain, under review) tested the efficacy of online self-compassion (n = 63) and optimism exercises (n = 55) compared to a placebo control (n = 70). Both of the active interventions resulted in increased well-being sustained to six months, and decreases in depression symptoms observable to three months. This study was limited by a self-selected, primarily Caucasian, female sample and high study attrition. A key strength of the study was the attempt to identify individual differences that moderate the effectiveness of OPPIs, in particular the personality orientations of self-criticism and dependence moderated the effects of the active interventions. In summary, three of the five studies demonstrated increases in well-being as a result of five independent OPPIs (i.e., using your strengths, three good things, gratitude visit, self-compassion and optimism). In the three studies where participants had mild to moderate depression symptoms at baseline the OPPIs had a significant impact on depression symptom reduction. This finding suggests that well-being interventions, while primarily targeted at improving wellness, may also have a treatment and prevention function.

The well-being outcomes measured in these five studies were based on two theoretical approaches, SWB (Diener, 1984) and an integrated well-being model (Seligman, et al., 2005). Two studies (Seligman, et al., 2005; Shapira & Mongrain, under review) detected significant changes using the SHI, this is consistent with the theory that the SHI is sensitive to upward changes in well-being. The third study (Mitchell, et al., 2009) that identified changes in well-being measured both the cognitive and affective components of SWB. Interestingly changes were evident for the cognitive but not the affective component of SWB; and the cognitive SWB changes were significant when measured by the PWI-A but not the SWLS. It has been suggested that the PWI-A is a more sensitive measure of the cognitive component of SWB compared to the SWLS because it has a domain specific rather than global focus (see Mitchell, et al., 2009). However, it should be noted that PPIs delivered offline have detected

significant changes using both the SWLS and PANAS. As the body of research grows it may be possible to determine more about the differences and similarities between these theoretical approaches and well-being measures, meantime it is important that positive psychology researchers continue to clearly identify the well-being constructs under review.

Based on the small amount of data available, the brief (1-3 weeks), single component OPPIs were more effective than longer (i.e., 6-10 weeks), multi-component OPPIs. This effect may be related to the difficulty in getting participants to dedicate ongoing time and effort to longer, and perhaps more complex, self-administered programs with a focus on wellness. This finding is in contrast to Sin and Lyubomirsky's (2009) meta-analyis results; how meaningful a finding this is will need to be determined by future research. Finally, the effect sizes for the well-being changes detected in the current review were nil (two studies) or small to medium (three studies), supporting the finding by Sin & Lyubomirsky (2009) that self-administered interventions are less effective than administered interventions in individual or group formats. However, if future research can identify the reason for this difference then it may be possible to reduce the effectiveness gap between offline and online formats. It would also be interesting to conduct a cost-benefit analysis of delivering a less effective intervention to a large audience (i.e., via the internet) versus a more effective intervention to a smaller audience (i.e., face-to-face individual or group delivery). Overall, online well-being interventions have demonstrated potential but more research is necessary to conclusively establish their efficacy.

Conclusion

This review of two relatively young fields of positive psychology and internet interventions highlights the benefit of integrating research to create new mental health opportunities. To paraphrase Marcel Proust (2009), this opportunity is based not on finding

new landscapes but on changing the way we view our current one. If mental health professionals remain focused on the alleviation of illness, then they miss out on the possibility of understanding and capitalising on well-being. Well-being has demonstrated potential as both a worthwhile pursuit in its own right and as a factor that can protect individuals against mental illness. The internet offers additional benefits, particularly in terms of accessibility and sustainability, and as a versatile medium with a growing presence in everyday life. Currently there is a small body of quality research that seeks to understand more about combining positive psychology with internet delivery to increase well-being and decrease illness symptoms. Additional research is required to clearly establish the efficacy of OPPIs. In addition, future research would benefit from addressing *intervention factors*, to learn more about which PPIs work best online and what program factors enhance participant adherence and reduce attrition. More quality research is also needed on *participant characteristics*, to enhance knowledge of who would use these interventions and if individual differences (e.g., personality traits or baseline well-being levels) moderate intervention effectiveness? In conclusion, researchers, practitioners and consumers are asked to consider the opportunities and benefits of delivering well-being interventions online. This approach to mental health promotion is intended to complement, not replace, current delivery formats and form part of a stepped care approach to complete mental health – the absence of illness *and* the presence of well-being.

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Table 1:

Overview of five randomised controlled trials testing Online Positive Psychology Interventions (OPPIs)

Authors	Design	Population	Measures	Intervention and control groups	Assessment	Well-being increased	Illness reduced	Attrition
Seligman et al., (2005)	RCT; 1 week intervention	Adults with mild depression (*n* = 557)	SHI * CES-D†	Three good things (gratitude)* † Gratitude visit*† Using strengths*† You at your best Identifying strengths Earliest memories (placebo control)	Pre, post, 1-month, 3-months, & 6-months	Yes*	Yes†	29% at 6-months
Mitchell et al., (2009)	RCT; 3 week intervention	Adult community sample (*n* = 160)	SWLS PANAS PWI-A* OTH DASS-21	Using strengths* Problem solving Information only (placebo control)	Pre-, post & 3-months	Yes*	No	69.8% at post, 83% at 3-months
Abbott et al., (2009)	RCT; 10 week intervention	Adult sales managers (*n* = 53)	AHI WHOQOL-BREF DASS-21	Resilience online (Waitlist control)	Pre- & post	No	No	41.5% at post
Parks (2009) (PhD thesis)	RCT; 6 week intervention	Adults with mild/mod depression (*n* = 267)	SWLS PANAS CES-D†	Positive psychotherapy (PPT) † (Waitlist control)	Pre-, post, 1-month & 3-months	No	Yes†	47.6% at post
Shapira & Mongrain (in review)	RCT; 1 week intervention	Adults with moderate depression (*n* = 188)	SHI * CES-D†	Self-compassion*† Optimism*† Earliest memories (placebo control)	Pre, post, 1-month, 3-months, & 6-months	Yes*	Yes†	35% at post, 79% at 6-months

Note: SHI = Steen Happiness Index; AHI = Authentic Happiness Index (updated version of SHI); SWSL = Satisfaction With Life Scale; PANAS = Positive & Negative Affect Scale; PWI-A = Personal Wellbeing Index – Adult version; OTH = Orientations to Happiness; WHOQOL-Bref = World Health Organisation Quality of Life – Brief version; CES-D = Centre for Epidemiological Studies – Depression scale; DASS-21 = Depression Anxiety Stress Scale – 21 item version.

* Significant improvement in well-being

† Significant reduction in depression symptoms

Chapter 3: Paper 2. A randomised controlled trial of a self-guided internet intervention promoting well-being

Contextual information

As mentioned previously, due to time variations in the publishing process of different journals, *Paper 2* was already accepted for publication when *Paper 1* was being revised based on the journal reviewers' comments. Consequently *Paper 2* does not reference *Paper 1,* and is based in the context of what was known in the early days of positive psychology intervention research. There was at this time just one other published longitudinal RCT of an OPPI available (Seligman, et al., 2005).

Strengths theory

The strengths intervention, which was the OPPI of interest in Study 2, was based on a strengths intervention used in the Seligman et al. (2005) study. The intervention is based on Seligman's theory of happiness (i.e., these authors refer to well-being as happiness in this model), which deconstructs happiness into three components or orientations - pleasure, engagement and meaning (Seligman & Csikszentmihalyi, 2000; Seligman, et al., 2005). The first orientation, *pleasure*, refers to the hedonic notion of increasing positive emotions. These emotions can be about the past (e.g., contentment, pride), present (e.g., satisfaction from immediate pleasure) or future (e.g., hope, optimism). The second orientation to happiness is *engagement*. The key characteristic of engagement is that it fully occupies or directs attention when undertaking an activity (e.g., reading a book, playing sport or listening to music). It is proposed that engagement in an activity involves developing and applying an individual's personal strengths (e.g., creativity, perseverance, social intelligence). Engagement is thought to result in *flow*, the psychological state experienced during engaging activities characterised by a feeling of energised focus, full immersion, and success in the process of the activity

(Csikszentmihalyi, 1990). The final orientation to happiness described by Seligman et al. (2005) is *meaning*. Meaning refers to applying one's personal strengths (e.g., team work, loyalty, social intelligence) to belong to and serve something larger than the self (e.g., institutions such as family, community, work, religion and country).

The strengths intervention used in the next study is proposed to enhance well-being by tapping into the engagement orientation through identifying and activating personal strengths. More detail about the strengths intervention and the comparison groups (i.e., problem solving intervention and placebo control) are provided in the following paper, and the appendices include website development information and images from the Wellbeing Online website.

Declaration for publication

Mitchell, J., Stanimirovic, R., Klein, B., & Vella-Brodrick, D. (2009). A randomised controlled trial of a self-guided internet intervention promoting well-being. *Computers in Human Behavior, 25*, 749-760.

Declaration by candidate

The nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Instigator of study and publication key ideas, conducted the research study, prepared the draft manuscript, incorporated other authors' comments in final manuscript, prepared and submitted for publication, completed changes requested by publisher.	85%

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

Name	**Nature of contribution**
Rosanna Stanimirovic	Feedback on study design, website development and draft manuscript
Britt Klein	Feedback on study design, statistical analysis and draft manuscript
Dianne Vella-Brodrick	Feedback on study design and draft manuscript

Candidate's Signature _____ **Date** _____

Declaration by co-authors

The undersigned hereby certify that:

(7) the above declaration correctly reflects the nature and extent of the candidate's contribution to this work, and the nature of the contribution of each of the co-authors.
(8) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(9) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(10) there are no other authors of the publication according to these criteria;
(11) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(12) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

Location(s)	Monash University, School of Psychology and Psychiatry, Caulfield campus

Signature 1 _____ **Date** _____

Signature 2 _____ **Date** _____

Signature 3 _____ **Date** _____

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A randomised controlled trial of a self-guided internet intervention promoting well-being

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ABSTRACT

Positive psychology is paving the way for interventions that enduringly enhance well being and the internet offers the potential to disseminate these interventions to a broad audience in an accessible and sustainable manner. There is now sufficient evidence demonstrating the efficacy of internet interventions for mental illness treatment and prevention, but little is known about enhancing well being. The current study examined the efficacy of a positive psychology internet based intervention by adopting a randomised controlled trial design to compare a strengths intervention, a problem solving intervention and a placebo control. Participants ($n = 160$) completed measures of well being (PWI A, SWLS, PANAS, OTH) and mental illness (DASS 21) at pre assessment, post assessment and 3 month follow up. Well being increased for the strengths group at post and follow up assessment on the PWI A, but not the SWLS or PANAS. Significant changes were detected on the OTH subscales of engagement and pleasure. No changes in mental illness were detected by group or time. Attrition from the study was 83% at 3 month follow up, with significant group differences in adherence to the intervention: strengths (34%), problem solving (15.5%) and placebo control (42.6%). Although the results are mixed, it appears possible to enhance the cognitive component of well being via a self guided internet intervention.

1. Introduction

Enhancing well-being at a population level is explored in this introduction in the context of two relatively young disciplines, namely positive psychology and internet interventions. An overview of theory and research in positive psychology and then internet interventions is presented as a rationale for the current study.

1.1. Positive psychology, mental health and well-being

The positive psychology movement has helped create the research momentum necessary to broaden mental health knowledge and understanding beyond a focus on illness and its direct alleviation. Positive psychology is the scientific study of well-being and optimal functioning, focusing on positive emotions, character traits and enabling institutions (Seligman & Csikszentmihalyi, 2000). The proponents of this movement aim to bring together and develop previously disparate lines of theory and research to provide a complete picture of mental health (Duckworth, Steen, & Seligman, 2005; Seligman, Steen, Park, & Peterson, 2005). The notion of a complete picture of health is reflected in the World Health Organisations definition of mental health as:

> ...a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her own community. (WHO, 2001a, p. 1).

This definition encapsulates the idea that mental health is the presence of well-being and not just the absence of mental illness. To test a model of complete mental health and psychosocial functioning Keyes (2005) surveyed a nationally representative sample of 3032 American adults. The results supported the theory that mental health and mental illness are independent but correlated axes; and not merely opposite ends of a continuum. Moreover, Keyes found that participants with no mental illness but low well-being (Keyes labels this *languishing*) had equivalently poor psychosocial outcomes as the participants with a mental illness. Consequently, promoting well-being and optimal psychosocial functioning is important in its own right, and not just an adjunct to mental illness treatment and prevention.

Well-being, also referred to by some researchers as happiness (these terms will be used interchangeably), is a complex construct concerned with optimal experience and functioning (Ryan & Deci, 2001). There are two major conceptual approaches to defining and

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measuring well-being: *eudaimonic* and *hedonic*. Aristotle (384–322 BC) first articulated the eudaimonic approach as being true to one's inner self. In contemporary psychology this approach is best reflected by the concept of psychological well-being (PWB), which is broadly defined as the degree to which a person is fully functioning and focuses on meaning and personal growth (Ryan & Deci, 2001; Ryff, 1989). In contrast, the hedonic approach focuses on pleasure attainment and pain avoidance (Ryan & Deci, 2001) and in contemporary psychology subjective well-being (SWB) best encapsulates this approach. SWB is defined as how an individual evaluates his/her own life (Diener, 1984) and incorporates both affective (e.g., positive and negative moods or emotions) and cognitive (e.g., satisfaction judgements) components. There has been debate over the utility of the eudaimonic/hedonic divide and more recently it has been proposed that these models are not mutually exclusive and can independently and in combination provide valuable insight about well-being measurement and underlying mechanisms (Kashdan, Biswar-Diener, & King, 2008; Keyes, Shmotkin, & Ryff, 2002; Ryan & Deci, 2001). Subsequently, some well-being theorists have combined both SWB and PWB into unifying models of well-being, for example, the complete state model of mental health (Keyes, 2005; Keyes, 2007) and the orientations to happiness (Peterson, Park, & Seligman, 2005).

While there is ample literature to suggest the pursuit of happiness is a worthwhile one (for a review see Lyubomirsky, King, & Diener, 2005), there is less literature focussed on whether it can be sustained or enhanced at a population level. One model of enduring, or chronic, happiness proposes three key factors that influence well-being: (1) a person's genetically determined set point, or set range, for happiness; (2) circumstantial factors (e.g., income, location, education level and marital status) and; (3) intentional cognitive, motivational, and behavioural activities that can influence well-being (Lyubomirsky, Sheldon, & Schkade, 2005). It is proposed that this last factor, with its focus on individual psychological processes, is most amenable to change. For example, data from longitudinal studies have demonstrated that well-being can be enhanced via interventions that promote intentional activity, such as practising gratitude, committing acts of kindness, visualizing best possible future selves, and processing positive life experiences (Lyubomirsky, 2006; Lyubomirsky, Sheldon et al., 2005). The current study set out to determine whether well-being could be enhanced by intentional activity and to extend previous research by examining whether this type of intervention can be delivered using the internet.

1.2. The internet and mental health promotion

A key objective of mental health promotion is to deliver interventions that have demonstrated efficacy and are accessible and sustainable. Traditional forms of delivery such as mass media campaigns, or individual or group interventions that are offered through schools or the work place, may demonstrate efficacy but are not always accessible (e.g., to rural communities or small businesses) or sustainable (e.g., are costly to deliver). Mass media campaigns tend to address only the most general determinants of a particular health issue or behaviour (e.g., an Australian campaign run by VicHealth called 'Together We Do Better', which seeks to increase community awareness of the benefits of strong, connected and supportive communities), yet we are told that behaviour change is more likely if interventions are targeted at the individual (de Vries & Brug, 1999). The internet has the potential to address these issues of efficacy, accessibility, sustainability and delivery at an individual level, therefore providing an adjunctive health promotion delivery framework (de Vries & Brug, 1999; Evers, 2006; Mihalopoulos et al., 2005).

Over the past 20 years the internet has become an integral part of the lives of most Australians. A national survey indicated that 84% of Australians, and 60% of Australian households (9.1 million people), have access to the internet (ABS, 2006; DCITA, 2005). These household access rates are similar to those reported for the United Kingdom (60.2%) and United States (62%) (ABS, 2006; Cheeseman Day, Janus, & Davis, 2005). People use the internet for a variety of purposes and there is a growing interest in wellness information unrelated to symptoms of illness, a medical diagnosis or other health crisis (Evers, 2006; Fox, 2006). The internet has been acknowledged by consumers, researchers, policy makers and clinicians as a valuable means of health promotion (Christensen, Griffiths, & Evans, 2002; Evers, 2006; Korp, 2006).

Obtaining health information via the web has taken a variety of forms including static health educational sites, peer support groups, online health consultations and delivery of internet interventions. Ritterband et al. (2003) defined internet interventions for mental health as interventions that promote knowledge and behaviour change via web-based programs that are typically theory driven, self-paced, interactive, tailored to the user and utilise the multimedia opportunities provided by the internet. These intervention websites are generally based on effective face-to-face interventions that have been operationalised and transformed for internet delivery, for example, Panic Online – a treatment program for panic disorder (Klein & Richards, 2001; Klein, Richards, & Austin, 2006).

The number of internet interventions available for mental health treatment and prevention is growing rapidly, as are interventions that promote health behaviour change (see Table 1). These interventions have demonstrated efficacy (e.g., reduction in symptoms or number of people meeting clinical criteria for diagnosis of a disorder, for a range of mental health disorders) and the majority are based on cognitive-behavioural approaches (Christensen, Griffiths, Korten, Brittliffe, & Groves, 2004; Klein et al., 2006, in pressb).

In contrast to the growing internet-based treatment and prevention literature, only one published randomised controlled trial was identified that focussed on well-being enhancement via the internet (Seligman et al., 2005). Seligman et al. (2005) used the internet for participant recruitment, data collection and intervention delivery. Five hundred and fifty-seven participants completed the pre-assessment questionnaires with 166 participants (29%) dropping out before the final 6-month assessment. Participants were randomly assigned to one of six groups including five active interventions and one placebo control. The five proposed happiness interventions included: (1) a gratitude visit; (2) identifying three good things in life; (3) identifying a time when you are at your best; (4) identifying signature strengths; and (5) identifying and using signature strengths in a new way. The placebo control involved writing about earliest memories. Participants completed a demographic survey and two questionnaires measuring depression (Centre for Epidemiological Studies – Depression Scale) and happiness (Steen Happiness Index) that were repeated on six occasions (pre-, post-assessment, 1-week, 1-, 3-, and 6-month follow-up); with reminder emails to complete the questionnaires sent at each time point. The 1-week intervention involved participants receiving instructions for their assigned activity via an email. Participants were encouraged to contact the researchers if they had any questions about the activity. Adherence to the activity was measured by a question requiring a 'yes' or 'no' response.

Using signature strengths in a new way and *three good things* produced significant change in the expected direction on the happiness and depression outcome measures, with benefits apparent at 6 months. The *gratitude* intervention was also effective in improving happiness and depression ratings, however this change lasted only 1 month. In addition, participants who reported continued adherence to the happiness intervention beyond the required 1 week, scored higher on happiness scores at all times points and

Table 1
Internet intervention controlled studies for the treatment and/or prevention of mental illness and health behaviour change.

Mental illness/health behaviour	Examples of controlled studies
Alcohol use	Kypri et al. (2004), Walters, Miller, and Chiauzzi (2005)
Anxiety	Kenardy, McCafferty, and Rosa (2003), Proudfoot et al. (2003)
Bipolar disorder	Proudfoot, Parker, Benoit, Manicavasagar, and Smith (2007), Proudfoot et al. (2007)
Depression	Andersson et al. (2005), Christensen, Griffiths, and Jorm (2004), Christensen et al. (2002), Clarke et al. (2002), Patten (2003), Proudfoot et al. (2004), Proudfoot, Ryden, and Goldberg (2005)
Eating and body image	Celio et al. (2000), Winzelberg et al. (2000)
Encopresis	Ritterband, Cox, et al. (2003), Ritterband et al. (2006)
Headaches	Devineni and Blanchard (2005), Strom, Pettersson, and Andersson (2000)
Nutrition/dietary behaviour/ weight loss	McKay, Glasgow, Feil, Boles, and Barrera (2002), Tate, Wing, and Winett (2001), Wantland, Portillo, Holzemer, Slaughter, and McGhee (2004), Winett et al. (1999)
OCD	Clark, Kirkby, Daniels, and Marks (1998)
Panic disorder	Carlbring et al. (2006), Carlbring et al. (2005), Carlbring et al. (2001), Kiropoulos et al. (2008), Klein et al. (in pressa), Klein and Richards (2001), Klein et al. (2006), Pier et al. (2008), Richards, Klein, and Austin (2006)
Phobias/panic	Kenwright, Liness, and Marks (2001)
Physical activity	Napolitano et al. (2003), Spittaels and De Bourdeaudhuij (2006), Vandelanotte, De Bourdeaudhuij, Sallis, Spittaels, and Brug (2005), Wantland et al. (2004)
Posttraumatic stress	Hirai and Clum (2005), Klein et al. (in pressb), Lange, van de Ven, and Shrieken (2003), Lange, van de Ven, Shrieken, and Emmelkamp (2001), Litz, Engel, Bryant, and Papa (2007)
Smoking cessation	Cobb, Graham, Bock, Papandonatos, and Abrams (2005), Etter (2005), Swartz, Noell, Schroeder, and Ary (2006), Walters, Wright, and Shegog (2006)
Social phobia	Andersson et al. (2006)
Tinnitus	Abbott et al. (in press), Andersson, Strömgren, Ström, & Lyttkens (2002)

lower on depression scores at 1-month follow-up, compared to those who did not continue to adhere.

A limitation of the study, from an internet interventions research perspective, was that the interventions were unlikely to qualify as a true internet intervention according to the definition provided earlier in this article (Ritterband et al., 2003). Although a website was used to recruit participants and collect data, the interventions each consisted of a single email with written instructions and did not utilise the interactive features of web-based technology.

In addition, the study was limited by a lack of clarity concerning the amount of human contact that was provided to participants. Participants were encouraged to contact the researchers if they had any questions about the intervention, but no details were published about how much human support was provided, making it unclear whether the program was self-guided or partially supported for some or all of the participants. Human supported (e.g., via email, phone, face-to-face contact) internet interventions have demonstrated larger effect sizes than pure self-help programs (Spek et al., 2007). Despite these limitations, the study demonstrated the potential for delivering mental health promotion interventions to promote well-being via the internet.

1.3. Aim and hypotheses

For the present study a positive psychology intervention, based on the '*using signature strengths in a new way*' intervention (see Seligman et al., 2005), was developed and delivered via a purposely built, fully automated and interactive website. Seligman's theory proposes that there are three orientations that promote happiness (i.e., pleasure, engagement and meaning) and this intervention activates the engagement orientation to happiness by helping people think about and use their personal strengths in a new way. The aim of this study was to test the efficacy of the internet intervention over time and in comparison to a cognitive-behavioural intervention (i.e., problem solving), as typically used in the treatment and prevention literature, and a placebo control. It was hypothesised that: (1) the strengths group would demonstrate an increase in well-being and engagement and decrease in mental illness at post- and follow-up assessment; (2) the problem solving group would demonstrate a decrease in mental illness at post- and follow-up assessment and; (3) adherence would be greatest in the strengths intervention group.

2. Methods

2.1. Design

A randomised controlled trial, 3 (group) × 3 (time) design was used. The three groups included a positive psychology strengths intervention, a problem solving intervention and a placebo control group. Participants completed online assessments at pre-, post-, and 3-month follow-up, to evaluate the post-intervention outcomes and durability of change over time.

2.2. Measures

The following measures were used to collect demographic information and measure well-being, mental illness, and adherence. The relevant Cronbach alpha coefficients for the current study are reported in Table 2.

2.2.1. Personal Well-being Index – Adult (PWI-A) Scale

The PWI-A (IWG, 2006) is a measure of subjective well-being consisting of eight items of satisfaction, each one corresponding to a life domain (i.e., standard of living, health, achieving in life, relationships, safety, community-connectedness, future security, and spirituality/religion). The PWI-A has satisfactory validity and reliability and correlates .78 with the SWLS (IWG, 2006).

2.2.2. Satisfaction with Life Scale (SWLS)

The SWLS (Diener, Emmons, Larsen, & Griffin, 1985) is a five item instrument designed to measure global cognitive judgments of one's life. Respondents use a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*) to rate the extent of their agreement with five statements (e.g., "I am satisfied with my life"). The majority of people obtain scores in the 23–28 range (*slightly satisfied* to

Table 2
Cronbach alpha coefficients, means and standard deviations on dependant variables by group and time.

Measure	Alpha	Group	Time 1		Time 2		Time 3	
			Mean	SD	Mean	SD	Mean	SD
PWI-A	.81	Strengths	71.25	15.61	72.65	14.16	73.63	14.45
		Problem solving	70.20	12.65	70.22	12.86	70.25	12.72
		Placebo control	71.69	13.75	70.08	15.67	69.90	15.95
SWLS	.86	Strengths	23.54	6.96	24.21	6.98	24.42	6.95
		Problem solving	23.38	6.08	23.50	6.12	23.34	6.07
		Placebo control	24.65	5.75	24.96	6.28	25.19	6.09
PANAS		Strengths	35.37	6.30	35.29	7.12	35.34	6.79
Positive affect	.85	Problem solving	33.55	6.52	33.55	6.58	33.59	6.64
		Placebo control	34.41	5.85	34.61	5.96	34.33	6.27
PANAS		Strengths	15.52	4.63	15.06	4.45	14.72	4.18
Negative affect	.86	Problem solving	15.93	5.71	16.02	5.76	15.95	5.77
		Placebo control	16.17	4.66	15.65	4.51	16.13	5.46
DASS		Strengths	6.33	5.52	6.19	5.74	5.75	5.29
Depression	.77	Problem solving	5.79	4.55	5.52	4.56	5.52	4.62
		Placebo control	5.07	5.09	5.28	5.16	5.54	5.52
DASS		Strengths	4.00	4.83	3.35	4.09	3.67	4.37
Anxiety	.74	Problem solving	3.74	3.55	3.71	3.62	3.57	3.70
		Placebo control	4.19	5.10	3.56	4.20	3.89	4.55
DASS		Strengths	10.25	7.97	10.48	8.49	10.67	8.18
Stress	.81	Problem solving	10.76	6.03	10.83	6.04	11.00	5.85
		Placebo control	10.93	5.90	10.74	5.57	11.07	6.03
OTH		Strengths	3.32	.80	3.43	.92	3.39	.95
Pleasure	.80	Problem solving	3.05	.73	3.05	.68	3.06	.72
		Placebo control	2.94	.87	2.94	.87	2.86	.86
OTH		Strengths	3.17	.74	3.23	.76	3.28	.72
Engagement	.70	Problem solving	2.98	.67	2.99	.63	3.00	.66
		Placebo control	2.88	.64	2.98	.63	2.97	.65
OTH		Strengths	3.43	.84	3.44	.85	3.48	.87
Meaning	.76	Problem solving	3.26	.75	3.28	.77	3.30	.80
		Placebo control	3.45	.79	3.48	.82	3.52	.84

Note: Alpha scores in excess of .70 indicate adequate internal consistency (Nunnally, 1978).

satisfied) and the SWLS has demonstrated satisfactory validity and reliability (Diener et al., 1985; Pavot & Diener, 1993).

2.2.3. Positive and Negative Affect Schedule (PANAS)

The PANAS (Watson, Clark, & Tellegen, 1988) is a measure of positive and negative affect, consisting of 10 positive emotions (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) and 10 negative emotions (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid). Participants rate items on a scale from 1 (*very slightly or not at all*) to 5 (*extremely*) based on the strength of emotion. The PANAS is commonly used in conjunction with the SWLS to measure subjective well-being and has demonstrated satisfactory validity and reliability (Watson et al., 1988).

2.2.4. Depression, Anxiety, Stress Scales (DASS-21)

The DASS-21 (Lovibond & Lovibond, 1995) is a short form of the DASS and contains three self-report scales, each with 7-items, designed to measure the emotional states of anxiety, depression, and stress. Respondents are asked to use a four-point severity/frequency scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*) to rate the extent that they had experienced each emotion over the last week (e.g., "I felt sad and depressed"). The DASS-21 has satisfactory validity and reliability (Antony, Bieling, Cox, Enns, & Swinson, 1998; Lovibond & Lovibond, 1995).

2.2.5. Orientations to Happiness (OTH)

The OTH (Peterson et al., 2005) is a relatively new 18-item scale consisting of three subscales (6-items per scale) measuring three different happiness endorsements (pleasure, engagement, and meaning). Respondents used a five-point scale from 1 (*not like me at all*) to 5 (*very much like me*) to rate the extent of their identification with each of the statements (e.g., "I seek out situations that challenge my skills and abilities"). Internal consistencies of the three subscales were reported as .82 for pleasure, .72 for engagement and .82 for meaning. Small to moderate correlations with the SWLS for each of the subscales are reported as .17 for pleasure, .30 for engagement and .26 for meaning (Peterson et al., 2005).

To establish the reliability of this scale in the current study, the Cronbach alpha coefficients are reported (see Table 2) and a principal component analysis (PCA) was conducted (see Table 3). Bartlett's Test of Sphericity was significant at $p < .001$, and the Kaiser–Meyer–Olkin measure of sampling adequacy was .78; exceeding the recommended value of .6 (Tabachnick & Fidel, 2007) supporting the factorability of the matrix. PCA revealed the presence of six components with eigenvalues exceeding 1, explaining 25.1%, 13.9%, 9.0%, 6.5%, 6.0%, and 5.6% of the variance, respectively. An inspection of the scree plot revealed a clear break after the third component and it was decided to retain three components for further analysis.

The three-component solution explained a total of 48.0% of the variance. Oblimin rotation was performed to aid in the interpretation and indicated weak negative correlations between Components 1 and 2 ($r = -.14$) and Components 1 and 3 ($r = -.29$); and a weak positive correlation between Components 2 and 3 ($r = .25$). Inspection of the matrix table showed a relatively clear three-factor solution, and the interpretation was consistent with previous research on the OTH scale, with meaning items loading

Table 3
Pattern matrix for PCA of three-factor solution of OTH items.

Number	OTH items	Pattern coefficients		
	Description	Component 1	Component 2	Component 3
11	I have a responsibility to make the world a better place	.854		
14	What I do matters to society	.790		
12	My life has a lasting meaning	.761		
17	I have spent a lot of time thinking about what life means and how I fit into its big picture	.614		
2	My life serves a higher purpose	.545		
4	I seek out situations that challenge my skills and abilities	.408		
5	In choosing what to do, I always take into account whether it will benefit other people	.399		
18	For me, the good life is the pleasurable life		−.814	
15	I agree with this statement: "Life is short–eat dessert first"		−.762	
13	In choosing what to do, I always take into account whether it will be pleasurable		−.727	
16	I love to do things that excite my senses		−.706	
3	Life is too short to postpone the pleasures it can provide		−.599	
8	I go out of my way to feel euphoric		−.433	−.415
7	I am always very absorbed in what I do			−.710
1	Regardless of what I am doing, time passes very quickly			−.707
6	Whether at work or play, I am usually "in a zone" and not conscious of myself			−.616
9	In choosing what to do, I always take into account whether I can lose myself in it			−.582
10	I am rarely distracted by what is going on around me			−.565

on Component 1, pleasure items on Component 2 and engagement items on Component 3. There were two exceptions to this model, with item 8 ('I go out of my way to feel euphoric.') crossloading on pleasure (.43) and engagement (.41); and Item 4 ('I seek out situations that challenge my skills and abilities') loading on meaning and not on engagement as intended. On inspection of the items that make up the OTH-engagement subscale, five items (see Table 3, items 1, 6, 7, 9, 10) appear to tap into the engagement experience, akin to flow (Csikszentmihalyi, 1990), as a theorised outcome of using your strengths. In contrast item 4 appears to measure seeking out situations that may create flow rather than the flow experience itself, and this maybe why this item has loaded on the meaning factor in this Australian sample. With some noted exceptions these results support the three-factor model of the OTH proposed by the authors.

2.2.6. Demographics

Demographic data were collected and included 10 questions about age, gender, income, education, employment, marital status, number of children, physical health, AIS athlete status, and residential postcode, were included in the study.

2.2.7. Adherence

Adherence to the intervention groups was manually recorded as a dichotomous value (yes/no) depending on whether participants had completed all three modules of the intervention (i.e., partial or non-completers were categorised as 'no').

2.3. Procedure

Ethics approval for the study was provided by the relevant Monash University and AIS Ethics Committees. Australian adults were recruited through advertising sent via Monash University and the Australian Sports Commission's online networks (e.g., websites, eNewsletters, and email distribution lists). Participants self-registered online for the study, completed an online informed consent process and were assigned a personal username and password for access to the intervention website. When participants first logged-in they were asked to complete a demographic survey and five mental health and well-being questionnaires (Time 1). On completion of the questionnaires all eligible participants were randomly allocated to one of three groups via an automated computer-based random number generator built into the web-based program by the web developers (www.janison.com).

Participants were given 3 weeks to complete the intervention and at completion were prompted via the website to answer the same five mental health and well-being questionnaires and a program evaluation (Time 2). Three months later participants were sent an email request to login to the website and complete the five mental health and well-being questionnaires for a final time (Time 3). An unintended outcome of the website design was that only participants who completed the whole online intervention were prompted to proceed to the post- and follow-up assessment phases of the study (i.e., post- and follow-up assessment data was not collected for non- or partial-intervention completion).

2.4. The intervention groups

The three programs were based on established protocols that were operationalised and transformed for delivery on the internet. The two active interventions (strengths and problem solving) were text and graphics based (no audio, animation or video) and used interactive features to engage the user in an active learning process (e.g., participants were asked to type their responses to questions, to click and drag objects around the page and provided with feedback based on the PWI-A questionnaire). The three programs were delivered over three sessions, with a recommended 1-week break between sessions, and automated weekly email reminders to complete the next session.

The *strengths intervention* was based on a positive psychology intervention that involved identifying and using your strengths (Seligman et al., 2005). In the first session, participants identified and prioritised their perceived strengths from a list of 24 signature strengths (Peterson & Park, 2004). At the end of the session they were assigned an offline activity, or homework task, asking them to share with a friend what they had learnt about identifying personal strengths. In session two, participants provided feedback on their progress with the previous session's offline activity and then selected three of their top 10 strengths to further develop in their daily life. Participants were asked to practice using their identified strengths during the week and were provided examples and an online, downloadable diary to help them record their progress. The final session reviewed participant progress, summarised the information provided to date, and directed participants to the post-intervention questionnaires. Once the questionnaires were completed, participants could view a graph with their scores on the SWLS at pre- and post-assessment. Three months later, after completing the follow-up assessment questionnaires, participants

could view their SWLS graph again with the additional follow-up assessment data included.

The *problem solving intervention* was based on a cognitive-behavioural approach to problem solving and was chosen because it is a life skill that could be applied across clinical and non-clinical populations. Problem solving is typically included in cognitive-behavioural treatment and prevention programs for stress management and depression. In the first session, participants were introduced to three steps of a six-step approach to problem solving. The six steps are (1) identify the problem; (2) generate possible solutions; (3) evaluate the alternatives; (4) decide on a solution; (5) implement the solution; and (6) evaluate and review progress. At the end of the first session, participants were assigned an offline activity asking them to share what they had learnt about problem solving with a friend/family member. In the second session, participants were asked to provide feedback on their progress with the offline activity from the previous session. Next, participants were introduced to steps four and five of the problem solving model and to apply this information to a real life problem. They were asked to practice using their problem solving skills during the week and were provided an online, downloadable diary to help them record their progress. In the final session, participants were asked to provide feedback on their offline activity, were introduced to step six of the model, given a summary of the whole six-step model, and then directed to the post-intervention questionnaires. As per the strengths intervention, participants could view a graph of their SWLS scores at three time points.

The *placebo control* was an abbreviated version of the problem solving intervention but without utilising any of the interactive web features (i.e., it is like reading an electronic book). Unlike the problem solving group, participants were not asked to apply the problem solving information to a real life problem, nor to complete any offline tasks.

2.5. Statistical procedures and analyses

Statistical analyses were conducted using SPSS version 14 and 10. Normality tests were performed on the data prior to running the analysis. To fulfil normality requirements outliers on three subscales (DASS subscales of depression and anxiety; and PANAS subscale of negative affect) had their raw scores truncated to be one unit larger than the next most extreme score in the distribution (Tabachnick & Fidel, 2007). To confirm random assignment to the three conditions, one-way ANOVAs and Chi-square tests were conducted on all pre-treatment measures and no significant differences were found. Data analysis involved intention-to-treat analyses, with pre-assessment scores for participants who discontinued their involvement at any stage (i.e., after they have been randomised to one of the three conditions) carried forward and used in both the post- and follow-up assessments. Intention-to-treat analysis is an accepted strategy to address the problem of attrition and missing data (Gross & Fogg, 2004; Lachin, 2000) and has become common practice in internet-based treatment research (Andersson, Strömgren, Ström, & Lyttkens, 2002; Carlbring, Westling, Ljungstrand, Ekselius, & Andersson, 2001; Klein et al., 2006; Winzelberg et al., 2000). The means and standard deviations for the dependant variables at all three time points are shown in Table 2.

Preliminary assumption testing was conducted with no serious violations noted. Repeated measures MANOVAs were performed to investigate differences in mental illness and well-being on the measures with more than one subscale (i.e., DASS, PANAS, and OTH). Repeated measures ANOVAs were conducted to test for any group differences on participants' well-being (i.e., SWLS and PWI-A) over time. Type I error rate was set at .05. Finally, a Chi-square test for independence was conducted to examine group differences on adherence to the interventions.

3. Results

3.1. Participants

Participants ($n = 160$) were included in the study if they were Australian residents and at least 18 years old. For duty of care reasons participants were excluded and referred to support services if their DASS subscale scores were in the 'severe' range ($n = 9$), indicating the possibility of a mood or anxiety disorder. The participant attrition rate for the study was 69% at post-assessment and 83% at 3-month follow-up. Participant flow through the study from recruitment to data analysis is summarised (see Fig. 1).

The mean age of participants was 37 years (range: 18–62; $SD = 11.2$) and most were female (83%). The majority of participants were employed (80%) or students (16%); had completed an undergraduate or postgraduate degree (76%); were married or in a defacto relationship (57%); had no children (58%) or 1–2 children (27%); and had a gross yearly income of $40,000 to $79,000 (48%) or less than $40,000 (36%). Most participants self-rated their physical health as above average (57%) or average (32%) and there was one AIS scholarship holders (i.e., elite level athletes) (<1%).

3.2. PWI-A

A repeated measures ANOVA showed a significant interaction between intervention group and time on the PWI-A, Wilks' Lambda = .93, $F(4,312) = 2.81$, $p = .02$, partial eta squared = .03. The strengths group showed an increase in PWI from pre- to post-assessment and to 3-month follow-up. The problem solving group showed no change over time and the placebo control group showed a decrease in PWI from pre- to post-assessment and then no change to follow-up. These results are summarised in Fig. 2.

3.3. SWLS

A repeated measures ANOVA showed no significant interaction between intervention group and time on the SWLS, Wilks' Lambda = .97, $F(4,312) = 1.27$, $p = .28$, partial eta squared = .02. The main effect for time was not significant, Wilks; Lambda = .96, $F(2,156) = 2.90$, $p = .058$, partial eta squared = .04. The main effect for group was not significant, $F(2,157) = .84$, $p = .43$, partial eta squared = .01.

3.4. PANAS

A repeated measures MANOVA was performed to investigate group differences on the subscales of the PANAS (i.e., positive affect and negative affect) over time. No significant differences were found for the main effects of group, $F(4,310) = .62$, $p = .65$; Wilks' Lambda = .98; partial eta squared = .01; or time, $F(4,153) = 1.23$, $p = .27$; Wilks' Lambda = .97; partial eta squared = .03. The interaction effect between time and group was not significant, $F(8,306) = 1.09$, $p = .37$; Wilks' Lambda = .94; partial eta squared = .03.

3.5. DASS-21

A repeated measures MANOVA was performed to investigate group differences on the subscales of the DASS-21 (i.e., depression, anxiety and stress) over time. No significant differences were found for the main effects of group, $F(6,310) = .29$, $p = .94$; Wilks' Lambda = .99; partial eta squared = .01; or time, $F(6,152) = 1.42$, $p = .21$; Wilks' Lambda = .95; partial eta squared = .05. The interaction effect between time and group was not significant, $F(12,304) = .77$, $p = .68$; Wilks' Lambda = .94; partial eta squared = .03.

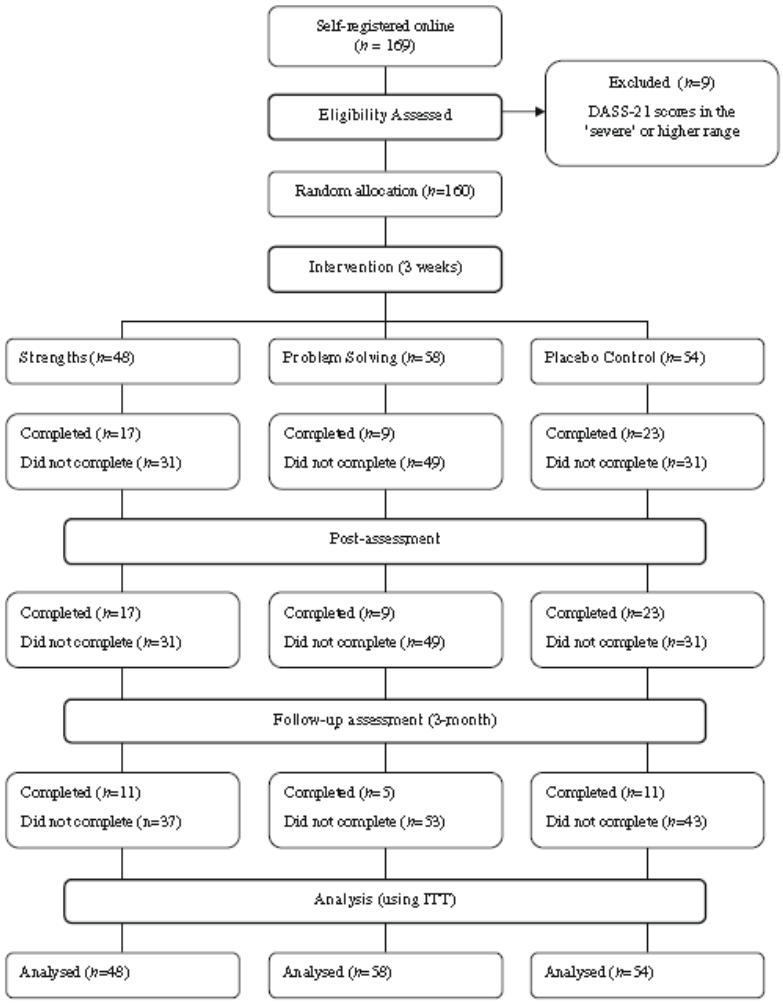

Fig. 1. Participant flow through the study from registration to data analysis.

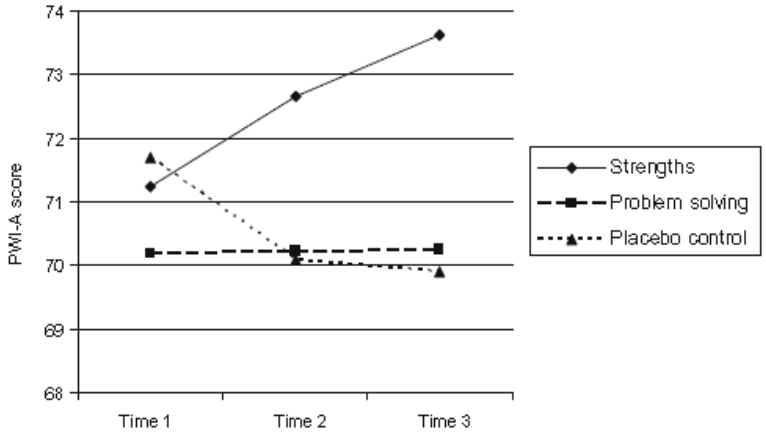

Fig. 2. PWI-A means by group at time 1 (pre), time 2 (post) and time 3 (3-month follow-up).

3.6. OTH

A repeated measures MANOVA was performed to investigate group differences on the subscales of the OTH (i.e., pleasure, engagement and meaning) over time. Significant differences were found for the main effects of group, $F(6,310) = .2.20$, $p = .043$; Wilks' Lambda = .92; partial eta squared = .04; and time, $F(6,152) = 2.48$, $p = .026$; Wilks' Lambda = .95; partial eta squared = .09. The interaction effect between time and group was not significant, $F(12,304) = .1.36$, $p = .186$; Wilks' Lambda = .90; partial eta squared = .05. A review of the univariate data indicated a significant time effect for engagement, $F(2) = 5.13$, $p = .006$, partial eta

squared = .03; and a significant group effect for pleasure $F(2) = 4.40$, $p = .014$, partial eta squared = .05. There was no significant time or group effect for meaning.

Posthoc analysis using paired samples t-tests showed a significant increase in engagement scores (see Fig. 3) for the placebo control group from: Time 1 to Time 2, $t(53) = 2.97$, $p < .01$ (two-tailed) and; Time 1 to Time 3, $t(53) = 2.75$, $p < .01$ (two-tailed). Posthoc comparisons using the Tukey HSD test indicated that pleasure scores (see Fig. 4) were significantly greater for the strengths group compared to the placebo control group at Time 2 ($p = .01$) and Time 3 ($p < .01$).

3.7. Adherence

Adherence to the intervention was 42.6% (23/54) for the placebo control group; 34.0% (16/47) for the strengths group; 15.5% (9/58) for the problem solving group; and overall adherence was 30.2% (48/160). A Chi-square test for independence indicated a significant association between group and adherence, $\chi^2(1, N = 160) = 10.39$, $p > .01$), with a small to moderate effect size (Cramer's V = .255).

4. Discussion

4.1. Well-being

The PWI-A results support the first hypothesis with a significant increase in the cognitive component of subjective well-being for the strengths group from pre- to post-assessment and 3-month follow-up. The effect size for this change was small, compared to the moderate effect size reported in the email intervention of Seligman et al. (2005). As hypothesised, the problem solving group demonstrated no change in well-being from baseline to post- or follow-up assessment; and the placebo control group showed a slight decrease in well-being from baseline to post-, and then remained stable to follow-up assessment.

Interestingly the SWLS, which like the PWI-A is a cognitive measure of subjective well-being, followed the hypothesised upward trajectory for the strengths group but this result was not statistically significant. The difference in results between these two measures of cognitive well-being may be accounted for by the global versus domain specific approach used by the SWLS and PWI-A, respectively. The PWI-A deconstructs the global cognitive satisfaction judgements into targeted life domains, providing a more specific reference point to base participants' satisfaction judgements, potentially making it a more sensitive measure of well-being than the SWLS and so more able to detect changes in subjective well-being.

The third measure of SWB, the PANAS, addressed the affective component of well-being and no significant changes were detected. This result indicates that the strengths intervention has the desired impact on the cognitive component of well-being but not the affective component. Alternatively, the lack of significant affective change may be because the PANAS is limited to only measuring activated emotions (e.g., excited, enthusiastic, distressed, guilty) not deactivated emotions (e.g., contented, calm, bored,

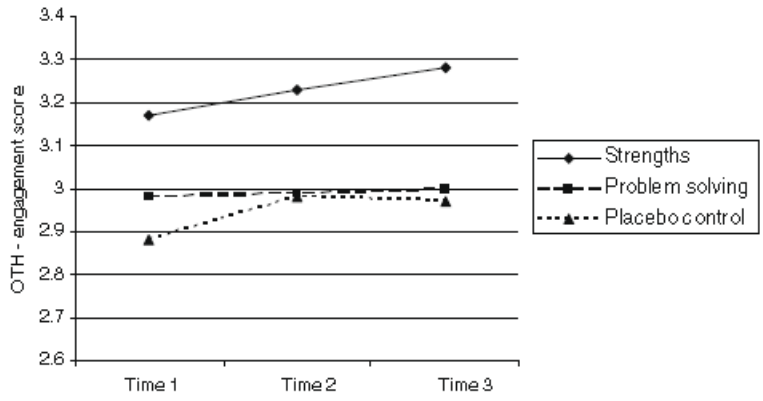

Fig. 3. OTH-engagement subscale means by group at time 1 (pre), time 2 (post) and time 3 (3-month follow-up).

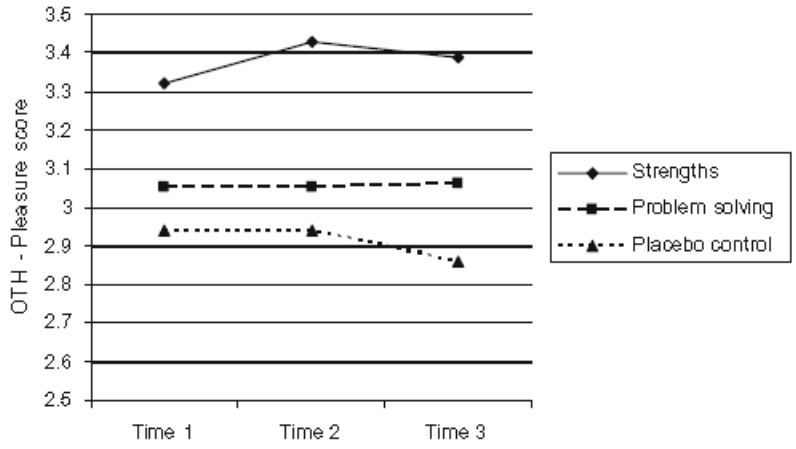

Fig. 4. OTH-pleasure subscale means by group at time 1 (pre), time 2 (post) and time 3 (3-month follow-up).

sad) as described in the circumplex model (Russell, 1980). A recent online longitudinal study found changes in deactivated, but not activated, positive emotions, as a result of a gratitude intervention (Iyer, 2008). Future research would benefit from measuring both activated and deactivated emotions.

The OTH was included in this study for exploratory purposes as there is no known longitudinal intervention data for this measure; it has previously been used as a predictor of life satisfaction rather than as an outcome variable. It was hypothesised that engagement would increase for the strengths intervention group only, however while there was a trend in the predicted direction, the result was not significant. The results suggest that engagement, as measured by the OTH subscale, is trait-like rather than state-like, and as a result may be less amenable to change. As previously mentioned, the engagement subscale of the OTH appears to measure the experience of the flow state as a result of using one's strengths, which requires not just cognitive change but behavioural change. The strengths intervention focuses on cognitive change in the first session and behavioural change in the second session, allowing little time for participants to experience a change in flow experiences prior to post-assessment. It is possible that change could be observed at 3-month follow-up, but the small sample size and high attrition rate made it difficult to detect significant change. There was an unexpected increase in engagement for placebo control group, which is likely to be a result of a low pre-assessment score for the placebo control relative to the other two groups resulting in regression toward the mean. The result is statistically significant but unlikely to be a meaningful finding.

Significant changes in participants' orientation to pleasure were recorded for the strengths group when compared to the placebo control at post- and follow-up assessment. It is plausible that an increase in pleasure orientation is a by-product of the engagement intervention, but it is surprising not to also observe the hypothesised change in engagement. It may be that it takes longer to see a shift in engagement then it does in pleasure, or that the OTH is more sensitive to shifts in pleasure orientation. An alternative possibility is that the results are merely a result of a low placebo control mean and high strengths mean score for engagement at baseline as the difference at baseline approaches significance ($p = .056$). If the results are treated as meaningful, then according to theory the pleasure orientation is equated to SWB, and so these results support the aforementioned changed on the PWI-A for the strengths group.

Overall, the theory and operationalisation of the OTH requires greater clarity to gain insight into exactly what is being measured. The authors of the OTH note that it elicits people's endorsement of ways to be happy, rather than actual behaviour (Peterson et al., 2005). This result suggests that the OTH is more trait than state-like. However, the OTH results should be treated with caution at this stage.

The well-being results of the current study are not as definitive as the results from Seligman et al. (2005) which measured well-being using the Steen Happiness Index (SHI). The SHI was a newly created, purposely built questionnaire designed to be a combined measure of hedonic (SWB) and eudaimonic (PWB) aspects of well-being. The current study used well established questionnaires measuring SWB, as well as the OTH as an emerging measure of SWB and PWB combined. The strengths intervention in the current study was intended to develop engagement, which is in theory more proximal to PWB than SWB. While SWB and PWB are moderately correlated they measure different aspects of well-being, and for this study a clearer picture may have emerged by including an established measure of PWB as a more proximal measure of well-being. The theory and measurement of well-being is a rapidly developing area and a number of brief, but valid and reliable population level measures that combine SWB and PWB are now becoming available, such as the Warwick–Edinburgh Mental Well-being Scales (Tennant et al., 2007).

4.2. Mental illness

The hypothesised reduction in mental illness, as measured by the DASS-21, was not supported by the results, with no change in depression, anxiety or stress scores over time or by group. This does not support the findings of Seligman et al. (2005) who found decreases in depression symptoms using the CES-D for their strengths intervention. Examining the mean depression, stress and anxiety scores at baseline may provide an explanation as the mean score for each subscale is at the low end of the normal range, which may be creating a floor effect. This low mean score at baseline would have been exacerbated by excluding participants from the study with DASS-21 scores in the 'severe' or higher range. To be able to detect change in symptoms of mental illness a less healthy sample may be required, as was the case in the Seligman et al. study that reported baseline scores on the CES-D of mild depression.

4.3. Adherence

The average adherence to the intervention groups was 31%, with a significant between groups difference indicating that people were more likely to adhere to the placebo control and strengths intervention than to the problem solving intervention. Although the reason for these differences from the current study cannot be conclusively ascertained, one possible explanation is that participants were more likely to complete the placebo control intervention because it required less effort (e.g., reading information online) and time compared to the other two groups. The strengths and problem solving groups required participants to put in more and equivalent amounts of effort (e.g., reading, writing, manipulating date on screen and offline tasks).

The difference in adherence between the two active interventions could be accounted for by the focus of the intervention content. The strengths intervention focussed on identifying what participants did well and doing more of it; while the problem solving intervention focussed on problems in participants' lives and how to resolve them. Intuitively, it would seem more enjoyable and novel to do the strengths intervention than the problem solving intervention. It has been identified that enjoyment is an important mediator of intervention effectiveness (Lyubomirsky, Dickerhoof, Boehm, & Sheldon, submitted for publication) and leads to higher motivation (e.g., Sheldon's self-concordant motivation theory). Perhaps health promotion could benefit from the adjunct of positive psychology interventions to traditional cognitive-behavioural interventions (e.g., problem solving, challenging negative thinking) not only because they are effective, but because they are enjoyable and so likely to increase adherence. It should be noted that although the hypothesised group difference in adherence was supported by the data, there is not enough information from this study to determine the exact reason for this difference.

4.4. Attrition

The attrition rate for internet interventions tends to be varied (6–95%) and this study's overall attrition rate, of 83% at 3-month follow-up assessment, is in the high end of the range. Attrition from internet intervention studies tends to be higher for programs that are automated; the implication being that human interaction (e.g., via email, telephone, face-to-face contact) reduces attrition, although this is still to be tested empirically. The current study used a fully automated internet intervention which would have contributed to the high attrition rate. In comparison, the reported

attrition rate by Seligman et al. (2005) from their positive psychology internet intervention was 29%. As discussed earlier, it is unclear how much of a role human contact played in their study, or if the mere expectation of support was enough to reduce attrition.

An unforeseen technical factor that is likely to have contributed to attrition was the website's tunnel design (Danaher, McKay, & Seely, 2005). The tunnel design meant participants needed to sequentially complete each stage of the program and participants who only partially completed the intervention were actively excluded from completing the post- and/or follow-up assessment. Allowing participants to complete the post- and follow-up questionnaires regardless of adherence to the program would have decreased attrition. While this approach ensured intervention fidelity, partial completion may have been enough to create change considering that the majority of the content was in the first two sessions.

A consideration for the current study was that high attrition can disrupt the randomisation process, which in turn can compromise the accuracy of the outcome results. To address this issue intention-to-treat (ITT) analysis was used. As noted earlier, ITT analysis is common practice in internet intervention research and is considered to be a conservative statistical approach (i.e., is likely to underestimate the probability of significant change). As the field of internet intervention research develops, so too are the statistical techniques being applied to address attrition issues and researchers should remain aware of and open to advances in this area.

While the upside of the internet is that it can reach a large audience, the down side is that attrition from these interventions can be high, as in the case of this study. Internet research is still in its infancy and issues that impact on attrition, such as website design and human interaction, need greater exploration.

4.5. Broad research implications

Two main points that emerge from this research are support for the theory that (a) it is possible to enduringly enhance well-being, and (b) well-being interventions can be effectively delivered via the internet. While being cautious about overstating the findings of this particular study, there are a number of health promotion implications stemming from these two points.

Keyes (2005) research indicated that only 20% of the adult population have high well-being (i.e., flourishing), leaving 80% with low or moderate levels of well-being. As discussed previously, the broad benefits of high well-being are better physical health, enhanced social relationships and enhanced performance at work, school and home; which in turn help create healthy, flourishing communities. It makes sense to invest in health promotion strategies that improve the well-being of individuals and communities. Health promotion, however, is often the poor cousin to illness treatment; perhaps as a result of the long held belief that if illness is eliminated then well-being will ensue. Overtime this biomedical approach has demonstrated that it is not sufficiently effective in stemming the growing burden of mental illness (Vaillant, 2003). An alternative option is to place greater focus on enhancing well-being, both as an independent outcome and as an adjunct to mental illness treatment and prevention. Using such an approach may serve the dual purpose of creating more flourishing individuals and reducing the incidence of mental illness.

Another recognised barrier to effective health promotion has been the reliance on traditional delivery mechanisms (e.g., face-to-face group programs; media campaigns). Internet delivery of well-being interventions addresses many of the limitations of traditional approaches, in particular the internet provides a more accessible, sustainable, and personalised approach to health promotion than has previously been possible. Combining what is known from positive psychology and well-being research with internet intervention research offers an immense opportunity to develop the field of health promotion world wide.

4.6. Limitations

This study had a number of limitations that made it difficult to detect significant change, most notably: the small sample size; high attrition; and the low levels of mental illness and high levels of well-being at baseline creating floor and ceiling effects. The sample was also largely female, tertiary educated and employed, thus limiting the generalisability of the findings.

While the benefit of conducting a longitudinal study is to demonstrate enduring change overtime, the current study only went for a 3-month period. It would be ideal to assess change over years rather than months, especially as some theories of well-being suggest that change will only ever be temporary and that most people return to their set point of happiness (Cummins, Gullone, & Lau, 2002; Headey, 2008). Finally, as mentioned earlier, the current study may have benefited from the inclusion of a measure of PWB which is theoretically more proximal to engagement then SWB.

5. Conclusions

The results, with some caveats, lend support to the body of literature indicating that well-being can be enhanced through intentional activity (i.e., identifying and using personal strengths) and that these changes continue on an upward trajectory for at least 3 months. In this study it is the cognitive, not the affective, component of subjective well-being that was amenable to change, although it is unknown if this was a reflection of the measures used, the intervention or both. While no changes in mental illness outcomes were found, no definitive conclusions can be made until the interventions are tested on a less mentally healthy sample. Although the results do lend support for mental illness and mental health as separate constructs, rather than being opposite ends of the same continuum.

The results demonstrate that the internet is an effective means of disseminating well-being interventions, reflecting the findings of internet research for prevention and treatment of mental illness. The fact that the intervention was a fully automated internet-based program, without any need for human contact, increases its sustainability and accessibility in the real world. While high attrition is an issue, delivery via the internet has the potential to reach a large audience and even if a small percentage complete the intervention (e.g., 31% for this study), many more people can be reached compared to traditional modes of dissemination.

Further research is needed to harness the full potential of positive psychology interventions via the internet and address issues of adherence, attrition and effect size. However, this study indicates it is possible to effectively deliver well-being enhancing interventions over the internet with some benefit to participants. These findings create exciting possibilities for the future direction of health promotion delivery and the possibility of reaching a mass audience while creating change at an individual level.

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Chapter 4: Paper 3. Flourishing online: Prevalence of well-being and psychometric properties of the MHC-SF

Contextual information

The next two papers are based on data from a second longitudinal RCT, similar to the previous study. The proceeding article, *Paper 3*, is an exploration of well-being measurement and prevalence using baseline data only from the RCT.

An article by Kashdan, Biswar-Diener and King (2008) challenged the way in which positive psychology and well-being research was conducted and identified problems related to poor articulation of key constructs, theory and measurement. While some areas of positive psychology research are more rigorous, for example, the measurement of life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985; Diener, Suh, Lucas, & Smith, 1999) other areas, such as the orientations to happiness model and measures (Seligman, et al., 2005), are less clearly articulated and conveyed. In the current thesis a range of well-being measures were included (e.g., PWI-A, SWLS, PANAS, OTH, PWB, MHC-SF) in order to gain a better understanding of commonalities and differences between measures and an understanding of their intervention research utility. For example, the previous paper included the OTH and found that it was more trait than state like and is perhaps best used as a predictor rather than an outcome variable in longitudinal research, a finding supported by recent research (Huta & Ryan, 2009). Not all well-being measures are the same, and it is important to be able to understand what they are measuring and then select the right measure for the research question and design. In addition, the majority of well-being measures have been developed based on either a hedonic or eudaimonic conceptualization. Recently the utility of this division has been questioned, particularly as the evidence suggests that conceptually they overlap and represent psychological mechanisms that operate in tandem (Kashdan, et al.,

2008). A handful of self-report questionnaires have been developed that address this issue by integrating hedonic and eudaimonic items, such as the Mental Health Continuum – Short Form (MHC-SF; Keyes, et al., 2008). The purpose of this next study, while addressing the central question of *do OPPIs work?*, was to add to the well-being literature by testing the psychometric properties of the MHC-SF as well as exploring the prevalence and degree of well-being, from languishing to flourishing, in an online community.

Declaration for publication

Mitchell, J., Vella-Brodrick, D., & Klein, B. (Submitted). Flourishing online: Prevalence of well-being and psychometric properties of the MHC-SF. *Journal of Personality and Social Psychology*.

Declaration by candidate

The nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Instigator of study and publication key ideas, conducted the research study, prepared the draft manuscript, incorporated other authors' comments in final manuscript, prepared and submitted for publication, completed changes requested by publisher.	85%

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

Name	**Nature of contribution**
Dianne Vella-Brodrick	Feedback on study design, statistical analysis and draft manuscript
Britt Klein	Feedback on study design, statistical analysis and draft manuscript

Candidate's Signature _____ **Date** _____

Declaration by co-authors

The undersigned hereby certify that:

(13) the above declaration correctly reflects the nature and extent of the candidate's contribution to this work, and the nature of the contribution of each of the co-authors.
(14) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(15) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(16) there are no other authors of the publication according to these criteria;
(17) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(18) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

Location(s)	Monash University, School of Psychology and Psychiatry, Caulfield campus

Signature 1 _____ **Date** _____

Signature 2 _____ **Date** _____

Reprint of the submitted manuscript

Flourishing online: Prevalence of well-being and psychometric properties of the Mental Health Continuum –Short Form (MHC-SF)

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Abstract

This paper explores the prevalence of well-being and the psychometric properties of the Mental Health Continuum – Short Form (MHC-SF) in an online and predominantly Australian based (70.5%) sample. Participants (N = 623) completed the MHC-SF as well as measures of subjective well-being (PWI-A, SWLS, mDES), psychological well-being (PWB-42), mental illness symptoms (DASS-21), personality (TIPI), mindfulness (MAAS) and physical health. The MHC-SF demonstrated good internal consistency, test re-test reliability, incremental and construct validity. The data supported a three factor structure of well-being, with a modified social well-being subscale. The structure of the social well-being subscale did not emerge as theorised suggesting more research is needed to optimise the subscales for use within this integrated well-being model. The MHC-SF diagnostic criteria were used to identify the prevalence of flourishing (45.5%), moderate mental health (46.4%) and languishing (8.1%). Individuals categorised as 'flourishing' had significantly better outcomes in terms of mental illness symptoms, mindfulness, self-rated physical health and alternate well-being measures.

Keywords: Flourishing; well-being; positive psychology; validity; reliability

The science of well-being and optimal human functioning has been explored within a positive psychology framework for the past decade and has helped create a shared language through which to explore and communicate theory and research. Well-being, a central tenet of positive psychology, has predominantly been explored using either the hedonic (subjective well-being) or eudaimonic (psychological well-being) approach. The hedonic approach emphasises the subjective experiences of positive emotions and life satisfaction judgements; while the eudaimonic approach focuses on optimal functioning, personal growth and meaning (Ryan & Deci, 2001). The utility of this dichotomous hedonic/eudaimonic approach has been challenged (Kashdan, Biswar-Diener, & King, 2008; Keyes, Shmotkin, & Ryff, 2002) and integrated models and measures of well-being have emerged (Keyes, 2007; Seligman, Steen, Park, & Peterson, 2005). Currently it is unclear whether existing models of well-being can or should be integrated (Gallagher, Lopez, & Preacher, 2009). This paper explores the structure of well-being based on an integrated, multi-factorial well-being model - the Mental Health Continuum (MHC). In particular, the psychometric properties of the Mental Health Continuum – Short Form (MHC-SF) are tested and the prevelance and associated outcomes of flourishing are measured in an online English-speaking sample.

The Mental Health Continuum Model

Keyes (2005b, 2007) developed the MHC as an integrated well-being model consisting of three related factors: (i) emotional well-being, (ii) psychological well-being and (iii) social well-being. The first factor, emotional well-being, is based on the hedonic or subjective well-being (SWB) approach. SWB is most commonly operationalised as having affective (i.e. positive and negative affect) and cognitive (i.e. life satisfaction judgement) components (Diener, 1984; Snyder & Lopez, 2002). Keyes' model differs from Diener's (1984) SWB framework by including the cognitive and positive affect components but not negative affect. Psychological well-being (PWB) is the second factor in the MHC model and

is derived from the eudaimonic tradition, with a focus on fulfilling one's potential through personal growth and meaning. PWB has been operationalised in terms of six dimensions of functioning (Ryff, 1989; Ryff & Keyes, 1995): *self-acceptance* - a positive attitude towards oneself and one's past life; *personal growth* - being open to new experiences; *purpose in life* - believing that one's life is meaningful; *environmental mastery* - the ability to manage one's life; *autonomy* - independence and self-determination; and *positive relations with others* - having satisfying high quality relationships. The third factor in the MHC model, social well-being, aligns most closely with the eudaimonic tradition with its focus on functioning, but it differs in that the context is societal rather than individual. Social well-being focuses on how well people believe their social world functions, and consists of five key dimensions of: *social coherence* – seeing social life as meaningful and understandable; *social acceptance* – acceptance of other people; *social actualisation* – viewing society as having potential for growth and development; *social integration* - feeling like you belong to and are accepted by your community; and *social contribution* – believing you have something worthwhile to contribute to society (Keyes, 1998).

The three-factor MHC model has been used by Keyes (2005a, 2005b) to categorise well-being along a mental health continuum from what he terms *languishing* (i.e. low levels of well-being) to *flourishing* (i.e. high levels of well-being), with anyone in between these two categories considered to have *moderate mental health*. These three mental health categories are determined using a system similar to the DSM-IV diagnostic criteria (APA, 2000). To be categorised as flourishing, individuals must report experiencing seven of 14 symptoms '*everyday*' or '*almost everyday*', with at least one item from the emotional well-being items (i.e., *happy*, *interested in life* or *satisfied*) and six items from either of the two subscales of psychological well-being and social well-being (made up of six-items and five-items respectively). To be categorised as languishing, individuals must report experiencing

seven of 14 symptoms '*never*' or '*once or twice'*, with at least one item from the three emotional well-being items and six items from either of the two subscales of psychological well-being and social well-being. Anyone who does not meet either the languishing or flourishing criteria is categorised as moderately mentally healthy. Earlier research has used longer versions of the MHC (e.g., 39-item MHC measure) (Keyes, 2002, 2005a, 2005b). The version used in the current study is the 14-item measure called the Mental Health Continuum – Short Form (MHC-SF) (Keyes, et al., 2008).

Well-being Research

Past research provides preliminary support for a multidimensional model of well-being (e.g., Keyes, 2005b; Keyes, et al., 2008) although these studies have had some methodological limitations and inconsistencies in the results (see Gallagher, Lopez & Preacher, 2009). In an effort to address previous limitations Gallagher, et al., (2009), conducted a study of the structure of well-being which predicted and confirmed a three-factor oblique structure (i.e., subjective, psychological and social well-being) as a better fit than one- or two-factor models with a student sample (N = 591) and general population sample (N = 4032). While overall the three-factor model was a good fit to the data, there were inconsistencies within the factors, in particular with social well-being. Keyes' (1998) theory, specifying five dimensions of social well-being, was only supported in the student sample and not in the general population sample. Gallagher, et al., (2009) suggested this may have been due to internal consistency problems with the social well-being measure being used in the American population; they reported only two subscales with acceptable alpha coefficients (.70 and .75), two had marginal consistency (.64 and .66) and the fifth subscale of '*social acceptance'* had poor internal consistency (.41). Moreover, the '*positive relations with others'* item unexpectedly loaded on social rather than psychological well-being. Overall, Gallagher, et al's. (2009) results converge with Keyes' own research findings (2006; 2008)

supporting a three-factor model as the best fit for the MHC-SF data (compared to a single-factor and two-factor latent models); and that this three-factor model replicates the proposed latent structure of well-being.

Research on the correlates and associated outcomes of well-being have focussed predominantly on hedonic or subjective well-being and to a lesser extent on psychological or social well-being (for a detailed review see Lyubomirsky, King, & Diener, 2005), with very little research conducted using integrated models of well-being. One exception is a study by Keyes (2005b) that explored the consequence of different categories of mental health and illness using data from Midlife in the United States (MIDUS), a telephone and postal population survey of American adults ($N = 3032$). Well-being was measured using a long version of the MHC, with participants placed in one of three well-being categories (i.e., languishing, moderate well-being or flourishing). Mental illness was measured using the Composite International Diagnostic Interview Short Form Scales (CIDI) (WHO, 1990) and participants were categorised as with or without a mental illness. The results indicated that flourishing individuals with no mental illness fared best in terms of a range of daily living and psychosocial outcomes (e.g., missed work days, helplessness, goals in life, resilience). Interestingly, languishing adults *without* a mental illness reported similar levels of dysfunction in terms of daily living and worse levels of psychosocial functioning when compared with adults with a mental illness and moderate/flourishing well-being. A similar study by Keyes (2005a) identified a relationship between flourishing mental health and physical illness, with flourishers reporting fewer health limitations, fewer chronic conditions and lower health care utilization than languishers or the moderate well-being groups. In summary, it is evident from the data that flourishing individuals fare significantly better on a range of physical and psychological health outcomes compared to languishing and moderately mentally healthy individuals. To date, with the exception of one study of

Setswana-speaking South Africans (Keyes, et al., 2008), the research has focussed on American populations, so it is unknown if the findings generalise to other nationalities or cultures.

A number of studies have identified the prevalence rates of flourishing and languishing in the population using the MHC model, and these are summarised in Table 1. Each study identified in Table 1 has been administered in a different format (e.g., self-administered vs. interview; pencil and paper vs. computer-assisted), with only one using computer-assisted delivery. As the use of technology extends into different areas of peoples' lives (e.g., education, work, home and health) it is possible to collect data across these life domains and across countries via the internet. In the area of mental health and well-being there are increasing numbers of empirically tested web-based treatment, prevention and health promotion interventions available online (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009). This paper presents the baseline results of an online application of the MHC-SF, as part of a larger longitudinal well-being study. The current research originated in Australia and attracted a mixed Australian and international, English-speaking population. The study data were used to (a) test the validity and reliability of the MHC-SF and (b) explore the prevalence of MHC categories and associated outcomes in an online community.

<Insert Table 1 about here>

Method

Participants

Participants ($N = 623$) were included in the study if they were at least 18 years old and had internet access. The mean age of participants was 39.9 years (range: 18-79; SD=11.9) and

most were female (81.0%). Participants resided in 23 different countries with the majority from: Australia (70.5%), USA (6.1%), United Kingdom (3.2%), New Zealand (2.2%), and Canada (1.6%). Most participants were currently: employed (70.5%) or students (15.0%); had completed an undergraduate or postgraduate degree (78.2%); were currently married or in a de facto relationship (58.7%) or single (28.8%); and had no children (51.0%). The modal gross yearly income in Australian dollars was $40,000 to $79,000 (40.6%), followed by those who earned less than $40,000 (34.7%), and then people earning $80,000 plus (24.8%). Most participants self-rated their physical health as average (53.2%) or above average (43.3%), with a minority rating themselves in poor health (3.5%).

Design and Measures

A cross-sectional study of participants recruited via the internet was conducted. Demographic data were collected and included questions about age, gender, income, education, employment, marital status, number of children, nationality and place of residence. The demographic questionnaire also asked participants to rate their physical health on a scale from 1(*extremely well*) to 7 (*extremely unwell*). The following self-report questionnaires were used to measure various forms of well-being, mental illness, mindfulness and personality. The Cronbach alpha coefficients for the current study are reported in Table 2.

<Insert Table 2 about here>

The Mental Health Continuum-Short Form (MHC-SF)

The MHC-SF (Keyes, 2006; Keyes, et al., 2008) is a 14 item, three subscale measure of well-being, based on the MHC model and derived from longer versions (Keyes, 2005b). The first subscale, emotional well-being, consists of three items (i.e., happy, interested in life, satisfied). The second subscale consists of five items measuring social well-being; one item

for each dimension of coherence, acceptance, social actualisation, social integration, and social contribution. The third subscale consists of six items each measuring one dimension of psychological well-being (i.e., self-acceptance, personal growth, purpose in life, environmental mastery, autonomy and positive relations with others). The MHC-SF asked participants to select the response that best represents how often you have felt each feeling, from 0 (*never*) to 5 (*everyday*), over the *past week.* A total score and three subscale scores were computed. A past study (Keyes, et al., 2008) using the MHC-SF indicated adequate reliability for the total score and emotional well-being subscale ($\alpha = 0.74$ & 0.73 respectively) and marginal to low reliability for the psychological and social well-being subscales ($\alpha = 0.67$ & 0.59 respectively).

Satisfaction with Life Scale (SWLS)

The SWLS (Diener, Emmons, Larsen, & Griffin, 1985) is a five item instrument designed to measure global cognitive judgments of one's life using a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*) to rate the extent of agreement with five statements (e.g., *"I am satisfied with my life").* Higher scores represent greater life satisfaction (range 5 – 35). The SWLS has demonstrated satisfactory validity and reliability (Diener, et al., 1985; Pavot & Diener, 2004) and is frequently used to measure the cognitive component of subjective well-being. Most people score in the 23 to 28 range (*slightly satisfied* to *satisfied*).

Personal Wellbeing Index - Adult (PWI-A) Scale

The PWI-A (IWG, 2006) is a seven item measure of the cognitive component of subjective well-being in various life domains. Each item asks *"How satisfied are you..."* with a specific life domain (i.e. standard of living, health, achieving in life, relationships, safety, community-connectedness, and future security). Responses are given on a scale from 0 (*completely dissatisfied*) to 10 (*completely satisfied*); the scores are then combined across the

seven domains to yield an overall score, which is adjusted to have a range of 0-100. The PWI-A has satisfactory validity and reliability (IWG, 2006) and in the current study correlates .73 with the SWLS. Normative data from 19 Australian population surveys indicates the average PWI-A scores range from 73.5 to 76.6 (Cummins, et al., 2009).

Modified Differential Emotion Scale (mDES)

The mDES (Cohn; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Fredrickson, Tugade, Waugh, & Larkin, 2003) is a 25-item measure of positive and negative affect, consisting of 12 positive emotion clusters, each with three adjectives per item (e.g., *I felt amused, fun-loving, silly*) and 13 negative emotion clusters (e.g., *I felt angry, irritated, frustrated*). Items are mainly drawn from the circumplex model of emotion (Russell, 1980). Participants are asked to rate how much they were feeling each of the emotions during the *past week* on a scale from 0 (*not at all*) to 5 (*extremely*). There is no known psychometric data available for this version of the mDES.

Psychological Well-being (PWB)

A 42-item version of the PWB (Ryff, 1989; Ryff & Keyes, 1995) was used to measure the six dimensions of psychological well-being (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, self-acceptance). Individuals respond to various statements and indicate how true each statement is of them using a six point scale from 1 (*strongly disagree*) to 6 (*strongly agree*). An overall score and a subscale score can be computed. The PWB has reported adequate validity and reliability (Keyes, et al., 2002; Ryff, 1989), although support for the six-dimension model of eudaimonic well-being has been questioned (Springer & Hauser, 2006) and it is recommended that subscale scores are used with caution, hence the total PWB score was also included in this study.

Depression, Anxiety, Stress Scales (DASS-21)

The DASS-21 (Lovibond & Lovibond, 1995) is a short form measure of mental illness symptoms and contains three self-report scales, each with 7-items, designed to measure the emotional states of anxiety, depression, and stress. Respondents are asked to use a four-point response scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*) to rate the extent to which they experienced each symptom over the last week (e.g., *I felt sad and depressed*). The DASS-21 has satisfactory validity and reliability and the authors provide population norms for symptom severity (normal, mild, moderate, severe, extremely severe); depression (0-9, 10-13, 14-20, 21-27, 28+, respectively); anxiety (0-7, 8-9, 10-14, 15-19, 20+, respectively); stress (0-14, 15-18, 19-25, 26-33, 34+, respectively) (Antony, Bieling, Cox, Enns, and Swinson, 1998; Lovibond and Lovibond, 1995).

Mindfulness and Awareness Scale (MAAS)

The MAAS (Brown & Ryan, 2003) is a 15-item scale that assesses mindfulness, or present moment awareness. Participants indicate the frequency of 15 behaviours on a 6-point scale from 1 (*almost always*) to 6 (*almost never*). Items include *"I snack without being aware of what I am eating"* and *"I could be experiencing some emotion and not be conscious of it until sometime later*". Higher scores reflect higher levels of dispositional mindfulness. The scale has adequate psychometric properties and has demonstrated small to moderate correlations with subjective well-being scales of life satisfaction (.23 to .26), positive affect (.16 to .43) and negative affect (-.33 to -.43) and moderate to large correlations with psychological well-being subscales of autonomy (.34 to .37), competence (.39 to .68) and relatedness (.28 to .31) (Brown & Ryan, 2003).

Ten item personality inventory (TIPI)

The TIPI (Gosling, Rentfrow, & Swann, 2003) is a brief, 10 item measure of the Big Five personality dimensions (Extraversion, Agreeability, Conscientiousness, Emotional

Stability and Openness), with two items per dimension. Each item starts with '*I see myself as:*' followed by two descriptors (e.g., *extraverted, enthusiastic*). Items are rated on a 7-point scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*), with one-item per pair reverse scored (e.g., *reserved, quiet*). Although the measure has good validity, it has somewhat inferior reliability (alphas) compared to longer 5-dimension personality measures, however the authors noted that this is to be expected with such a brief measure of broad domains with only two items per dimension and using items at both the positive and negative poles (Gosling, et al., 2003). The authors suggest that the TIPI is most suitable for research where personality is not the primary focus.

Procedure

Ethics approval for the study was gained from the relevant Monash University ethics committee. Individuals were recruited to participate in a longitudinal randomised waitlist controlled trial testing the efficacy of two online well-being interventions. The current research study used the baseline data from the longitudinal trial (Mitchell, Klein, Vella-Brodrick, & Meyer, in preparation). Participants were recruited through electronic advertising sent via Monash University and the Australian Sports Commission's online networks (e.g., websites, eNewsletters and email distribution lists) and a range of professional and community websites and listservs (e.g., Australian Psychological Society website, Positive Psychology listserv, International Society for Research on Internet Interventions listserv). Participants self-registered online for the study, completed an online informed consent process and were assigned a personal username and password for access to the website. When participants first logged-in they were asked to complete a demographic survey and battery of mental health and well-being questionnaires, which is the data used in the current study, before proceeding to the intervention phase of the main research trial.

Results

Preliminary statistical procedures and analyses

Statistical analyses were conducted using SPSS and Amos, version 17.0. The means, standard deviations, alphas and correlations for questionnaire totals and subscales are presented in Tables 2 and 3. Preliminary assumption testing was run on the data prior to performing any analyses with no serious violations noted. As expected for a non-clinical sample, the measures of well-being were slightly negatively skewed (range -0.16 to -0.89) and the illness measures (DASS and Negative affect) were slightly positively skewed (range .75 to 1.50). Independent samples t-tests to compare mean differences on all questionnaires and subscales between Australian and non-Australians found no significant differences (p=>.05, two-tailed). A chi-square test for independence indicated no significant association between country of residence (Australian or non-Australian) and MHC-SF category x^2 (2, *n* = 552) = .51, phi = .05. As a result, the sample was subsequently analysed as a whole (i.e., Australian and non-Australian combined).

<Insert Table 3 about here>

Reliability of the MHC-SF

The MHC-SF total, and its three subscales, demonstrated good internal reliability with all alphas (see Table 2) exceeding the minimum recommended of .70 or greater (Nunnally & Bernstein, 1994). Test-retest reliability was conducted for a portion of the sample (*n* =133) who had been randomly selected to re-take the MHC-SF after a three week waiting period. The bivariate correlation between time 1 and time 2 was satisfactory at .75.

Construct Validity of the MHC-SF

The construct validity correlations are presented in Table 3. As expected the *total MHC-SF* had strong relationships with all the hedonic or SWB scales; the strongest was with the positive affect scale, a key criteria for the MHC categorical diagnosis. Similarly there was a large inverse relationship with negative affect and symptoms of depression (i.e., negative affect is considered a central component of depression). The total MHC-SF had large positive correlations with the PWB total and all subscales except autonomy, which was moderately correlated. Small to medium positive correlations were evident with the MHS-SF and four of the personality subscales, and a large positive relationship with the fifth scale of emotional stability. The correlations with the MHC-SF subscales and the hedonic and eudaimonic measures were similar.

The MHC *psychological well-being subscale* mirrored the relationships of the MHC total with regard to both hedonic and eudaimonic measures. The psychological well-being subscale also had a moderate positive relationship with mindfulness, stress, anxiety and the personality subscales (except for a large correlation with emotional stability subscale). The brief personality subscales (TIPI) correlated most strongly and consistently with the MHC-SF psychological well-being subscale, in particular emotional stability. Emotional stability was also the personality dimension most strongly related to overall well-being. The *emotional well-being subscale* had strong positive correlations with the hedonic well-being measures and the PWB total. The emotional well-being subscale had moderate relationship with the autonomy and growth subscales, and a large strong relationship with all other PWB subscales. The emotional well-being subscale also had a large inverse correlation with negative affect, depression and stress; and a small to moderate relationships with the measures of personality, mindfulness and anxiety. Finally the *social well-being subscale* demonstrated a medium to large correlation with the PWB relations subscale, the only other

measure with a social component. The social well-being subscale correlated strongly with the PWB total and the PWB acceptance subscale, and moderately with all the other hedonic and eudaimonic well-being measures. Small to moderate correlations were evident with the five personality subscales, mindfulness, stress and anxiety.

Incremental Validity of the MHC-SF

Lyubomirsky, Sheldon and Schkade (2005) proposed that heritable traits such as personality account for approximately 50% of the variance in well-being. The moderate to strong relationship between personality and well-being has been well documented by previous research (Kahneman, Diener, & Schwarz, 1999) and is further supported by the correlation results from the current study. The incremental validity (Hunsley & Meyer, 2003) of the MHC-SF was tested using a multiple regression to determine how much of the variance in the MHC-SF could be explained by personality. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. The five personality subscales (extraversion, agreeableness, conscientiousness, emotional stability and openness) were entered collectively as the independent variables and MHC-SF as the dependent variable. Personality variables accounted for 39% of the variance in the MHC-SF, $F(5, 543) = 69.55$, $p<.001$. Each personality subscale made a significant unique contribution at $p<.01$: emotional stability ($\beta = .37$), extraversion ($\beta = .21$), conscientiousness ($\beta = .15$), and openness ($\beta = .15$) and agreeableness ($\beta = .11$).

Factorial Validity of the MHC-SF

Two different statistical methods, principle axis factoring (PAF) and confirmatory factor analysis (CFA) were used to test the factorial validity of the MHC-SF. The sample was randomly split and half used in each analyses. The factor structure was initially explored

using PAF (n = 276). Bartlett's Test of Sphericity was significant at p< .001, and the Kaiser–Meyer–Olkin measure of sampling adequacy was .93, exceeding the recommended value of .6 (Tabachnick & Fidel, 2007) and supporting the factorability of the matrix. PAF revealed the presence of two components with eigenvalues exceeding 1, explaining 51.6% and 8.9% of the variance respectively. The two-component solution explained a total of 60.5% of the variance. Theory and past research has indicated that the best fit is a three-factor solution, so a forced three-factor PAF was analysed (see Table 4). The three-factor solution explained an additional 6.0% of the variance, making a total of 66.5%. All items loaded on the theorised factors, except for items 4 and 5, which loaded on psychological well-being instead of social well-being.

<Insert Table 4 about here>

CFA via structural equation modelling (SEM) (MacCallum, Browne, & Sugawara, 1996) was then conducted on the second half of the sample (n = 276) to determine which theoretical model provided the best interpretability, fit to data, parsimony and predicative success from a group of four competing models. Based on theory and past research, a *three-factor model* has been proposed as the best fit (i.e., emotional, psychological and social well-being) (Gallagher, et al., 2009; Keyes, 2005b). This was compared to a *one-factor model*, consisting of a single order factor made up of the three emotional well-being items, six psychological well-being items and five social well-being items combined. The next hierarchical model consisted of *two-factors* representing hedonia or subjective well-being (including the three emotional well-being items) and eudaimonia or positive functioning (including the six psychological well-being items and five social well-being items). Finally, based on these results and observations from the PAF, it was decided to also run a *modified*

version of the three-factor model by deleting the two unstable social well-being items (items 4 and 5); this meant in the modified model the social well-being factor consisted of three (not five) items, emotional well-being consisted of three items, and psychological well-being consisted of six items. The results for each model are described in Table 5 and indicated that the three-factor (modified) model is the best fit, followed by the three-factor, two-factor and one-factor models respectively. However, it is only the three-factor (modified) model that meets all the specified criteria for a medium to good fit of the data.

<Insert Table 5 about here>

Mental Health Prevalence and Associated Health Outcomes

Estimates of the prevalence of mental health in the online sample (n = 552) were obtained using a categorical diagnosis (Keyes, et al., 2008) and the results are presented in Table 1. As described earlier in this paper, based on MHC-SF scores the categorical diagnosis allocates participants into one of three mental health categories (i.e., languishing, moderate and flourishing) reflecting increasing levels of well-being. Similar to past research (Keyes, 2005a, 2005b; Keyes, et al., 2008) the mean level of psychopathology symptoms and health assets were then examined by categorical diagnosis of mental health (see Table 6).

A MANOVA was conducted to explore the impact of mental health category on psychopathology symptoms (i.e. depression, anxiety and stress) and a statistically significant difference was found between categories on the combined dependent variables, $F(3, 547) = 43.0$, $p < .001$; Pillai's trace = .38; partial $\eta^2 = .19$. When the results for the dependant variables were considered separately, using a Bonferroni adjusted alpha, they all reached significance at the $p<.001$ level: depression, $F(2, 549) = 909.7$, partial $\eta^2 = .37$; anxiety, $F(2,549) = 51.2$, partial $\eta^2 = .16$; stress, $F(2,549) = 55.2$, partial $\eta^2 = .17$. Post-hoc analysis,

using a Bonferroni adjusted alpha, revealed all possible comparisons reached statistical significance at the $p<.001$ level. Using *Cohen's d* effect size classification (Cohen, 1988), all mean differences were considered large. Flourishing was associated with low levels of depression, anxiety and stress and languishing with higher levels of illness symptoms.

An ANOVA of mean mindfulness scores by mental health category found a statistically significant difference between the three categories, $F(2, 549) = 40.96$, $p< .001$, $\eta^2 = .13$, *d* = medium*).* Post-hoc comparisons using the Tukey HSD test indicated significant mean score differences between all groups. Flourishing was associated with high mindfulness and languishing with lower levels of mindfulness.

An ANOVA of self-rated physical health scores by mental health category found a statistically significant difference between the three categories, $F(2, 541) = 11.98$, $p< .001$, $\eta^2 = .04$, *d* = small. Post-hoc comparisons using the Tukey HSD test found significant mean score differences between all categories except between languishing and moderate mental health. Flourishing was associated with better self-reported physical health and languishing with lower levels of physical health.

A MANOVA was conducted to explore the impact of mental health category on psychological well-being using the PWB total and six subscales. A statistically significant difference was found between categories on the combined dependent variables, $F(6, 544) = 29.06$, $p <.001$, Pillai's trace = .48, partial $\eta^2 = .24$. When the dependent variables were considered separately, using a Bonferroni adjusted alpha level, they all reached statistical significance at the $p<.001$ level: PWB (total), $F(2, 549) = 233.41$, partial $\eta^2 = .046$; autonomy, $F(2, 549) = 48.82$, partial $\eta^2 = .15$; environmental mastery, $F(2,549) = 119.39$, partial $\eta^2 = .30$; personal growth, $F(2,549) = 103.37$, partial $\eta^2 = .27$; positive relations, $F(2, 549) = 106.41$, partial $\eta^2 = .28$; purpose in life, $F(2,549) = 81.76$, partial $\eta^2 = .23$; self-acceptance, $F(2,549) = 167.84$, partial $\eta^2 = .38$; all *d*s = large. Post-hoc analysis, using a

Bonferroni adjusted alpha, revealed all possible comparisons reached statistical significance at the $p<.001$ level (see Table 6). Flourishing was associated with high psychological well-being and languishing with lower levels of psychological well-being.

A MANOVA was conducted to explore the impact of mental health category on subjective well-being (i.e. life satisfaction, positive affect and negative affect) and a statistically significant difference was found between categories on the combined dependent variables, $F(4, 546) = 37.84$, $p < .001$; Pillai's trace = .43; partial $\eta^2 = .28$. When the results for the dependant variables were considered separately, using a Bonferroni adjusted alpha, they all reached significance at the $p<.001$ level: life satisfaction (domain), $F(2, 549) = 106.87$, partial $\eta^2 = .28$; life satisfaction (global), $F(2, 549) = 82.11$, partial $\eta^2 = .23$; positive affect, $F(2,549) = 161.52$, partial $\eta^2 = .37$; negative affect, $F(2,549) = 86.55$, partial $\eta^2 = .24$; all *d*s = large. Post-hoc analysis, using a Bonferroni adjusted alpha, revealed all possible comparisons reached statistical significance at the $p<.001$ level. Flourishing was associated with high subjective well-being and languishing with lower levels of subjective well-being.

<Insert Table 6 about here>

Discussion

Psychometric Properties of the MHC-SF

The internal reliability, 3-week test-retest reliability, incremental and construct validity data provide good support for the MHC-SF as a reliable and valid three-factor measure of well-being. The internal reliability of the MHC-SF total scale and subscales exceeded acceptable criteria and is markedly better than has been previously reported (Keyes, et al., 2008), particularly for the psychological and social well-being subscales. The test-retest

reliability is adequate and similar to other measures of well-being (Krueger & Schkade, 2008). Similar to previous findings, personality accounts for 39% of the variance of the MHC-SF, primarily through emotional stability and extraversion, leaving 61% of the variance unexplained. While caution should be taken in analysing the personality data due to previously mentioned limitations of the TIPI, it appears clear that the MHC-SF is measuring something beyond personality.

In the current study, the emotional well-being and psychological well-being subscales appear to be more similar to each other than to the social well-being subscale; this is consistent with other studies that have noted considerable overlap between hedonic and eudaimonic well-being (Keyes, et al., 2002). Although the emotional and psychological well-being subscales both correlate strongly with other measures of SWB and PWB, there are also differences in the expected direction (i.e., psychological well-being subscale correlates more strongly on PWB; emotional well-being correlates more strongly on SWB), suggesting that they do in fact measure highly correlated but different constructs. This suggests that interventions designed to create change in one dimension of well-being (e.g., eudaimonic well-being) are likely to generalise to the other dimension (e.g., subjective well-being) and vica versa.

In an attempt to replicate the hypothesised three-factor structure of the MHC-SF factor analyses were conducted. While the three-factor model was a relatively better fit than the one- or two-factor models, it did not meet accepted 'good' fit criteria until the social well-being scale was reduced from five to three items. The two eliminated items, identified by the PAF analysis, were social integration and social acceptance. Internal consistency problems within the social acceptance subscale have been reported in past research using a longer version of the MHC social well-being measure (i.e., three items per dimension) (Gallagher, et al., 2009). While this issue with the social well-being items may be due to the brevity of the

MHC-SF, it may also be related to wording differences between these two items and the other three subscale items. The social integration and social acceptance items ask for an appraisal of how 'you function' in society; whereas the other social well-being items ask how 'society' functions. Asking how 'you function' is more similar to the psychological well-being items, even though the context remains societal, which may explain why they load on the psychological well-being factor in the PAF analysis. It is also noteworthy that most of the variance in MHC-SF was explained by emotional well-being (51.6%) rather than psychological (8.9%) or social (6.0%) well-being, suggesting that hedonic or subjective well-being is the primary component of the MHC-SF. Overall, the three-factor model was supported by the data, with some inconsistencies related to the social well-being scale which require further exploration.

Mental Health Prevalence, Psychopathology and Health Assets

The prevalence of flourishing in the current study was high (45%) and languishing was low (8.1%) relative to other studies using the MHC. The difference may be due to the nature of the sample which was a self-selected group of people interested in participating in a well-being intervention study. In contrast, the two representative population studies have reported average levels of flourishing between 18-20%, and languishing at 12-17%. Epidemiological research is required to know more about whether this sample is unique or similar to the broader Australian or online community. It should be noted that based on Australian norms for the PWI-A scale, the average level of life satisfaction for this population falls slightly below the population mean range, suggesting that based on this cognitive subjective well-being measure the group does not have particularly high well-being.

In looking at differences on symptoms of illness and health assets across the three MHC categories, the current study supported previous research indicating that flourishers perform better than languishers and the moderately mentally healthy on all the outcome measures

(Keyes, 2005a, 2005b; Keyes, et al., 2008). According to DASS symptom severity norms, languishers have depression symptom scores in the 'severe' range and 'moderate' anxiety and stress. In contrast flourishers are in the 'normal' range for depression, anxiety and stress symptoms. Conversely, life satisfaction scores for both the languishing and moderate mental health group are below the average population range; and flourishers are within the average range. The MHC categorisation also reflected significant differences in trait mindfulness, with flourishers performing best of the three groups. Mindfulness is associated with a range of physical and psychological health benefits (Allen, et al., 2006; Baer, 2003; Brown & Ryan, 2003; Jain, et al., 2007; King, 2006). In addition, while it was only a small affect, self reported physical health was better for flourishers compared to languishers and the moderately mentally health.

These results support the utility of MHC-SF as a brief measure of well-being that can guide mental health treatment, prevention and health promotion, by meaningfully distinguish between various levels of well-being and identifying those 'at risk' of mental illness. These results also highlight some of the benefits of promoting flourishing mental health above and beyond the alleviation of illness. The MHC-SF could be used to explore how individual differences moderate well-being intervention (e.g., using your strengths or developing mindfulness skills) outcomes. For example, do strength interventions work best for flourishers, languishers or the moderately mentally healthy? In addition, the MHC-SF subscale scores may provide useful feedback on matching participants to interventions, for example, someone lower on psychological well-being versus subjective well-being may benefit more from strengths based interventions rather than a gratitude intervention.

Limitations

The study sample was largely female, tertiary educated, self-selected and presumably motivated for self-change, thus limiting the generalisability of the findings. It was also a

cross-sectional study so the directional nature of the relationship between the variables of interest was not able to be determined. For example, does flourishing lead to more mindfulness or does more mindfulness lead to flourishing? Further research using longitudinal designs will help to establish the direction of the relationship. The study would benefit from using a broader range of measures of psychosocial assets, rather than using various forms of well-being as both a predictor and outcome variables. Future research could also focus on epidemiological studies to assess the prevalence of well-being in populations outside of America, where most of this research is currently conducted.

Conclusion

This study provides evidence for the reliability and validity of the MHC-SF in an online adult population and contributes to the research supporting an integrated three factor structure of well-being. There are, however, some inconsistencies within the social well-being subscale suggesting that additional research is required to optimise the subscales for use within this well-being model. Finally, the categorical diagnosis of flourishing identified a group of people who performed best in terms of mental illness symptoms, mindfulness, self-rated physical health and alternate measures of well-being. The MHC-SF has the potential to act as a brief diagnostic tool identifying different categories of well-being and better informing the application of well-being interventions.

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Table 1

Study details and prevalence of well-being by mental health continuum (MHC) category of four past studies and the current study.

Study reference	(Keyes, 2005b)	(Keyes, 2006)	(Gallagher & Lopez, 2007)	(Keyes, et al., 2008)	Current study
Participants	3032	1234	293	1050	522
Sample	Randomly selected American adults	Randomly selected American youth	Self-selected American students	Randomly selected Setswana-speaking South African adults	Self-selected online adults
MHC version (administration)	Long form (phone interview)	Short form * (self- administered audio-computer)	Long form (self-administered pencil-paper)	Short form (in-person Interview)	Short form (self-administered online)
Age range	25-74	12-18	18-26	30-80+	18-79
MHC category					
Languishing	17.0%	6.2%	21.1%	12.2%	8.1%
Moderate	65.0%	55.9%	50.9%	67.8%	46.4%
Flourishing	18.0%	37.9%	28.0%	20.0%	45.5%

* This version of the MHC-SF had items deleted to make it more suitable for use with a young population.

Table 2

Means, standard deviations (SD) and Cronbach alpha coeffecients (α) for measures and subscales

Questionnaire Subscales	Mean	SD	α	N
MHC-SF (total)	3.15	1.02	.92	552
Emotional well-being	3.63	1.12	.88	552
Psychological well-being	3.41	1.11	.85	552
Social well-being	2.55	1.20	.81	552
mDES				
Positive Affect	2.14	.89	.93	610
Negative Affect	.95	.63	.86	610
SWSL	22.50	6.82	.85	622
PWI	67.15	14.57	.82	623
PWB (total)	4.51	.68	.93	575
Autonomy	4.19	.93	.82	575
Environmental mastery	4.16	.95	.80	575
Personal growth	5.08	.72	.73	575
Relations with others	4.71	.91	.80	575
Purpose in life	4.67	.78	.66	575
Self-acceptance	4.26	1.09	.88	575
DASS				
Depression	7.51	8.20	.89	566
Anxiety	4.40	5.47	.78	566
Stress	11.63	7.88	.84	566
MAAS	3.94	.83	.89	559
TIPI				
Extraversion	8.38	3.28	.67	550
Agreeability	10.45	2.44	.27	550
Conscientiousness	10.63	2.85	.57	550
Emotional Stability	9.01	3.17	.64	550
Openness to experience	11.18	2.18	.29	550

Table 3

Correlations of MHC-SF subscales (emotional, psychological and social well-being) and MHC-SF total score with criterion validity measures

Questionnaire Subscales	Emotional well-being	Psychological well-being	Social well-being	MHC-SF (total)
MHC-SF (total)	.82	.93	.89	1
mDES				
Positive Affect	.74	.70	.55	.73
Negative Affect	-.60	-.50	-.34	-.51
SWSL	.60	.53	.47	.58
PWI	.62	.56	.49	.61
PWB (total)	.67	.76	.58	.75
Autonomy	.30	.48	.27	.40
Environment	.59	.61	.49	.63
Growth	.47	.59	.44	.57
Relations	.51	.57	.48	.58
Purpose	.51	.55	.39	.54
Acceptance	.65	.67	.55	.70
DASS				
Depression	-.75	-.59	-.46	-.64
Anxiety	-.49	-.39	-.27	-.41
Stress	-.50	-.39	-.29	-.42
MAAS	.41	.39	.31	.41
TIPI				
Extraversion	.28	.33	.26	.33
Agreeability	.27	.32	.29	.33
Conscientiousness	.25	.34	.18	.29
Stability	.48	.50	.40	.51
Openness	.22	.33	.19	.28

Note: All correlations are significant $p < 0.01$ level (2-tailed).

Table 4

PAF pattern matrix for a three-factor solution of MHC-SF items (n = 276)

MHC-SF Items		Pattern coefficients		
No.	Description	Component 1 (Emotional)	Component 2 (Psychological)	Component 3 (Social)
1	Happy	.922		
2	Interested in life	.774		
3	Satisfied	.794		
4*	That you have something important to contribute to society		.633*	
5*	That you belonged to a community (like a social group, neighbourhood, city)		.429*	.311
6	That our society is becoming a better place for people			.690
7	That people are basically good			.695
8	That the way our society works makes sense to you			.685
9	That you like most parts of your personality		.602	
10	That you are good at managing the responsibilities of your daily life		.626	
11	That you have warm and trusting relationships with others		.481	
12	That you have experiences that challenge you to grow and become a better person		.645	
13	Confident to think or express your own ideas and opinions		.825	
14	That your life has a sense of direction of meaning to it		.614	

Note: The proposed structure of the MHC-SF is items 1-3 (emotional), items 4-8 (social) and items 9-14 (psychological)

* Theorised social well-being items that unexpectedly loaded on the psychological well-being factor

Table 5

Confirmatory Factor Analysis of five different models of well-being

	X^2	*df*	GFI	NFI	CFI	RMSEA (90% CI)	BIC
3-Factor modified*	187.3	51	.928	.887	.914	.098 (.084 - .114)	339.009
3-Factor	345.3	74	.829	.834	.864	.115 (.103 - .128)	519.565
2-Factor	374.1	77	.824	.820	.851	.118 (.107 - .131)	531.441
1-Factor	496.6	78	.775	.762	.790	.140 (.128 - .152)	648.335

Note: GFI = Goodness of Fit Index. NFI = Normed Fit Index. CFI = Comparative Fit Index. RMSEA (90% CI) = Root Mean Square Error of Approximation (90% Confidence Interval). BIC = Bayesian Information Criterion. Model fit criteria: GFI, NFI & CFI, >.90 = good (Byrne, 1994); RMSEA, <.05 = good, .05 to .10 = moderate, and >.10 = poor (Browne & Cudeck, 1992); BIC, lower values superior to higher values (Schwarz, 1978).

* Two of the five social well-being items (items 4 & 5) deleted from this model

Table 6

Mean and Standard Deviation (SD) of psychopathology symptoms and psychosocial assets by categorical diagnosis of mental health (languishing, moderate & flourishing).

	Languishing (*n*=44)	*SD*	Moderate (*n*=257)	*SD*	Flourishing (*n*=251)	*SD*
Psychopathology Symptoms						
Depression	21.95*	*9.75*	9.11*	*7.90*	3.42	*3.68*
Anxiety	10.59*	*8.02*	5.10	*5.64*	2.62	*3.47*
Stress	20.91*	*9.79*	12.68	*7.62*	9.07	*6.15*
Psychosocial Assets						
Mindfulness	3.31	*0.66*	3.77	*0.77*	4.25	*0.78*
Physical Health (self-rated)	3.45	*1.44*	3.19	*1.32*	2.65	*1.47*
Psychological Well-being	3.44	*0.60*	4.26	*0.55*	4.96	*0.42*
Autonomy	3.55	*1.00*	3.93	*0.93*	4.58	*0.76*
Environment	2.97	*0.92*	3.86	*0.79*	4.67	*0.77*
Growth	4.15	*0.79*	4.89	*0.71*	5.43	*0.44*
Relations	3.54	*1.03*	4.47	*0.84*	5.16	*0.62*
Purpose	3.84	*0.77*	4.46	*0.75*	5.05	*0.60*
Acceptance	2.58	*1.00*	3.92	*0.96*	4.88	*0.73*
Life satisfaction (global)	14.05†	*6.03*	20.97†	*6.07*	25.44	*5.93*
Life satisfaction (domain)	47.79†	*13.83*	63.71†	*12.30*	74.25	*11.94*
Positive Affect	0.92	*0.52*	1.87	*0.71*	2.67	*0.70*
Negative Affect	1.77	*0.73*	1.09	*0.62*	0.69	*0.41*

Note: All possible contrasts were statistically significant at $p<.001$, except between the physical health categories of languishing and moderate mental health.

* Scores above the population 'normal' range (i.e. greater symptom severity) according to DASS subscale norms.

† Scores below the lower bound of the population mean range for life satisfaction (SWLS and PWI-A).

Chapter 5: Paper 4. A randomised controlled trial of fully automated online positive psychology interventions: Strengths and mindfulness

Contextual information

The final manuscript, *Paper 4*, presents the longitudinal results of an RCT testing the efficacy of two OPPIs, strengths and mindfulness. The strengths intervention is the same as that described and used in the first RCT, and the mindfulness intervention is a previously untested OPPI. Following is a review of mindfulness theory and literature, of which a summarised version is provided in *Paper 4*, as a rationale for its well-being enhancement potential and therefore inclusion in the final RCT.

The approach taken to data analyses in *Paper 4* is a departure from what is usually seen in the internet intervention and positive psychology literature. For the final study Hierarchical Linear Modelling (HLM) was used for the primary analyses, and is described in some detail in *Paper 4*. A rationale for using HLM is provided after the review of mindfulness theory and research.

Mindfulness theory

The origins of mindfulness can be traced back to ancient traditions such as Buddhism but in more recent years it has been adopted by researchers and clinicians as a technique to treat and to understand a range of mental and physical illnesses, independent of any religious or cultural context. In order to effectively utilize mindfulness as an intervention it is necessary to understand how it works. Shapiro et al (2006) proposed a non-linear model (IAA) based on a variety of established theoretical approaches and past mindfulness research. The IAA model is based on Kabat-Zinn's (1994, p. 4) definition of mindfulness as *"paying attention in a particular way: on purpose, in the present moment, and non-judgmentally"*. Shapiro et al. (2006) identified three building blocks, or axioms, of mindfulness, namely

intention ("on purpose"), attention ("paying attention") and attitude ("in a particular way") (IAA). The authors propose that mindfulness is a moment-to-moment experience during which these three axioms are simultaneously activated. The experience of mindfulness is theorised to result in a shift in perspective called reperceiving – the ability to observe moment-to-moment experiences (e.g., thoughts, feelings, images, sensations) with greater clarity and objectivity (Shapiro, et al., 2006). Reperceiving is similar to the cognitive psychology concept of metacognition and decentering – the ability to monitor or observe personal thought processes and recognise that thoughts are a transient mental state rather than a literal representation of reality (Allen, et al., 2006). The common element shared by reperceiving and decentering appears to be a shift in perspective, and it is this shift that allows change to occur.

Reperceiving is proposed to overarch other mechanisms that lead directly to behaviour change. Four of the mechanisms highlighted in the IAA model are: values clarification; cognitive, emotional and behavioural flexibility; exposure; and self-regulation and self-management (Shapiro, et al., 2006). In the IAA model it is proposed that reperceiving activates attention to *values* - principles that guide thinking and behaviour and are embedded through exposure to family, culture and society. Individuals seldom bring conscious awareness to their values, however, if personal values become outdated, or behaviour changes and no longer matches strongly held values, then dissonance can occur. The process of mindfulness can bring attention to an individual's values and help them to either re-assess their values or choose behaviours that are congruent with their values. Research by Brown and Ryan (2003) found that individuals who experience mindfulness were more likely to act in ways that were congruent with their actual values and interests. The second mechanism activated by reperceiving is that of *flexibility*. The IAA model proposes that reperceiving enables people to step back from their thoughts and emotions and

objectively observe their inner experience, which fosters greater cognitive, emotional and behavioural flexibility and less mindless reactivity. Parallels can be seen with the Broaden and Build theory of positive emotions, where by positive emotions are thought to broaden people's thought-action repertoire (Fredrickson, 2001).

Thirdly, Shapiro et al (2006) discuss mindfulness as a form of *exposure* to strong emotions, thoughts and sensations, which might otherwise be avoided. They focus on the role of exposure in the treatment of psychological disorders, and the benefit of being able to experience strong emotions with greater objectivity and less automatic reactivity. The other side of this coin is that mindfulness can also expose people to emotions, thinking and behaviour that not only alleviates illness but facilitates well-being. There is growing evidence to suggest that mindfulness may promote positive subjective experiences (Brown & Ryan, 2003; Davidson, et al., 2003; Grossman, Niemann, Schmidt, & Walach, 2004) which results in positive behaviour change (Fredrickson, 2001, 2006). Finally, mindfulness is believed to enhance *self-regulation* by paying attention to new or previously unobserved information (i.e., thoughts and feelings) that can then inform the *self-management* process and leads to behaviour change that results in increased health and well-being (Brown & Ryan, 2003; Ryan & Deci, 2000). The mindfulness intervention in *Paper 4* is based on the IAA model.

Mindfulness research

Mindfulness was selected as well-being intervention based on the following review of the literature. Correlational research has identified that mindfulness is associated with a number of well-being outcomes such as increased positive affective, vitality, life satisfaction, self-esteem, optimism, self-actualisation, and the three basic needs identified in self-determination theory (i.e., autonomy, competence and relatedness); and is inversely correlated with neuroticism, anxiety, depression and negative affective (Brown & Ryan, 2003; Ryan & Deci, 2000). There is also a growing body of evidence that mindfulness-based

interventions can effectively improve mental and physical health outcomes in a variety of clinical populations (e.g., individuals with mood and anxiety disorders, substance use disorders, personality disorders, psychotic disorders, chronic pain, binge eating, obesity, psoriasis, cancer, multiple sclerosis, heart disease and fibromyalgia) (Allen, et al., 2006; Baer, 2003; Brown & Ryan, 2003; Brown, Ryan, & Creswell, 2007; Jain, et al., 2007; King, 2006). These mindfulness interventions are delivered in a group format over 8-12 weeks, with one to two hour sessions weekly (e.g., Mindfulness Based Cognitive Therapy, Mindfulness Based Stress Reduction). The primary health outcomes measured in mindfulness research have focused on illness rather than wellness, including psychological (e.g. depression, anxiety, stress, coping style) and physical measures of health (e.g., medical symptoms, physical impairment, sensory pain, functional disability). A small number of studies have taken some direct and indirect measures of well-being (e.g., positive states of mind, self-compassion, empathy, satisfaction with life, quality of life) and seen significant positive change. For example, a randomised controlled pilot study of an eight week mindfulness-based stress reduction program for health care professionals (n = 38) found increases in positive states of mind, empathy, self-compassion and a trend toward significant increases for life satisfaction (Shapiro, Astin, & Bishop, 2005). These results reproduced earlier studies of stress in medical and health students which found decreases in psychopathology and increases in positive states of mind (Chang, et al., 2004) and empathy (Shapiro, Schwartz, & Bonner, 1998) for the mindfulness intervention.

The research linking the benefits of mindfulness to physical and mental illness is growing, however it has been criticized for the paucity of quality research (Grossman, et al., 2004; Shapiro, et al., 2006). A limitation of all these studies is that while mindfulness was a central component, it formed part of a broader stress reduction or cognitive behavioural program, making it unclear exactly which elements of the program were having an effect. In

response to this criticism a study of distressed students (n = 83) compared relaxation training and mindfulness meditation with a waitlist control (Jain, et al., 2007). Compared to the waitlist control, both the mindfulness and relaxation groups experienced significant reductions in distress and increases in positive states of mind over time. The mindfulness group showed a larger effect size for positive states of mind compared to the relaxation group (Cohen's d = .71 and .25 respectively). The authors also reported that mindfulness was distinct from relaxation in its ability to significantly reduce rumination and distraction. So it appears that mindfulness, like relaxation, can reduce psychological distress, but mindfulness may have a larger impact on increasing positive states of mind. A limitation of this study, and mindfulness research in general, is that it has been conducted with either clinical or highly stressed populations, such as medical/health students and professional, with no known longitudinal research measuring well-being outcomes in relatively healthy populations.

In summary, the primary research focus has been on delivering multi-component, group mindfulness programs to clinical or highly stressed populations, and health outcomes have predominantly measured mental and physical illness. There is some preliminary evidence to suggest that mindfulness is correlated with, and mindfulness interventions have beneficial effects on, direct and indirect measures of well-being. There is a research opportunity to explore the well-being outcomes of mindfulness interventions in non-clinical/highly stressed populations and to see if mindfulness can be delivered online.

Hierarchical Linear Modeling in longitudinal research

In *Paper 2* (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009) the longitudinal data were analysed using repeated measures ANOVAs and MANOVAs, a fairly typical internet intervention analyses strategy, and to fulfill the assumptions of these analyses missing data were imputed using intention to treat (IIT). As mentioned in *Paper 2*, ITT has been considered an acceptable and commonly used strategy to address the issue of attrition

and missing data (Gross & Fogg, 2004; Lachin, 2000). Missing data as a result of attrition from longitudinal intervention trials is a persistent problem, and internet interventions research is not immune from this issue (Christensen, Griffiths, & Farrer, 2009; Eysenbach, 2005). The particular ITT strategy used in *Paper 2* was Last Observation Carried Forward (LOCF), which imputes missing values based on the last observed value, making the assumption that outcomes have not changed from the last observed value. An often used alternative to LOCF is Complete Case analysis (CC) which only uses participants with complete data sets, which results in the exclusion of those with incomplete data sets and consequently reduces power. Increasingly the case is being argued that neither of LOCF or CC are suitable for longitudinal data sets with missing data due to attrition, particularly when missing data are not missing completely at random (MCAR) (Houck, et al., 2004). MCAR is when missing data does not depend on either the observed or missing values (Little & Rubin, 2002). To avoid biased and inefficient estimates it is important that the underlying missing-data mechanism is considered when selecting an appropriate statistical technique, although this is often ignored (Houck, et al., 2004). There is a strong case being made by several research groups for abandoning LOCF and CC analysis in longitudinal intervention trials with missing data (Christensen, et al., 2009; Houck, et al., 2004; Salim, Mackinnon, Christensen, & Griffiths, 2008). An alternative approach which addresses the problems (e.g., restrictive compound symmetry assumption for ANOVAs, and bias in LOCF and CC) associated with traditional repeated measures statistics, is hierarchical linear modeling (HLM).

The advantages of HLM over other repeated measures analysis methods is it allows for unequal numbers of repeated observations for each participant, missing data and variable timing of observations (Bryk & Raudenbush, 1987; R. L. Tate & Hokanson, 1993; Wu, 1996). As explained by Bryk and Raudenbush (1987) HLM describes intra-individual change

patterns and identifies inter-individual predictors of change by estimating an individual growth curve for each individual and a group growth curve from the individual growth curve parameter. Group growth curve parameters are estimated as the weighted mean of the corresponding individual curve from individuals in that group, with larger weights given to individuals with more repeated assessments and smaller weights for individuals with less assessments. This process of smoothing individual curves and weighting of group curve parameters can greatly increase the precision of parameter estimates and power to identify predictors of change patterns (Burchinal, Nelson, & Poe, 2006). A step by step overview of the HLM method is provided in *Paper 4* (Mitchell, Klein, Vella-Brodrick, Meyer, & Stanimirovic, submitted), which adopted HLM as a statistically robust way to address the issue of missing data and assess for change over time and between groups.

The disadvantage of using HLM is mainly the researcher time involved in learning to apply this new technique and in gaining access to the appropriate statistical software. It was intended in the current thesis for the author to undergo HLM training; however this did not turn out to be practical within the timeframe of the PhD and given the training and software resources available. As a result of these restrictions, the author did the conceptual and data preparation but the HLM analysis was conducted by Dr Denny Meyer, Senior Lecturer in Statistics at Swinburne University, who had knowledge of and access to the statistical package HLM version 6.

Declaration for publication

Mitchell, J., Klein, B., Vella-Brodrick, D., Meyer, D., & Stanimirovic, R. (Submitted). A randomised controlled trial of fully automated online positive psychology interventions: Strengths and mindfulness.

Declaration by candidate

The nature and extent of my contribution to the work was the following:

Nature of contribution	**Extent of contribution (%)**
Instigator of study and key concepts, conducted the research, wrote the manuscript (except first draft of HLM statistic section), integrated other authors' comments in final manuscript, prepared and submitted for publication.	70%

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

Name	**Nature of contribution**
Britt Klein	Guidance on study design and statistics, feedback on draft manuscript
Dianne Vella-Brodrick	General supervision and feedback on draft manuscript
Denny Meyer	Ran the HLM statistic and wrote the first draft of the HLM statistics section
Rosanna Stanimirovic	Feedback on study design and draft manuscript

Candidate's Signature _____ **Date** _____

Declaration by co-authors

The undersigned hereby certify that:

(19) the above declaration correctly reflects the nature and extent of the candidate's contribution to this work, and the nature of the contribution of each of the co-authors.
(20) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(21) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(22) there are no other authors of the publication according to these criteria;
(23) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(24) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

Location(s) Monash University, School of Psychology and Psychiatry, Caulfield campus

Signature 1 _____ **Date** _____

Signature 2 _____ **Date** _____

Signature 3 _____ **Date** _____

Signature 4 _____ **Date** _____

Reprint of the submitted manuscript

A randomised controlled trial of fully automated online positive psychology interventions: Strengths and mindfulness

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Abstract

Objective: To test the efficacy of online positive psychology interventions (OPPIs) to enhance well-being and reduce mental illness symptoms. *Method:* The study included 623 adult participants (81% female, 70.5% Australian residents, mean age 39.9 years) in a randomised controlled trial investigating longitudinal outcomes for three intervention groups (strengths, eCoach and mindfulness) compared to a waitlist control (WC). Self-report measures were administered at baseline, post-intervention, one month and three months follow-up, and included the Personal Well-being Index-Adult, Satisfaction With Life Scale, Modified Differential Emotions Scale, Psychological Well-Being, Mental Health Continuum – Short Form, and the Depression Anxiety Stress Scale-21. Potentially moderating variables included human support (via the offer of email support to the eCoach group) and baseline levels of well-being and depression symptoms. *Results:* Hierarchical Linear Modelling analyses indicated that, compared to the WC, the Strengths and eCoach participants had significant average monthly increases, up to three months, on measures of well-being (PWI-A, mDES positive affect, PWB, MHC-SF). The eCoach and Mindfulness groups had a significant reduction in depression and anxiety symptoms respectively. Various moderating effects were found, for example, increases in life satisfaction at three months for Mindfulness group participants with elevated depression symptoms. *Conclusion:* The results support the efficacy of strengths and mindfulness OPPIs to enhance well-being and reduce illness symptoms. The moderating effects highlight the importance of tailoring interventions to the individual. The internet offers an opportunity to deliver fully automated, tailored interventions as part of an accessible and sustainable health promotion and illness prevention strategy.

Keywords: Well-being; mental illness; internet interventions; mindfulness; strengths; hierarchical linear modelling.

The science of well-being and optimal human functioning, operating under the umbrella of positive psychology, has highlighted the benefits of well-being for individuals and communities, and intervention research in particular has demonstrated the efficacy of positive psychology interventions (PPIs) to enhance well-being overtime (Sin & Lyubomirsky, 2009). Delivering PPIs using the internet has been mooted as an accessible and sustainable means of health promotion in the general community and in populations with sub-clinical symptoms of mental illness (Mitchell, Vella-Brodrick, & Klein, Submitted-b). The current study tested the efficacy of three fully automated online positive psychology interventions (OPPIs) to enhance well-being and reduce symptoms of illness, and explored potential moderators of OPPI effectiveness.

Past research testing OPPI efficacy has had some success, in particular, a randomised controlled trial (RCT) testing the efficacy of an online strengths intervention compared to a placebo control, demonstrated increases in subjective well-being at three-months post intervention (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009). Two other RCTs (Seligman, Steen, Park, & Peterson, 2005; Shapira & Mongrain, submitted) found increased well-being for single component interventions delivered over one or three weeks and aimed at developing either strengths, gratitude, optimism or self-compassion, with effects lasting up to six months. However, two RCTs (Abbott, Klein, Hamilton, & Rosenthal, 2009; Parks, 2009) tested multi-component OPPIs delivered over six or ten weeks and found no significant changes in well-being, although the Parks (2009) study reported decreased depression symptoms. A review of these five studies (Mitchell, Vella-Brodrick, & Klein, Submitted) concluded that while OPPIs demonstrated potential as an effective health promotion strategy, given the conflicting results more evidence was needed to conclusively support their efficacy. Hence the current study aimed to extend the research base by testing the efficacy of two fully automated OPPIs, strengths and mindfulness.

Strengths and mindfulness interventions

The current study employed a strengths intervention that had demonstrated success in enhancing well-being and, as discussed below, used it as the basis for testing the potential moderating effect of human support. The strengths intervention is based on the Seligman et al. (2005) theory which proposes three pathways to happiness (i.e., pleasure, engagement and meaning). The intervention was designed to tap into the engagement orientation by assisting individuals to identify and actively use their personal strengths, such as gratitude or love of learning, in new ways (for a more detailed description of the strengths intervention see Mitchell, et al., 2009; Seligman, et al., 2005).

To extend knowledge of effective well-being interventions a previously untested mindfulness intervention was included in the current study. Although many mindfulness programs are available, there are no known published studies testing online delivery of mindfulness and very few studies that measure well-being outcomes. To help understand how mindfulness influences behaviour change in general, and well-being in particular, Shapiro et al. (2006) developed a non-linear model based on Kabat-Zinn's (1994, p.4) definition of mindfulness as *"paying attention in a particular way: on purpose, in the present moment, and non-judgmentally"*. Shapiro et al. identified three building blocks, or axioms, of mindfulness, namely intention ("on purpose"), attention ("paying attention") and attitude ("in a particular way") (IAA). The authors proposed that mindfulness is a moment-to-moment experience during which these three axioms are simultaneously activated. The experience of mindfulness is theorised to result in a shift in perspective called reperceiving – the ability to observe moment-to-moment experiences (e.g., thoughts, feelings, images, sensations) with greater clarity and objectivity (Shapiro, et al., 2006). Reperceiving facilitates a number of mechanisms including: clarification of personal values; exposure to emotions, thoughts and sensations; flexibility in cognitive, emotional and behavioural responses; and increased

ability to self-regulate and manage behaviour in a way that enhances health and well-being. This model was used as the basis of the mindfulness intervention in the current study.

Mindfulness was selected as a potential OPPI based on a review of the literature. Correlational research has identified that mindfulness is associated with a number of well-being outcomes such as increased positive affect, vitality, life satisfaction, self-esteem, optimism (Brown & Ryan, 2003; Ryan & Deci, 2000). There is also evidence that mindfulness-based interventions can effectively improve mental and physical health outcomes in a variety of clinical populations (e.g., mood and anxiety disorders, chronic pain, and heart disease) (Allen, et al., 2006; Brown & Ryan, 2003; Brown, Ryan, & Creswell, 2007). The primary health outcomes measured in mindfulness research have focused on illness rather than wellness, including psychological (e.g., depression, anxiety, stress, coping style) and physical measures of health (e.g., medical symptoms, physical impairment, sensory pain, functional disability). The impact of mindfulness in non-clinical populations has been investigated in a small number of studies, however, these non-clinical samples tend to have high levels of stress (Chang, et al., 2004; Chiesa & Serretti, 2009; Cohen-Katz, et al., 2005; Shapiro, Astin, & Bishop, 2005; Shapiro, Schwartz, & Bonner, 1998; Williams, Kolar, Reger, & Pearson, 2001). If, as the research suggests, mindfulness can reduce symptoms of ill health then it is plausible that practicing mindfulness can also enhance health and well-being, however, no known longitudinal research has measured well-being outcomes in populations without illness or notable stress. A selection of studies, particularly those focusing on participants with high stress, have taken some direct and indirect measures of well-being (e.g., positive states of mind, self-compassion, empathy, satisfaction with life, quality of life) and reported significant positive change (Chang, et al., 2004; Shapiro, et al., 2005; Shapiro, et al., 1998). The limitation of all these studies is that while mindfulness was a central component, it formed part of a broader stress reduction or cognitive behavioural program,

making it unclear which elements of the program were having an effect and what contribution mindfulness made. RCTs testing the well-being outcomes in non-clinical/stressed and online populations are needed to investigate the potential health promotion benefits of mindfulness. The current study tested the longitudinal efficacy of a brief mindfulness intervention, as well as a strengths intervention, and explored program and individual factors influencing efficacy.

Factors influencing OPPI efficacy

A meta-analysis (Sin & Lyubomirsky, 2009) of 51 face-to-face and self-administered positive psychology intervention (PPI) studies found that human administered (individual or group) PPIs had a greater mean effect size than self-administered PPIs, suggesting that human support may enhance intervention outcomes. A similar finding was reported in a meta-analytic study of 12 mental health online treatment interventions (Spek et al., 2007) which found human supported interventions produced larger pooled effect sizes compared to self-administered interventions. However, the authors noted that due to methodological limitations (e.g., small sample size) of their study more research was required to support this finding. Although there are no definitive theories explaining the mechanisms underlying the role of human support it has been suggested that it may motivate participant adherence to the intervention, and adherence has been shown to be an important factor in creating positive change (Celio, Winzelberg, Dev, & Taylor, 2002; Christensen, Griffiths, & Farrer, 2009). The exact role of human support in online interventions for mental health is still a grey area with conflicting outcomes, for example, there is correlational data indicating that treatment outcomes may be enhanced when increasing the amount of human contact provided (Palmqvist, Carlbring, & Andersson, 2007); but it has also been observed that limited therapist contact (i.e., one email per week) can be just as efficacious as more frequent therapist emails (i.e., minimum of three per week) (Klein, et al., 2009). In addition, there is great variability in what constitutes a no-human support intervention online. While some

websites are static, similar to a self-help book, others are highly interactive and provide tailored feedback and email reminders, simulating some of the functions of human support(Barak, Klein, & Proudfoot, 2009). Meta-analytic studies conducted to date have taken a broad brush approach categorising studies as human supported vs. self-administered, which is not surprising given the small number of quality studies available, but potentially limits the findings and conclusions that can be drawn from them. Conclusions about the role and benefit of human support for online interventions remain equivocal. In the current study human support was tested via an eCoach intervention group, which replicated the Strengths group intervention and added human support via an email communication option. In total there were three intervention groups in the current study: Strengths, eCoach and Mindfulness.

Individual characteristics influencing intervention efficacy are also explored in the current study. Two literature reviews (Mitchell, et al., Submitted-b; Sin & Lyubomirsky, 2009) have indicated that baseline levels of illness symptoms appear to moderate outcome effects, although this has not been directly tested. In studies where participants have mild to moderate symptoms of depression at baseline, OPPIs resulted in significant changes in well-being and illness symptoms (Parks, 2009; Seligman, et al., 2005; Shapira & Mongrain, submitted). Like illness symptoms, well-being levels vary between individuals and have different health consequences (Keyes, 2005a, 2005b). To date well-being intervention research has been dominated by the assumption that *more is better* and consequently focussed on enhancing rather than maintaining well-being. An area yet to be investigated is whether OPPIs have varying efficacy depending on baseline level of well-being, for example, OPPIs may have a well-being enhancement role for people with low or moderate well-being, and a maintenance role for people with higher levels of well-being.

The current study hypotheses

The primary aim of the current study was to test the efficacy of three OPPIs, strengths, eCoach and mindfulness, to enhance well-being and reduce illness symptoms in the general population. In addition, the study aimed to explore three potential moderators of OPPI effectiveness: human support, and baseline well-being and illness symptoms. It was hypothesised that:

H1. From pre- to post-assessment there would be no difference between participants in the intervention groups (i.e., strengths, eCoach, and mindfulness) and the WC group (i.e., as demonstrated by previous OPPI studies).

H2. From pre- assessment to one and three month follow-up-assessment participants in the three active interventions would demonstrate increased well-being and decreased illness symptoms compared to the waitlist control (WC).

H3. Participants in the human support (eCoach) intervention would have greater adherence and greater average monthly increase in well-being and decrease in illness symptoms compared to the no-human support (strengths) intervention.

H4. Baseline levels of well-being (flourishing vs. languishing/moderate) would moderate the follow-up well-being effects of the three intervention groups, with languishing/moderate well-being resulting in average monthly increase in well-being and decrease in illness symptoms and flourishing resulting in no change.

H5. Baseline levels of depression symptoms (above normal vs. normal) would moderate the follow-up well-being effects of the three intervention groups, with above normal depression symptoms resulting in average monthly increase in well-being and decrease in illness symptoms, and normal range depression resulting in no change.

Method

Participants

Participants (N = 623) were included in the study if they were at least 18 years old, were English speaking and had internet access. Participant demographic data are described in Table 1.

<*Insert Table 1 about here*>

Design and Measures

A RCT of participants recruited via the internet was conducted comparing three active interventions, strengths, eCoach (strengths plus human support) and mindfulness, to a WC group. Outcome measures were administered at baseline, post-intervention, one- and three-month follow-up. The following self-report questionnaires were administered at all four time points and used to measure well-being and illness symptoms. The Cronbach alpha coefficients for measures used in the current study indicated adequate internal consistency and were reported in a earlier paper (Mitchell, Vella-Brodrick, & Klein, Submitted-a).

Satisfaction with Life Scale (SWLS)

The SWLS (Diener, Emmons, Larsen, & Griffin, 1985) is a five item instrument designed to measure global cognitive judgments of one's life using a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Users rate the extent of agreement with five statements (e.g., *"I am satisfied with my life"*), with higher scores reflecting greater life satisfaction (range 5 – 35) and most people scoring in the 23 to 28 range (*slightly satisfied* to *satisfied*).The SWLS is commonly used to measure the cognitive component of subjective well-being and has demonstrated adequate validity and reliability (Diener, et al., 1985; Pavot & Diener, 2004).

Personal Wellbeing Index - Adult (PWI-A) Scale

The PWI-A (IWG, 2006) is a seven item measure of the cognitive component of subjective well-being in various life domains. Each item asks *"How satisfied are you..."* with a specific life domain (i.e., standard of living, health, achieving in life, relationships, safety, community-connectedness, and future security). Responses are provided on a scale from 0 (*completely dissatisfied*) to 10 (*completely satisfied*); the scores are then combined across the seven domains to yield an overall score, which is adjusted to have a range of 0-100, with normative data indicating the average Australian score ranges from 73.5 to 76.6 (Cummins, et al., 2009). The PWI-A has satisfactory validity and reliability (IWG, 2006).

Modified Differential Emotion Scale (mDES)

The mDES (Cohn, 2008; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Fredrickson, Tugade, Waugh, & Larkin, 2003) is a 25-item measure of positive affect (PA) and negative affect (NA), consisting of 12 positive emotion clusters, each with three adjectives per item (e.g., *I felt amused, fun-loving, silly*) and 13 negative emotion clusters (e.g., *I felt angry, irritated, frustrated*). Items are mainly drawn from the circumplex model of emotion (Russell, 1980). Participants are asked to rate how much they were feeling each of the emotions during the *past week* on a scale from 0 (*not at all*) to 5 (*extremely*), and an average mean score was calculated. The two subscales report adequate internal reliability (Mitchell, et al., Submitted-a).

Psychological Well-being (PWB)

The PWB (Ryff, 1989; Ryff & Keyes, 1995) was used to measure the six dimensions of psychological well-being (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, self-acceptance). Individuals respond to 42 statements and indicate how true each statement is of them using a six point scale from 1 (*strongly disagree*) to 6 (*strongly agree*), with an average mean score calculated and higher scores

reflecting greater well-being. The PWB has reported adequate validity and reliability (Keyes, Shmotkin, & Ryff, 2002; Ryff, 1989), although Springer and Hauser (2006) recommended that subscale scores are used with caution, hence the total PWB score was used in the current.

The Mental Health Continuum-Short Form (MHC-SF)

The MHC-SF (Keyes, 2006; Keyes, et al., 2008) is a 14 item measure of well-being comprised of three subscales of emotional well-being (three items), social well-being (five items) and psychological well-being (six items). The MHC-SF asked participants to select the response that best represents *"how often you have felt each feeling"*, from 0 (*never*) to 5 (*everyday*), over the *past week.* The MHC-SF can be interpreted as both a continuous score, with higher scores reflecting greater well-being, and a categorical scale (languishing, moderate, flourishing) (Keyes, et al., 2008). *Flourishing* individuals must report experiencing seven of 14 symptoms '*everyday*' or '*almost everyday*', with at least one item from the three emotional well-being items and six items from either of the two subscales of psychological and social well-being. *Languishing* individuals must report experiencing seven of 14 symptoms '*never*' or '*once or twice'*, with at least one item from the emotional well-being items and six items from either of the two subscales of psychological and social well-being. Anyone who does not meet either the languishing or flourishing criteria is categorised as having *moderate* well-being. In the current study these categories were used to test for the moderating effect of baseline well-being. The scale has reported adequate reliability and validity for the total score (Keyes, et al., 2008; Mitchell, et al., Submitted-a).

Depression, Anxiety, Stress Scales (DASS-21)

The DASS-21 (Lovibond & Lovibond, 1995) is a short form measure of the DASS-42. It measures mental illness symptoms and contains three self-report scales, each with 7-items, designed to measure the emotional states of anxiety, depression, and stress. A four-point response scale from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of*

the time) rated how much participants experienced each symptom over the last week (e.g., *I felt sad and depressed*). Scores on each subscale are doubled (range from 0-42) so the DASS-42 norms can be applied. The DASS-21 has satisfactory validity and reliability, and has normative data indicating symptom severity cut off scores (e.g., For depression, 0-9 = normal, 10-13 = mild, 14-20 = moderate, 21-27 = severe, 28+ = extremely severe) (Antony, Bieling, Cox, Enns, and Swinson, 1998; Lovibond and Lovibond, 1995).

Attrition and adherence

Study *attrition* refers to the number of people who did not complete the post-intervention, one- or three-month follow-up assessment phases, and these results are described in Figure 1. *Completer status* measured overall adherence to the three week intervention phase by categorising participants as a 'completer' or 'non-completer'. Participant *program adherence* during the intervention phase was measured at post-intervention using two self-report items that asked participants to indicate how much *time* (in minutes) and how much *effort* (none, minimal, moderate, maximum) they put into completing the intervention programs. *Continued practice* beyond the intervention phase was measured at follow-up by asking how much time and effort participants put into applying the program information and skills after the intervention period.

<Insert Figure 1 about here>

Procedure

Ethics approval for the study was gained from the relevant Monash University ethics committee. The study was conducted entirely online at www.wellbeingonline.org. Participants were recruited through electronic advertising sent via Monash University and the Australian Sports Commission's online networks (e.g., websites, eNewsletters and email

distribution lists) and a range of professional and community websites and listservs. Promotional postcards advertising the study website address were distributed from a range of Melbourne city and suburban venues (e.g., libraries, cafes, University campuses).

Participants self-registered online for the study, provided informed consent and were assigned a personal username and password for access to the website. When participants first logged-in to the website they completed a demographic survey and battery of mental health and well-being questionnaires (Time 1) before proceeding to the intervention phase of the main research trial. Participants were then randomly allocated, using a computer generated algorithm, to one of four groups: strengths, eCoach, mindfulness or WC. After three weeks all groups were prompted, via an automated email message, to answer the same well-being and illness symptoms questionnaires (Time 2) and a program evaluation. One month later all participants were sent an email request to login to the website and repeat the questionnaires (Time 3). Afterwards the WC group were given access to the strengths intervention and not required to complete any more assessment questionnaires. The other three groups repeated the assessment phase one more time (Time 4). Study design and participant flow through the study is summarised in Figure 1.

The Interventions

The strengths and mindfulness interventions were based on established face-to-face protocols that were operationalised and transformed for self-administration via a fully automated website with feedback and reminder mechanisms. The website used text, graphics, an animated guide and interactive features to engage the user in an active learning process (e.g., participants were asked to type their responses to questions, to click and drag objects around the page, and were provided with personalised well-being feedback based on SWLS scores). The interventions were delivered over three sessions, with a recommended one week break between sessions to practice and consolidate learning, and automated weekly email

reminders to complete the next session. Each online session took approximately 10-20 minutes to complete.

The *mindfulness intervention* was based on the IAA model (Shapiro, et al., 2006). In the first session, participants were introduced to the concept of mindfulness versus being on autopilot, and were able to listen to a five minute mindfulness audio (downloadable MP3 file) or read a mindfulness script (PDF). Session two started with the same mindfulness audio before participants were introduced to concepts such as observing, guiding, and non-judgemental awareness. The final session repeated the mindfulness audio practice and then introduced the concept of daily mindfulness. Participants were provided with examples of daily mindfulness activities (e.g., mindful eating, teeth brushing or walking) and asked to practice five minutes daily. At the end of each session participants were assigned an offline activity, or homework task, asking them to practice mindfulness for five minutes per day. As a reminder to practice and to facilitate learning, participants were asked to provide feedback on their offline practice at the start of each new session. At the end of the three week intervention participants were reminded to complete the next set of questionnaires (Time 2) and, based on their SWLS scores, were given automated graph and text based feedback. After completing the Time 3 and 4 assessments participants could again view their well-being graph with the additional assessment data included.

The general format of the *strengths intervention* was the same as the mindfulness intervention with offline activities, automated email reminders, and SWLS score feedback. The specific content for this intervention is based on identifying personal strengths and using them in new ways (for more detail see an earlier pilot study Mitchell, et al., 2009). A variation on the strengths intervention was the *eCoach* intervention, which was identical to the strengths intervention but also included the option of email support by an eCoach (the first author, a registered clinical psychologist) via the intervention website. Participants could

email as often as they liked and would receive a maximum of one reply to their emails per week for the three weeks of the intervention.

Participants allocated to the *WC* group were directed to a webpage informing them that they would be given access to one of the active interventions after a seven week waiting period (i.e., after the one month follow-up assessment). Participants received automated email reminders to complete the Time 2 and 3 assessments at the end of weeks three and seven respectively.

Results

Preliminary statistical procedures and analyses

Preliminary analyses, using SPSS version 17.0, compared baseline differences by group and/or completer status on well-being, illness, effort and demographic variables, using analysis of variance (ANOVAs) and Chi-square statistics. To satisfy normality assumptions the following transformation were made to the baseline data: square (PWI-A, SWLS, PWB, MHC-SF), square root (NA, DASS stress), logarithmic (DASS depression and anxiety).

Hierarchical linear modelling (HLM) was conducted, using HLM version 6, to test for differences between groups and over time, as well as for moderators of change. HLM has an advantage over more traditional repeated measures statistics because it allows the use of incomplete data from individuals. This is particularly important when the imputation of missing values is impossible due to patterns in the missing data and/or the percentage of missing data is high. The current study had 623 participants but only 72 had a complete set of data for all four time points. High attrition is typical of internet intervention trials, particularly self-administered studies (Eysenbach, 2005; Mitchell, et al., 2009) and common approaches to address this issue, such as completer analysis or last observation carried forward (LOCF), have inadequacies that compromise their ability to draw reliable conclusions about intervention effectiveness (Salim, Mackinnon, Christensen, & Griffiths, 2008). As noted by

Tate and Hokanson (1993) HLM analysis assign weights to the intercept π_{0i} and coefficient π_{1i} estimates for each individual with higher weights assigned to more reliable observations (e.g., more complete data). In addition, Little's MCAR test indicated that the imputation of missing values was not possible for this data set because data were not missing in a completely random pattern (Chi-Square = 366, *df* = 292, *p* = .002). It was for this reason that an HLM analysis was employed with this data. HLM is a relatively uncommon approach in the internet intervention literature, so a detailed description of this approach is provided. Appropriate transformations were applied to the data to ensure that the assumption of normally distributed errors was reasonable. Plots of Mahalanobis Distances for Residuals against Chi Square Percentiles identified at most three outliers for each variable which were subsequently deleted.

Human support manipulation check

While all participants in the eCoach group were offered the option of human support via weekly emails for the duration of the program, only 12% (9/75) used this option. Each of these participants sent either one or two emails, and the eCoach responded to all emails.

Baseline differences between program completers and non-completers

Two-way between group ANOVAs were conducted to compare overall and group differences between completers and non-completers at pre-assessment on demographic, well-being, and illness variables. There was a significant main effect for completer status and DASS anxiety, F (3, 387) = 5.83, p = .016. These results indicate that completers (M = 1.46) had lower DASS anxiety at baseline compared to non-completers (M = 1.64). No differences were found between intervention groups on any of the variables.

Chi-square tests for independence were conducted to compare baseline differences between completers and non-completers on gender, residential location, education,

employment status, marital status and group. A significant association was found for gender, X^2 (1, n = 545) = 5.13, p = .023, with Yates Continuity correction, phi = -.10 (small effect size); and group, X^2 (3, n = 623) = 15.6, p = .001, phi = -.16 (small effect size). The data suggest that females (66.6%) were more likely to complete the intervention phase compared to males (54.7%) and that WC participants (69.8%) were more likely to complete (i.e., three week waiting period) compared to participants in the three active interventions (49.3 - 53.3%).

HLM analyses

Longitudinal HLM analysis involves an assessment of individual change from baseline and a prediction of individual-level differences in change, if they exist. Bryk and Raudenbush (1987) recommend first fitting a model to describe the general form of change, before introducing a second-level HLM equation to model possible group-level differences. In the current study, changes from baseline were considered at three times: post-intervention (time=0); one month follow-up (time=1); and three months follow-up (time=3). This suggests a first-order model with Y_{it} defined as the change from pre-assessment for individual *i* (1,2,…) at time 0, 1 and 3 and e_{it} defined as the random within-subjects error of prediction for individual *i* at time *t*, with a variance of σ^2.

$$Y_{it} = \pi_{0i} + \pi_{1i} time + e_{it}$$

In this equation π_{0i} is the estimated change from baseline to post-intervention and, π_{1i} is the average estimated change per month thereafter. The basic (unconditional) second-level model is defined below.

$$\pi_{0i} = \beta_{00} + u_{0i}$$
$$\pi_{1i} = \beta_{10} + u_{1i}$$

With β_{00} estimated using the average individual intercept, β_{10} estimated using the average change per month after the intervention. The random contributions of individuals to these parameters are represented by u_{0i} and u_{1i} respectively. The variances of these random effects are τ_{00} and τ_{11} respectively and the associated covariance is τ_{01}. A more complex second-level model, incorporating group differences, was then considered using indicator (dummy) variables to represent the various groups.

The initial analysis was carried out using an unconditional model to describe the behaviour of the response variables. This was done to test the variability of the individual regression equations about the mean. In particular the variance associated with the intercept and slope (τ_{00} and τ_{11}) was estimated and the significance of the parameter variances tested, determining what percentage of this variability is available for modelling at the second level. This is referred to as the reliability of the estimate. The results are summarised in Table 3.

<Insert Table 3 about here>

Table 3 shows that there are significant improvements at post-intervention for all the dependent variables except MHC-SF, DASS depression and anxiety. The intercept coefficient gives the estimate for the average size of this improvement. There is significant improvement at three month follow-up in the case of PWI-A, PWB and MHC-SF. The coefficients for the slope give the average increase expected per month. The reliability figures and chi-square tests that there is significant variability between individuals which can be modelled using group variables in the case of the intercepts. In the case of the slopes there is significant variability for level 2 modelling for SWLS, PWI-A, PA, PWB and DASS stress. Overall, these results justify the next level of modelling.

A more complex between-subjects conditional model is now considered, incorporating group differences using indicator (dummy) variables to represent the various groups. Using X_{1i} to identify members of the Strength group, X_{2i} to identify members of the eCoach group and X_{3i} to identify members of the Mindfulness group the second level of the model is described as follows, with the WC group as the reference group.

$$\pi_{0i} = \beta_{00} + \beta_{01}X_{1i} + \beta_{02}X_{2i} + \beta_{03}X_{3i} + u_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11}X_{1i} + \beta_{12}X_{2i} + \beta_{13}X_{3i} + u_{1i}$$

When interpreting Tables 4-8, the intercept provides the units of change from pre-to post intervention, and the slope gives you the average monthly change from post-intervention to three months follow-up. The intercept and slope co-efficient provide an indication of effect size relative to the WC group, and are measured in the units of the observed variable. Tables 4-8 do not include data for measures that had no significant results for all groups, however, this data is available for viewing in the supplementary tables.

Pre- to post-intervention change by group

Table 4 shows the intercept results with contrast tests used to compare the Strength, eCoach and Mindfulness groups with the WC group and, to compare the Strength and eCoach groups, on change from pre- to post-intervention. Table 4 shows three significant results, the constant for the SWLS and DASS anxiety variables indicate a significant improvement on these variables for the WC group during the program. The Mindfulness group showed a significant increase in DASS anxiety from pre- to post-intervention. None of the other intervention groups differed significantly on any variables from the WC group during the program, nor was there any significant difference between the eCoach and Strength groups.

<Insert Table 4 about here>

Average monthly change from post-intervention to three month follow-up

Group differences explain a significant amount of the variation between individuals for average monthly changes from post-intervention to follow-up, see Table 4. All three intervention groups experienced an increase in PA, while the WC group experienced a decline. In the case of NA there was a significant difference between the WC and eCoach group with the latter group showing a decline in NA while the WC group showed an increase in NA. There were significant group differences for PWB changes, the Strength and eCoach groups had an increase in PWB while the WC group showed a decline. DASS depression levels rose for the WC group and declined for all the other groups, but only significantly for the eCoach group. DASS anxiety levels rose for the WC group and dropped for the intervention groups, but only significantly for the Mindfulness group. The Chi square statistic indicates no significant differences between the Strength and eCoach groups at follow-up.

HLM for moderating effects

To test for moderating effects, group comparisons were performed after splitting the data into two pre-assessment groups, MHC-SF well-being categories (*flourishing* or *languishing/moderate*) and DASS-21 depression symptom severity categories (*normal*, scores <10 or *above normal*, scores >9). The model was fitted using the WC group as the reference category in all cases.

The influence of baseline well-being at post-intervention and three month follow-up

Table 5 shows the results for participants categorised as flourishing at baseline. There was a significant overall drop in DASS anxiety from pre- to post-intervention for the WC group. For the follow-up period there was a significant difference between the WC group and the eCoach group for estimated average improvement in PA and PWB. The average

improvement in PA per month was .51 units higher for the eCoach group than for the WC group, while the average improvement in PWB per month was .17 units higher for the eCoach group than for the WC group.

<Insert Table 5 about here>

In Table 6 the constant term for the intercept indicates a significant post-intervention improvement for WC group participants with languishing/moderate well-being on SWLS, PWI-A, PWB, and NA. No significant differences were found between the intervention groups and the WC group at this stage. However, in the case of the average monthly improvement after the intervention there were significant between group differences. The languishing/moderate well-being participants in the WC group showed a significant decline during this period on SWLS, PWI-A, PA, NA and DASS anxiety. In contrast to the WC group, the Strength group showed a significant improvement in SWLS, PWI-A, PA and NA; the eCoach group showed a significant improvement in SWLS, PWI-A, NA and DASS depression and; the Mindfulness group showed a significant improvement in DASS anxiety.

<Insert Table 6 about here>

The influence of baseline depression at post-intervention and three month follow-up

Table 7 presents the results for people with baseline depression levels above normal. Between pre and post-intervention SWLS increased for the WC group and decreased for the Strength group, producing a significant difference between these two groups. In addition, NA for the WC group declined significantly at post-intervention. There were also average monthly changes at follow-up, with SWLS improving significantly for all three groups compared to a decline for the WC group. The PWI-A results followed the same pattern

however the results were only significant for the Strengths and Mindfulness groups. NA and DASS depression declined significantly for the eCoach group.

<*Insert Table 7 about here*>

The results for participants with depression symptoms in the normal range are somewhat different to those for participants with above normal depression symptoms, see Table 8. For participants with baseline DASS depression symptoms in the normal range, there was a significant decline in DASS anxiety from pre- to post-intervention for the WC group, and a significant increase in the MHC-SF for the Mindfulness group. During the follow-up period there was a significant decline in PA for the WC group, and an increase in PA for the intervention groups, which was significant for the Strengths and eCoach groups only. Also during the follow-up period compared to the WC group there was an improvement in PWB for the Strength and eCoach groups, a significant decline in DASS anxiety for the Mindfulness group, and a significant decline in DASS depression for the Strength group.

<*Insert Table 8 about here*>

Time and effort at post-intervention and follow-up

The degree of intervention program adherence, in terms of time and effort, was measured at post-intervention. A one-way between groups ANOVA was conducted to explore the impact of group on effort and time, with no significant difference found for effort, $F(2, 231) = 1.12$, $p < .05$; or time, $F(2,231) = .32$, $p < .05$. The degree of continued practice, in terms of time and effort, was measured at one- and three-month follow-up, with no significant difference found between groups at one-month follow-up for effort, $F(2, 156) = .17$, $p < .05$; or time, $F(2,156) = .41$, $p < .05$. No significant differences were found between

groups at three-month follow-up for effort, $F(2, 116) = 1.44$, $p < .05$; or time, $F(2,116) = .32$, $p < .05$. These results indicate that for the current sample the amount of time or effort invested in the program was not significantly different between groups. It was intended to conduct HLM analysis for time and effort, as moderators of intervention efficacy, however the study did not have enough power to run this analysis.

Discussion

This current study is one of the first internet intervention research trials to use longitudinal HLM data analysis. Shortcomings of traditional data analysis approaches (e.g., LOCF and ANOVAs) have often been cited in the internet intervention literature, particularly in relation to attrition and missing data (Salim, et al., 2008). The use of HLM analysis in the current study was an attempt to address the shortcomings of past forms of analysis (e.g., Mitchell, et al., 2009) and draw attention to alternative approaches for longitudinal intervention research.

Subjective, psychological and combined well-being outcomes

The well-being results support the first hypothesis with none of the intervention groups significantly different to the WC group at post-intervention. In the three months after the intervention period there were significant average monthly increases on subjective, psychological and combined well-being measures for both of the strengths interventions, but not for the mindfulness intervention. Contrary to what was hypothesised, there were no significant differences between the strengths and eCoach group on any measures, indicating that the offer of human support provided no additional benefit to the strengths intervention. The adherence data (completer status, time and effort) indicated no differences between the active intervention groups, suggesting that neither type of intervention or offering human support, had an impact on program adherence. People were more likely to complete the

intervention phase if they were in the WC group, which is not surprising as this group were not required to do anything during this time and had the expectation of access to one of the interventions.

The intercept and slope co-efficient provides an indication of effect size relative to the WC group, and is measured in the units of the observed variable. For example, the average monthly change for life satisfaction for the eCoach group was 2.13 PWI-A units (over three months this equates to 6.39 PWI-A units), the Strengths group was 1.34 PWI-A units (4.02 PWI-A units over three months). As an indication of what this means in terms of clinical significance, normative data for the Australian population indicate average PWI-A scores range from 73.5 to 76.6 (range 0-100) (Cummins, et al., 2009), so a 4-6 PWI-A unit increase could move an individual from below to above average. The normative data for the PWI-A is useful but gives little indication of clinical significance (e.g., a PWI-A score of 80 is above the average range, but is it meaningfully better than a score of 70?). Currently data available to guide interpretation of well-being scales is limited. The SWLS has slightly more useful interpretative data with relative satisfaction categories (e.g., 15-19 = slightly dissatisfied, 21-25 = slightly satisfied, 26-30 = satisfied) and normative data indicating SWLS scores for the general community fall between 23 and 28. Research on the MHC-SF indicates that people with scores in the flourishing well-being category perform better on a range of mental and physical health outcomes, compared to people in the languishing and moderate well-being categories (Keyes, 2005a, 2005b). Currently interpretation of most well-being measures is a simple 'more is better', with limited consideration yet to be given to the question 'how much well-being is enough?'

Overall, the well-being results support the findings of the two previous RCTs (Mitchell, et al., 2009; Seligman, et al., 2005) demonstrating that the strengths intervention is an effective OPPI for the enhancement of both subjective and psychological well-being. The

Mitchell et al., (2009) study found an increase on the cognitive component of subjective well-being only and suggested that this intervention specifically targeted this one aspect of well-being alone. However, the current finding of increases on multiple well-being measures for the strengths intervention suggest that the previous result was more likely a combination of small sample size and the use of LOCF and repeated measures analysis, making it difficult to detect change, rather than an indication that the intervention specifically targeted the cognitive component of subjective well-being.

While there were overall increases in life satisfaction and positive affect for the mindfulness intervention they did not reach significance, indicating that the mindfulness intervention was not effective at enhancing well-being. However, the moderating effect of baseline well-being and depression provided some interesting results that support the well-being efficacy of mindfulness for specific groups. In particular the mindfulness intervention resulted in average monthly increases in life satisfaction (2.18 SWLS units and 5.12 PWI-A units per month) for participants with above normal depression symptoms (DASS depression score >9); this approximately equates to a 15% increase in life satisfaction scores over a three month period. In addition, mindfulness intervention participants with flourishing well-being at baseline experienced a short term increase in psychological well-being (.19 PWB units, 3.1% increase at post-assessment), and participants with baseline depression symptoms in the normal range experienced post-intervention increases on the combined well-being measure (.33 MHC-SF units, 6.6% increase at post-assessment). These findings are important because they suggest that changes on different measures of well-being are not only determined by the intervention type (e.g., strengths vs. mindfulness) but also by individual characteristics (e.g., with or without depression symptoms).

The moderating effects of well-being and depression symptoms at baseline were also evident for the strengths intervention. The Strengths group appeared to have a well-being

maintenance role for participants with flourishing well-being, and a well-being enhancement role for those with languishing or moderate well-being. The eCoach group enhanced well-being across both groups, although the type of well-being varied between groups. In terms of depression levels at baseline, both groups experienced improved well-being at follow-up but the group with elevated depression symptoms had improved life satisfaction and reduced negative affect, and the participants with normal range depression symptoms had improved positive affect and psychological well-being. These results provide additional support for the observation that changes on different measures of well-being appear to be determined not only by the intervention type but also by individual characteristics.

As previously mentioned, offering human support via the eCoach intervention did not result in any significant differences compared to the strengths group, however there were some observable effect size differences. There was an interesting finding for participants with elevated depression symptoms, who demonstrated an unexpected reduction in life satisfaction at post-assessment for the Strengths group but not the eCoach group. At follow-up this effect has been reversed and both the Strengths and eCoach groups have increased life satisfaction compared to a reduction for the WC group. One possible interpretation is that the addition of offering human support may protect participants with depression symptoms from a relative drop in life satisfaction as they completed the strengths program, which was a cognitively challenging task.

Depression, anxiety and stress symptom outcomes

The illness symptom data indicating change from pre- to post-intervention supported the first hypothesis, of no difference between groups, with the exception of the Mindfulness group on one illness variable. Interestingly, compared to a decrease in DASS anxiety for the WC group there was an overall increase in DASS anxiety for the Mindfulness group during the intervention phase. These results may be explained by the process of mindfulness, which

exposes people to their present moment emotions and thoughts and initially this, depending on the types of emotions and thoughts being experienced, can be a confronting experience. Over time and with mindfulness practice participants may be more able to observe their internal experience without or with less emotional reactivity and judgement. This explanation is reflected in the follow-up data, where the mindfulness group experienced significant monthly decreases in anxiety, more so than any other group. The mindfulness intervention was effective at reducing average monthly anxiety for the group as a whole (1.47 DASS anxiety units over three months) and in particular for participants with languishing/moderate well-being (1.65 DASS anxiety units over three months) or with depression symptoms in the normal range (2.04 DASS anxiety units over three months). Based on DASS anxiety severity categories (e.g., 8-9 = mild, 10-14 = moderate, 15-19 = severe) a change of a few anxiety units would be clinically meaningful (Lovibond & Lovibond, 1995).

It is interesting that given the documented efficacy of mindfulness interventions for treating depression and reducing stress (Baer, 2003; Brown, et al., 2007), that these results were not replicated here. Compared to other mindfulness intervention studies the current intervention differs in a number of notable ways, first, it does not form part of a broader stress reduction or cognitive behavioural treatment program, it focuses on mindfulness alone. It is a brief program consisting of one x 10-20 minute session per week for three weeks, plus 5 minutes recommended daily practice, compared to other empirically tested mindfulness programs which on average consist of a one to two hour session each week for 8-12 weeks, plus 45 minutes recommended daily practice (i.e., less than three hours compared to over 30 hours). Finally, it is a self-administered online intervention rather than the usual face-to-face, group format. Given the simplicity and brevity of the intervention, and the fact that participants did not have the additional motivation of treating or reducing illness symptoms, it is encouraging that changes were observed. For future research it would be interesting to

explore whether mindfulness skills taught within a broader well-being enhancement program would have greater well-being and illness benefits.

In terms of the strengths intervention, the offer of human support appeared to provide added benefit for the reduction of depression symptoms. Again, all three intervention groups demonstrated average monthly decreases in depression symptoms compared to increases for the WC group, but this was only significant for the eCoach group. In addition, the eCoach intervention was particularly effective at reducing depression for participants with baseline languishing/moderate well-being or those with above normal depression symptoms. Participants with elevated depression symptoms in the eCoach group had an average monthly decrease of 2.45 DASS depression units, which equates to a reduction of 7.35 units over the three month follow-up period. In terms of clinical significance this would shift a participant down at least one depression severity category based on DASS norms (Lovibond & Lovibond, 1995). These results suggest a depression prevention or treatment role for the eCoach intervention. While uptake of the eCoach email support was minimal (12%) all participants were offered this human support option and from the data it appears that just the offer or choice of support was enough to have an impact on depression symptoms, especially for those with baseline languishing/moderate well-being or above normal depression symptoms. This result fits well with the literature on the inverse relationship between perceived social support and depression symptoms (Sheldon & McKay, 1984). While the strengths intervention without human support did not have a universal illness reduction effect, it did significantly reduce depression symptoms for people with baseline depression symptoms in the normal range, indicating an illness prevention capacity with this particular group of people.

Implications and applications

The results suggest that these two OPPIs may have both a health promotion and illness prevention role. When delivered online these well-being programs are accessible to anyone with internet access, which is conservatively estimated as being over 70% of the westernised world (IWS, 2009). These OPPIs could be easily integrated as part of wellness programs in educational or workplace settings, without the financial burden of ongoing face-to-face delivery costs. They could also be offered to the general community via public access websites, so that anyone interested in looking after their own well-being can simply log on and be self-guided through a program. The results suggest OPPIs may also have potential as an adjunct to mental health treatment programs, enhancing well-being and reducing residual illness symptoms, or form part of a relapse prevention program. Currently face-to-face, multi-component PPIs are being tested in individual and group formats for depression treatment with favourable results (Parks, 2009; Seligman, Rashid, & Parks, 2006). Internet interventions are not only accessible but often sustainable, with the initial website development being the major cost. Subsequent maintenance costs are often minimal, unlike a lot of group or individual programs that require intensive ongoing human support (Crone, et al., 2004; de Graaf, et al., 2008; Mihalopoulos, et al., 2005; D. F. Tate, Finkelstein, & Khavjou, 2009).

The moderating effects identified in the current study add richness to the data and provided useful information about program and individual characteristics that influence OPPI outcomes. These results indicate that tailoring online interventions to individual characteristics and preferences is an important consideration in maximising program outcomes. Unlike more traditional forms of health promotion delivery (e.g., via mass media messages or group program delivery) internet programs are capable of being quickly and easily tailored to suit individual needs. For example, participants could complete measures of well-being and illness symptoms prior to starting an OPPI and on the basis of these results be

directed to the most suitable intervention (e.g., strengths, mindfulness, gratitude, optimism) either with or without human support. To enhance well-being outcomes future research could investigate other individual and program characteristics that moderate OPPI outcomes, such readiness for change, motivation, learning style, different multimedia formats, and addition of human support options such as discussion boards or chat rooms.

Well-being research has most often looked at ways to increase well-being without considering that for some people (e.g., flourishers) maintaining well-being is a more likely outcome. The moderating effect of baseline well-being is an important factor for well-being intervention researchers to consider, as populations with high levels of well-being are unlikely to see significant increases as a result of the intervention; what researchers need to look for is well-being maintenance effects. Screening people for baseline well-being levels also means that realistic expectations can be promoted to consumers, somewhat akin to physical fitness analogy where once a certain physical fitness level has been achieved, the focus shifts to being about fitness maintenance.

Limitations

Limitations of the study included the sample being self-selected and predominantly Australian, female, and tertiary educated, limiting the generalisability of the findings. Due to logistical constraints the longitudinal results of this study only extended up to three months and would have benefited from measurement over a longer period of time to understand how long well-being and illness changes endure. Future research may consider hybrid preference/randomised designs (Danaher & Seeley, 2009) (e.g., prior to randomisation participants nominate if they want human support). Individual preferences are typically disregarded when employing a traditional RCT design but may explain some of the variation in internet intervention outcome results. Last, the use of a waitlist control group controlled for the passage of time but not for non-specific intervention factors.

Conclusion

The current study supports the efficacy of the strengths intervention as an effective OPPI that both enhanced well-being and reduced depression symptoms for up to three months. The strengths intervention outcomes were moderated by baseline well-being and depression symptoms, and the offer of human support appeared to enhance depression symptom reduction. The mindfulness intervention demonstrated well-being benefits for up to three months for people with depression symptoms; and shorter term well-being benefits for flourishers and those without depression symptoms. Overall, the mindfulness intervention significantly reduced anxiety symptoms with effects lasting up to three months. This was the first online trial testing the efficacy of a mindfulness intervention, and the results were especially favourable considering the brevity and simplicity of this intervention compared to usual face-to-face mindfulness programs. The moderating effects suggest tailoring of interventions is an important concept requiring further research attention in order to capitalise on the full potential of OPPIs as an effective, accessible and sustainable health promotion and illness prevention strategy.

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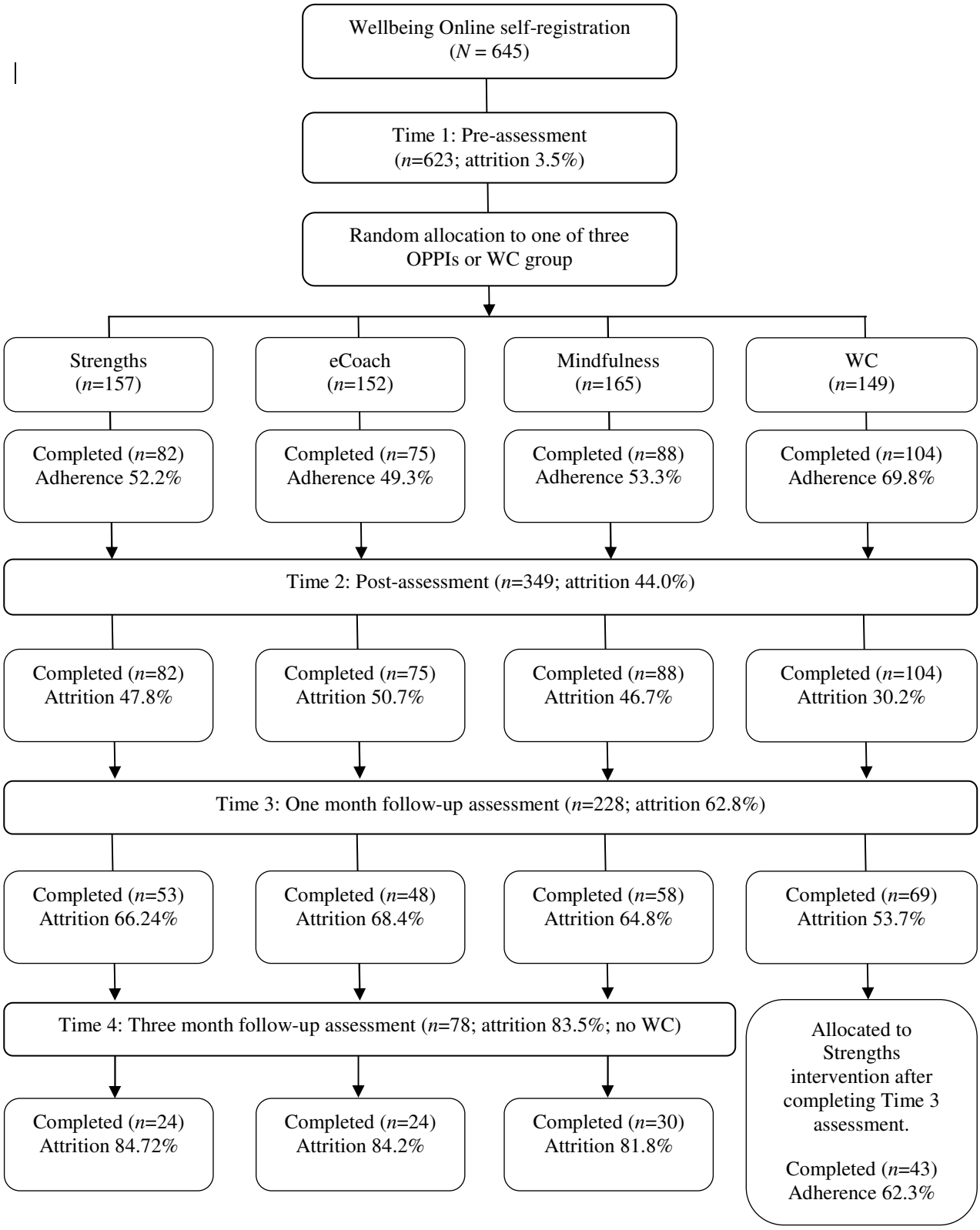

Figure 1:

Participant flow through the study, completed (*n*), adherence and attrition percentages

Table 1

Participant demographic data

	Participant mean (range; standard deviation) or category frequency	
Age	*M* = 39.9 years (*range* 18-79; *SD* =11.9)	
Sex	Female 81% Male 19.0%	
Residence	Australia	70.5%
	USA	6.1%
	United Kingdom	3.2%
	New Zealand	2.2%
	Canada	1.6%
	Other (18 countries)	16.4%
	Suburban	50.3%
	City/Urban	36.3%
	Rural & Remote	13.4%
Primary work status	Employed	70.5%
	Student	15.0%
	Unemployed	5.7%
	Fulltime parent	4.8%
	Retired	4.0%
Highest education completed	Postgraduate degree	44.8%
	Undergraduate degree	33.4%
	Certificate or diploma	13.9%
	High School (year 7-12)	7.9%
Marital status	Married	44.6%
	Single or never married	28.8%
	Divorced or separated	11.6%
	Defacto relationship	14.0%
	Widowed	1.0%
Children	No 51.2% Yes 48.8%	
Income AUD	< $40,000	34.7%
	$40 - 80,000	40.6%
	> $80,000	24.8%
Physical health	Well	43.3%
	Average	53.2%
	Unwell	3.5%

Table 2

Group mean and standard deviation for well-being and illness symptom measures

Measure	Time	Strengths		eCoach		Mindfulness		WC	
		Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
PWI	Pre	67.32	*14.84*	66.78	*13.89*	66.55	15.23	68.47	*13.28*
	Post	71.10	*14.09*	70.99	*13.04*	68.96	14.16	71.32	*13.34*
	1-month	70.27	*16.53*	73.27	*13.25*	71.31	15.16	72.86	*14.59*
	3-month	67.26	*20.50*	66.61	*15.85*	74.52	10.59		
SWSL	Pre	22.63	*7.04*	22.00	*6.82*	22.42	*6.53*	22.87	*6.87*
	Post	24.65	*6.55*	24.01	*6.57*	23.56	*6.75*	24.18	*6.91*
	1-month	25.00	*7.49*	24.31	*7.25*	25.34	*6.78*	24.83	*6.85*
	3-month	24.00	*8.32*	22.33	*7.86*	25.90	*6.40*		
mDES	Pre	2.18	*0.89*	2.09	*0.86*	2.11	*0.92*	2.20	*0.86*
PA	Post	2.32	*0.82*	2.30	*0.79*	2.14	*0.90*	2.33	*0.82*
	1-month	2.31	*1.06*	2.42	*0.82*	2.37	*0.99*	2.27	*0.87*
	3-month	2.44	*1.01*	2.00	*0.87*	2.39	*1.01*		
mDES	Pre	0.89	*0.58*	1.01	*0.64*	1.02	*0.71*	0.90	*0.55*
NA	Post	0.82	*0.56*	0.76	*0.53*	0.88	*0.61*	0.73	*0.45*
	1-month	0.71	*0.62*	0.72	*0.45*	0.82	*0.74*	0.72	*0.50*
	3-month	0.76	*0.62*	0.99	*0.57*	0.71	*0.50*		
PWB	Pre	4.51	*0.70*	4.42	*0.67*	4.52	*0.71*	4.60	*0.65*
	Post	4.50	*0.69*	4.53	*0.63*	4.62	*0.62*	4.70	*0.69*
	1-month	4.58	*0.78*	4.57	*0.70*	4.66	*0.73*	4.68	*0.72*
	3-month	4.70	*0.81*	4.65	*0.63*	4.76	*0.73*		
MHC-SF	Pre	3.14	*1.05*	3.12	*1.00*	3.11	*1.02*	3.23	*1.03*
	Post	3.14	*1.01*	3.35	*0.98*	3.13	*1.05*	3.26	*1.07*
	1-month	3.25	*1.13*	3.47	*1.00*	3.35	*1.23*	3.24	*1.09*
	3-month	3.34	*1.11*	2.99	*1.11*	3.44	*1.13*		
DASS	Pre	7.37	*8.34*	7.94	*8.10*	7.83	*9.30*	6.88	*6.74*
Depression	Post	7.03	*7.43*	5.75	*6.40*	6.92	*7.77*	6.24	*6.96*
	1-month	6.77	*9.47*	5.42	*5.90*	6.00	*8.08*	6.18	*8.00*
	3-month	5.27	*7.42*	10.00	*8.00*	6.07	*7.55*		
DASS	Pre	3.75	*4.69*	4.60	*5.15*	4.72	*6.24*	4.51	*5.58*
Anxiety	Post	3.40	*4.54*	3.18	*3.65*	3.53	*3.94*	3.68	*5.33*
	1-month	3.65	*5.40*	3.33	*5.62*	3.68	*5.26*	3.41	*4.85*
	3-month	2.64	*3.72*	3.75	*3.60*	2.80	*3.62*		
DASS	Pre	10.73	*7.61*	13.05	*8.02*	11.52	*8.47*	11.31	*7.19*
Stress	Post	10.48	*7.20*	11.13	*6.92*	10.80	*7.83*	9.33	*7.58*

1-month	10.62	*8.81*	10.40	*8.30*	9.93	*7.99*	9.44	*8.10*
3-month	9.00	*8.23*	15.00	*9.40*	8.80	*6.76*		

Table 3:

Fixed and random effects for the unconditional model

Dependant Variable	Fixed Effect			Random Effect Variance		χ^2	Reliability	Sample Size	
	Co-efficient	SE	T Ratio	σ^2	τ			Assessments	*N*
SWLS									
Intercept	1.44	.25	5.79***	7.11	12.46	586***	.68	586	291
Slope	.20	.13	1.54		.69	236*	.19		
PWI-A									
Intercept	2.67	.62	4.32***	30.20	86.49	756***	.76	547	294
Slope	.88	.34	2.58*		3.94	247***	.17		
PA									
Intercept	.09	.04	2.34*	.23	.24	384***	.54	544	292
Slope	.03	.03	1.09		.03	240*	.15		
NA									
Intercept	-.12	.02	-4.83***	.10	.09	311***	.48	538	290
Slope	-.00	.02	-.04		.00	182	.07		
PWB									
Intercept	.06	.02	2.68*	.04	.09	627***	.69	541	293
Slope	.02	.01	1.97*		.01	264***	.21		
MHC-SF									
Intercept	.06	.04	1.39	.22	.31	444***	.62	527	284
Slope	.05	.02	2.14*		.00	199	.01		
Depression									
Intercept	-.51	.37	-1.37	30.11	14.47	273***	.35	535	288
Slope	-.19	.30	-.62		.42	193	.03		
Anxiety									
Intercept	-.24	.20	-1.18	9.44	4.16	276***	.33	535	288
Slope	-.04	.14	-.28		.09	176	.02		
Stress									
Intercept	-.95	.34	-2.72**	17.05	17.88	401***	.54	532	287
Slope	-.02	.25	.02		2.28	226*	.17		

*** p<.001, **p<.01, * p<.05

Table 4:

Fixed and random effects on the intercept and the slope for all groups, and Chi square comparison of the eCoach and Strengths (e&S) groups.

Dependant Variable	Intercept (pre to post intervention change)						Slope (follow-up monthly change)					
	Fixed Effect			Random Effect Variance		e&S	Fixed Effect			Random Effect Variance		e&S
	Co-eff	SE	T Ratio	σ^2	τ	$\chi^2(1)$	Co-eff	SE	T Ratio	σ^2	τ	$\chi^2(1)$
SWLS												
Constant	1.30	.51	2.52*	7.11	12.55	1.10	.07	.30	.24	7.11	.72	.01
Strength	-.25	.72	-.35				.26	.41	.63			
eCoach	.45	.60	.67				.28	.36	.78			
Mindfulness	.33	.72	.45				-.01	.40	-.03			
PWI-A												
Constant	1.93	1.39	1.39	29.96	87.33	.16	-.09	.53	-.17	29.96	3.76	.56
Strength	1.27	1.76	.72				1.25	.99	1.26			
eCoach	.68	1.70	.40				2.04	.84	2.44*			
Mindfulness	1.06	1.91	.55				.71	.87	.81			
PA												
Constant	-.02	.08	-.178	.23	.24	.23	-1.09	.06	-1.74	.23	.02	.01
Strength	.11	.11	1.05				.22	.09	2.57*			
eCoach	.16	.11	1.46				.23	.08	2.81**			
Mindfulness	.13	.11	1.28				.14	.08	1.71			
PWB												
Constant	.05	.04	1.22	.04	.09	2.20	-.019	.03	-.73	.04	.01	.76
Strength	-.05	.06	-.89				.094	.04	2.59*			
eCoach	.04	.06	.62				.067	.03	1.98*			
Mindfulness	.04	.06	.62				.023	.03	.65			
MHC-SF												
Constant	.01	.10	.07	.21	.32	.11	.025	.04	-.60	.21	.00	.24
Strength	.00	.12	.03				.129	.06	2.02*			
eCoach	.04	.12	.33				.160	.06	2.73**			
Mindfulness	.14	.12	1.19				-.000	.05	-.00			
Depression												
Constant	-.20	.79	-.25	28.77	15.40	.59	1.09	.56	1.94	28.77	.98	.15
Strength	-.07	1.10	-.07				-1.68	.86	-1.96			
eCoach	-.87	1.07	-.82				-1.90	.78	-2.53*			

Mindfulness	-.27	1.05	-.25				-1.50	.82	-1.82			
Anxiety												
Constant	-.86	.35	-2.43*	9.40	4.14	.55	.35	.29	1.22	9.40	.11	.04
Strength	.47	.55	.86				-.35	.49	-.72			
eCoach	.92	.56.	1.63				-.44	.37	-1.19			
Mindfulness	1.06	.52	2.03*				-.84	.39	-2.15*			
*** p<.001, **p<.01, * p<.05												

Table 5:

Estimated fixed effect coefficient by group and random effect variance for flourishing well-being at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
PA						
Intercept	-.06 (.12)	.09 (.19)	.24 (.18)	.24 (.15)	.218	.22
Slope	-.15 (.11)	.27 (.16)	.36 (.13)**	.17 (.13)		.05
NA						
Intercept	.00 (.07)	-.22 (.13)	-.27 (.11)*	-.10 (.10)	.07	.11
Slope	-.01 (.07)	.00 (.11)	-.08 (.08)	.03 (.08)		.03
PWB						
Intercept	-.00 (.07)	.03 (.11)	.06 (.10)	.19 (.09)*	.03	.10
Slope	-.04 (.04)	.13 (.06)	.13 (.06)*	.03 (.05)		.014
*** p<.001, **p<.01, * p<.05						

Table 6:

Estimated fixed effect coefficient by group and random effect variance for languishing/moderate well-being at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
SWLS						
Intercept	1.90 (.77)*	-.96 (1.06)	.08(1.03)	.56(1.09)	7.10	16.47
Slope	-82 (.31)**	1.12 (.42)**	1.28 (.47)**	.51 (.50)		.32
PWI-A						
Intercept	3.97 (1.59)*	-1.88 (2.14)	-1.76 (2.18)	-1.62 (2.73)	27.86	104.39
Slope	-1.81 (.83)*	4.24 (1.08)***	3.74 (1.15)***	1.81 (1.20)		1.53
PA						
Intercept	.04 (.10)	.08 (.14)	.11 (.17)	.05 (.15)	.24	.30
Slope	-.15 (.08)	.29 (.10) **	.28 (.11)	.16 (.10)		.00
NA						
Intercept	-.15 (.07)*	.05 (.10)	.05 (.10)	.02 (.10)	.11	.11
Slope	.13 (.05)*	-.16 (.06)*	-.17 (.06)**	-.07 (.06)		.00
PWB						
Intercept	.10 (.05)	-.11 (.08)	-.01 (.08)	-.01 (.09)	.05	.10
Slope	-.01 (.04)	.10 (.05)*	.04 (.05)	.02 (.05)		.00
MHC-SF						
Intercept	.19 (.13)	-.16 (.17)	-.10 (.17)	-.11 (.18)	.20	.38
Slope	-.06 (.06)	.16 (.08)*	.20 (.09)*	.04 (.08)		.00
Depression						
Intercept	-1.54 (1.11)	1.27 (1.55)	1.07 (1.54)	.91 (1.52)	21.74	27.05
Slope	1.32 (.88)	-1.49 (.98)	-2.67 (1.01)**	-1.50 (.91)		.27
Anxiety						
Intercept	-.57 (.58)	.19 (.71)	.66 (.73)	1.47 (.71)*	8.16	3.83
Slope	.73 (.33)*	-.68 (.43)	-.69 (.55)	-1.28 (.45)**		.01

*** p<.001, **p<.01, * p<.05

Table 7:

Estimated fixed effect coefficient by group and random effect variance for 'above normal' depression symptoms at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
SWLS						
Intercept	2.65 (.83)**	-3.34 (1.14)**	-.52 (1.16)	-.52 (1.33)	5.98	14.58
Slope	-.76 (.38)*	1.32 (.49)**	1.69 (.55)**	.1.42 (.48)**		.01
PWI-A						
Intercept	1.59 (1.87)	-.54 (2.41)	1.98 (2.81)	-.19 (3.75)	31.65	134.49
Slope	-1.62 (1.10)	3.23 (1,40)*	2.55 (1.44)	3.50 (1.32)*		.29
NA						
Intercept	-.17 (.07)*	.07 (.13)	.05 (.10)	.04 (.11)	.07	.10
Slope	.12 (.07)	-.15 (.08)	-.20 (.08)*	-.09 (.08)		.01
Depression						
Intercept	-2.54 (1.66)	1.86 (1.88)	1.36 (1.89)	1.78 (1.94)	8.40	21.83
Slope	2.00 (1.25)	-.98 (1.53)	-4.45 (1.64)**	-2.20 (1.32)		5.95

*** p<.001, **p<.01, * p<.05

Table 8:

Estimated fixed effect coefficient by group and random effect variance for 'normal' depression symptoms at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
PA						
Intercept	.02 (.09)	.11 (.14)	.19 (.16)	.15 (.13)	.2376	.27
Slope	-.17 (.09)	.28 (.11)*	.27 (.10)*	.13 (.10)		.02
PWB						
Intercept	.04 (.05)	-.04 (.08)	.03 (.08)	.07 (.08)	.04	.10
Slope	-.04 (.04)	.14 (.05)*	.09 (.05)	.02 (.05)		.01
MHC-SF						
Intercept	-.03 (.11)	-.05 (.16)	.05 (.17)	.30 (.14)*	.22	.3194
Slope	-.03 (.05)	.13 (.09)	.14 (.08)	-.03 (.06)		.00
Depression						
Intercept	.39 (.85)	-.77 (1.37)	-.94 (1.40)	-.43 (1.29)	35.54	13.91
Slope	1.32 (1.02)	-2.64 (1.32)*	-1.90 (1.32)	-2.00 (1.15)		1.86
Anxiety						
Intercept	-.98 (.41)*	.21 (.65)	.86 (.78)	.97 (.64)	8.18	4.70
Slope	.58 (.35)	-.77 (.61)	-.42 (.48)	-1.26 (.50)*		.23

*** p<.001, **p<.01, * p<.05

Supplementary Tables: Non-significant results

Table S1:

Fixed and random effects on the intercept and the slope for all groups, and Chi square comparison of the eCoach and Strengths (e&S) groups.

Dependant Variable	Intercept (pre to post intervention change)						Slope (follow-up monthly change)					
	Fixed Effect			Random Effect Variance		e&S	Fixed Effect			Random Effect Variance		e&S
	Co-eff	SE	T Ratio	σ^2	τ	$\chi^2(1)$	Co-eff	SE	T Ratio	σ^2	τ	$\chi^2(1)$
NA												
Constant	-.09	.05	-1.82	.10	.09	.01	.03	.04	.75	.10	.00	1.22
Strength	-.06	.07	-.80				-.04	.06	-.62			
eCoach	-.07	.07	-.95				-.09	.05	-1.86			
Mindfulness	-.02	.07	-.36				.01	.05	.17			
Stress												
Constant	-.97	.73	-1.34	16.92	18.26	.23	.28	.52	.54	16.92	2.55	.11
Strength	.25	1.06	.23				-.29	.70	-.42			
eCoach	-.22	.95	-.23				-.53	.77	-.69			
Mindfulness	.09	.94	.09				-.37	.65	-.56			

All results are non-significant, p>.05

Table S2:

Estimated fixed effect coefficient by group and random effect variance for flourishing well-being at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
SWLS						
Intercept	.94 (.71)	.45 (1.05)	.99 (.99)	.11 (.89)	7.40	7.22
Slope	.50 (.44)	-.15 (.73)	-.17 (.52)	-.22 (.54)		.79
PWI-A						
Intercept	.47 (2.39)	4.50 (3.14)	2.93 (2.86)	3.64 (2.72)	25.63	89.32
Slope	1.13 (.71)	-.54 (1.69)	-1.10 (1.32)	.16 (1.42)		7.36
MHC-SF						
Intercept	-.14 (.14)	.01 (.20)	.08 (.20)	.40 (.17)	.22	.27
Slope	.00 (.06)	.11 (.12)	.13 (.09)	-.06 (.08)		.00
Depression						
Intercept	.68 (1.06)	-1.52 (1.66)	-2.25 (1.59)	-.50 (1.48)	32.72	6.66
Slope	1.69 (1.24)	-3.30 (1.75)	-2.21 (1.69)	-2.54 (1.53)		6.26
Stress						
Intercept	-1.11 (.94)	1.01 (2.02)	-2.16 (1.44)	-.10 (1.24)	20.98	14.90
Slope	.43 (.91)	-.17 (1.12)	-.16 (1.29)	.22 (1.09)		2.61
All results are non-significant, p>.05						

Table S3:

Estimated fixed effect coefficient by group and random effect variance for languishing/moderate well-being at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
Stress						
Intercept	-1.19 (1.17)	.55 (1.49)	1.13 (1.42)	.67 (1.42)	14.42	20.39
Slope	.51 (.59)	-.82 (.85)	-.50 (1.02)	-.93 (.77)		2.40
All results are non-significant, p>.05						

Table S4:

Estimated fixed effect coefficient by group and random effect variance for 'above normal' depression symptoms at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
PA						
Intercept	.01 (.14)	.04 (.17)	.11 (.20)	.11 (.20)	.21	.25
Slope	-.09 (.09)	.18 (.14)	.22 (.16)	.20 (.12)		.03
PWB						
Intercept	.07 (.06)	-.03 (.09)	.02 (.10)	-.02 (.10)	.04	.10
Slope	.01 (.04)	.05 (.05)	.07 (.07)	.03 (.06)		.01
MHC-SF						
Intercept	.16 (.19)	-.04 (.21)	-.12 (.21)	-.22 (.24)	.18	.35
Slope	-.03 (.08)	.13 (.09)	.21 (.12)	-.02 (.10)		.00
Anxiety						
Intercept	-.48 (.73)	.24 (1.07)	.86 (.88)	.78 (.99)	7.63	5.14
Slope	.35 (.31)	-.17 (.45)	-.93 (.63)	-.67 (.47)		.07
Stress						
Intercept	-2.06 (1.52)	2.04 (1.97)	1.98 (1.84)	2.36 (1.85)	7.65	26.34
Slope	.54 (.86)	.42 (1.40)	-1.52 (1.36)	-2.07 (1.11)		7.60
All results are non-significant, p>.05						

Table S5:

Estimated fixed effect coefficient by group and random effect variance for 'normal' depression symptoms at baseline.

Variable	Fixed effect, co-efficient (SE)				Random Effect Variance	
	Constant (β_0)	Strength (β_1)	eCoach (β_2)	Mindfulness (β_3)	σ^2	τ
SWLS						
Intercept	.87 (.65)	.85 (.94)	.71 (.88)	.71 (.81)	7.77	10.14
Slope	.17 (.39)	.06 (.53)	.13 (.45)	-.22 (.46)		.45
PWI-A						
Intercept	2.47 (1.93)	1.29 (2.45)	-.41 (2.29)	1.71 (2.16)	24.50	79.87
Slope	-.17 (.60)	1.30 (1.17)	1.45 (1.10)	-.34 (1.13)		5.74
NA						
Intercept	-.03 (.06)	-.13 (.10)	-.16 (.10)	-.09 (.08)	.11	.11
Slope	.01 (.06)	-.02 (.08)	-.07 (.07)	.05 (.06)		.01
Stress						
Intercept	-.85 (.85)	.07 (1.34)	-1.08 (1.20)	-1.00 (1.11)	20.05	16.41
Slope	.57 (.76)	-.85 (.91)	.12 (.99)	-.13 (.90)		1.13
All results are non-significant, p>.05						

Chapter 6: Wellbeing Online program evaluation

Participants who completed any of the three active interventions were asked to provide feedback on the Wellbeing Online programs and the evaluation data are presented in Table 1 and 2. Each of the programs were expected to take approximately 2-3 hours to complete over three weeks, including the online and offline activities, and this is reflected in the data in Table 1. Most people indicated they put in minimal or moderate amounts of effort to complete the program, and as reported previously (Mitchell, Klein, et al., submitted) there were no differences between groups in terms of effort or time. Overall the results indicated above average scores for all three programs (range 4.29-4.81) on participant program satisfaction, program relevance and application. Scores for ease of website navigation were approximately one unit higher, indicating relative ease of navigation for all programs (range 5.61-5.85). Finally, the majority of participants said they would recommend Wellbeing Online to others (78-86%).

Table 1:

Response frequency (%) for program time and effort

Question	Response	Frequency %		
		Strengths *n*=79	eCoach *n*=73	Mindfulness *n*=83
How much effort did you put into completing this program?	None	8.9	8.2	4.9
	Minimal	32.9	26.0	32.9
	Moderate	54.4	56.2	50.0
	Maximum	3.8	9.6	12.2
How much time per week (on average) did you spend completing this program?	None	11.4	9.6	9.8
	< 30 mins	31.6	34.2	42.7
	30-60 mins	38.0	28.8	19.5
	1-2 hrs	7.6	13.7	11.0
	2-3 hrs	6.3	6.8	8.5
	3-4 hrs	3.8	5.5	2.4
	> 4hrs	1.3	1.4	6.0
Would you recommend this program to other people?	Yes	77.9	85.5	79.2
	No	22.1	14.5	20.8

Table 2:

Response means for program evaluation questions

Question	Program	*N*	Mean	*SD*
Overall, how satisfied are you with this online program?	Strengths	79	4.72	1.35
	eCoach	73	4.47	1.36
	Mindfulness	83	4.46	1.42
How relevant to you was the program content?	Strengths	79	4.76	1.4
	eCoach	73	4.77	1.45
	Mindfulness	83	4.81	1.51
Were you able to apply the program content to your daily life?	Strengths	79	4.03	1.74
	eCoach	73	4.29	1.66
	Mindfulness	83	4.10	1.69
Were you able to navigate around the website easily	Strengths	79	5.76	1.63
	eCoach	73	5.85	1.54
	Mindfulness	83	5.61	1.87
Responses were given on the scale 1 (*not at all*) to 7 (*completely*)				

Chapter 7: General Discussion

The following chapter provides an integration of the key research findings, theory, and practical applications, derived from the studies and papers that contributed to this thesis. Suggestions for future research directions are made throughout the chapter. Specific detail relating to individual studies is provided in the preceding papers.

Enduring Happiness

Cumulatively the research findings presented in this thesis support the sustainable happiness model put forward by Lyubomirsky, Sheldon and Schkade (2005). Intentional activity, in the form of a fully automated online strengths or mindfulness intervention, enhanced well-being for at least three months. The strengths intervention demonstrated universal well-being enhancement, while the mindfulness intervention was effective for people with above normal range depression symptoms only. In addition, the second RCT provided evidence that the strengths intervention reduced symptoms of depression, and the mindfulness intervention reduced symptoms of anxiety. The longitudinal effects were only explored up to three months, so it could be argued that they merely demonstrate a temporary shift in well-being as it is unknown what happened beyond this time frame; although other OPPI studies have demonstrated effects to six months (Seligman, et al., 2005; Shapira & Mongrain, submitted). It is encouraging that this brief intervention, consisting of approximately one hour per week of intentional effort over a three week period, was able to enhance well-being for at least three months. Overall, the RCTs conducted in this thesis add to the evidence base supporting the model of sustainable happiness, and the enhancement of well-being via intentional activity. Future research may like to test the effects of different OPPIs (e.g., gratitude, random acts of kindness) and using extended times frames.

The role of the internet in the delivery of these interventions was a central component of this thesis. Evidence from two sources, internet interventions for mental illness treatment and positive psychology interventions for well-being enhancement, was integrated and created the case for OPPIs as an efficacious, accessible and sustainable health promotion strategy (see *Paper 1*). The current thesis provided support for the 'efficacy' component of this case as a result of the two longitudinal RCTs that were conducted. While evidence for the accessibility and sustainability of OPPIs was not directly tested, evidence was integrated from a range of other sources. The internet offers the opportunity to deliver OPPIs in a highly accessible format (i.e., accessible anytime from an internet connected computer or mobile phone) and at no or low cost to the consumer (e.g., open access website, free iPhone applications) The major cost of OPPI delivery appears to be the initial website development, as subsequent maintenance costs for fully automated interventions are often minimal, especially compared to many group or individual health promotion programs that require intensive ongoing human contact and support (Crone, et al., 2004; de Graaf, et al., 2008; Mihalopoulos, et al., 2005; D. F. Tate, Finkelstein, & Khavjou, 2009). It would be useful for future intervention research to also include cost-effectiveness analyses, as demonstrated in a handful of internet illness treatment studies (Crone, et al., 2004; de Graaf, et al., 2008; Mihalopoulos, et al., 2005).

Paper 4 provided evidence for the moderating effects of program (i.e., human support) and individual (i.e., baseline well-being and depression symptoms) characteristics on OPPI adherence and outcomes. There was evidence from the internet intervention illness treatment literature that human support would influence intervention adherence and consequently well-being outcomes, however this was not supported by the current research. There was some tentative evidence for the offer of human support enhancing the effectiveness of the strengths interventions for depression symptom reduction, but not well-

being enhancement. The differential effect of human support on well-being and depression symptoms is perhaps a reflection of different mechanisms in action for well-being promotion and illness reduction. While a lot has been learned from the illness treatment literature it is important to also recognise key differences between illness treatment and well-being enhancement approaches. For example, motivation is likely to be different between an illness treatment group and a well-being group, as one is seeking to alleviate illness symptoms and the other is seeking well-being enhancement. This could mean that the urgency or need to attend to the intervention protocol may be less for the happiness seekers. Consequently, factors that might lead to greater effectiveness in treatment interventions (e.g., human support) may not have the same effect for OPPIs.

A range of program factors that may impact on OPPI efficacy were identified in the literature review, although not directly tested by the current research, and are worthy of future investigation. It was observed that brief, simple, single component OPPIs, rather than longer, multi-component programs may have greater efficacy (see *Paper 1*). Observations of how people are interacting with newer internet technology (e.g., iPhone applications) indicate that brief, simple interventions are appealing because they can be accessed when there is a small window of time (e.g., between work meetings, waiting for public transport, between lectures) and with little effort. Another concept that may contribute to greater engagement with well-being interventions is *play*. Making OPPIs playful and fun, an option less viable for treatment programs, may be more effective at encouraging return visits than the addition of human support for programs with a focus on wellness. Future OPPI research might like to explore the relative advantages of longer, multi-component programs compared to brief, single-component programs; as well as comparing traditional sequential sessions based programs (i.e., tunnel designs) to free form matrix designs (Danaher, McKay, & Seely, 2005). The

popular appeal of iPhone applications may reflect user preferences for this general concept and provide an ideal research opportunity.

Moderating effects of baseline well-being and depression symptoms were also reported and highlight the importance of tailoring interventions to match individual characteristics (e.g., baseline levels of well-being and depression symptoms) and preferences (e.g., with or without human support). An advantage of internet delivery is that tailoring of interventions is possible, and from a consumer perspective it is usually immediate, especially compared to more traditional forms of health promotion delivery (e.g., via mass media messages or group program delivery). To enhance well-being outcomes future researchers could investigate other individual characteristics that may moderate OPPI outcomes, such as readiness for change, motivation, and learning style.

How much well-being is enough?

To date there has been little research exploring the question *how much well-being is enough?* This thesis contributes a small piece through the exploration of prevalence of flourishing (45.5%), moderate (46.4%) and languishing (8.1%) well-being in an online, predominantly Australian sample. *Paper 3* reported that individuals categorised as flourishing had significantly better outcomes in terms of lower mental illness symptoms and higher mindfulness, self-rated physical health and higher scores on alternate well-being measures, which supports the findings of Keyes (2005a, 2005b). So perhaps, *nothing less than flourishing well-being* is the answer to the question *how much well-being is enough?* The findings presented in *Paper 4* indicated that it is people with languishing or moderate well-being (54.5% of the sample) that benefitted most from the OPPIs, and that the interventions either slightly enhanced or maintained well-being for participants with flourishing well-being, perhaps because they are already well enough, or maybe because of ceiling effects on the measures being used.

In terms of well-being studies, research has most often looked at ways to increase well-being without considering that for some people (e.g., flourishers) maintaining well-being is a more likely outcome. The moderating effect of baseline well-being is an important factor for well-being intervention researchers to consider, as populations with high levels of well-being are unlikely to see significant increases as a result of the intervention; what researchers need to look for is well-being maintenance effects. Screening people for baseline well-being levels also means that realistic expectations can be promoted to consumers, somewhat akin to a physical fitness analogy where once a certain physical fitness level has been achieved, the focus shifts to fitness maintenance.

Clearly more research is required to adequately answer this question, meantime measures such as the MHC-SF with their categorical diagnosis of well-being provide a guide to establishing whether an individual could benefit from a well-being enhancement intervention.

Measuring well-being

The development of well-being constructs and measures has been advanced in this thesis by providing additional psychometric data for two, relatively new, self-report questionnaires that integrate hedonic and eudaimonic well-being items, the OTH and MHC-SF. In addition, the inclusion of a variety of hedonic and eudaimonic well-being questionnaires in the two RCTs provided an opportunity to observe similarities and differences in these measures overtime. While the following observation is largely speculative, there did not appear to be any obvious hedonic/eudaimonic split in the pattern of well-being changes, nor any added benefit from observing the data in this manner as opposed to looking at the measures individually. Some questionnaires did appear more sensitive to change (e.g., PWI-A) than others (e.g., OTH, SWLS), however, overall change seemed to be

determined as much by the type of intervention (i.e., strengths or mindfulness) as it did by individual characteristics (e.g., baseline levels of well-being or depression).

Attrition

A recurring issue for longitudinal studies in general and internet interventions in particular is high levels of study attrition. While there are mechanisms for reducing attrition from studies (e.g., reminder emails or phone calls, offer of human support, or payment for questionnaire completion) they are unlikely to eliminate the issue completely so it is essential that suitable statistical techniques are applied. This issue is discussed in more detail in *Paper 4*, however the findings from this thesis support the use of HLM analysis to address the shortcomings of traditional data analysis approaches (e.g., LOCF and ANOVAs) particularly in relation to attrition and missing data (Salim, et al., 2008).

Health promotion and illness prevention

As discussed at the start of this thesis, mental health and well-being has been primarily focused on treatment of mental health disorders. Recently it has been acknowledged that a purely treatment-oriented approach cannot adequately address the growing social and economic burden of mental illness (Andrews, Issakidis, Sanderson, Corry, & Lapsley, 2004; Cuijpers, van Straten, Smit, Mihalopoulos, & Beekman, 2008; WHO, 2003), nor can it address the well-being needs of the general population. As a consequence greater attention has been invested in mental health promotion and prevention. The findings of this thesis provide evidence for OPPIs having a role in both health promotion and illness prevention. Delivered online these well-being programs are accessible to anyone with internet access, which is conservatively estimated as being over 70% of the westernised world (IWS, 2009), and could be easily integrated as part of wellness programs in educational or workplace settings, without the financial burden of ongoing face-to-face delivery costs. They

could also be offered to the general community via public access websites, so that anyone can simply log on and be self-guided through their own *well-being workout*.

The illness symptom reduction capacity of OPPIs suggests a role for these programs in mental illness prevention. These interventions, with their focus on well-being, are unlikely to attract the same stigma as programs with a focus on mental illness, and so may well be an attractive option for consumers. Mental health specialists may consider integrating OPPIs as part of a depression or anxiety relapse prevention program following a successful treatment protocol, to help maintain progress and build enduring personal resources. Currently face-to-face, multi-component PPIs are being tested in individual and group formats for depression treatment with favourable results (Parks, 2009; Seligman, Rashid, & Parks, 2006). In general caution should be taken in how OPPIs are utilised as they are primarily intended to build well-being, rather than alleviate illness.

Mental health promotion is not as advanced as other forms of health promotion, such as physical fitness, which could be considered the physical health equivalent to well-being (Secker, 1998). Physical fitness has established key evidence based messages that are being clearly communicated and are widely adopted, from which mental health researchers and practitioners could learn. For example, Australian evidence-based *National Physical Activity Guidelines* have been developed that recommend exercise of at least a moderate level, most days of the week for a total of 30 minutes or more on each of those days, and with each exercise session lasting 10 minutes or more (DOHAC, 1999). In the well-being literature there is: established evidence for the benefits of well-being; preliminary prevalence data indicating between 54.5% and 82% of the adult population have languishing or moderate levels of well-being and; intervention research that suggests that well-being can be sustainably enhanced. Perhaps what is now required is the establishment of evidence based

Well-being Activity Guidelines to create a shared language and clear communication of how to improve and maintain mental health and well-being of all Australians.

This thesis was intended to advance the science of well-being and optimal human functioning through the development and testing of two OPPIs – strengths and mindfulness. There are three key messages broadly supported by this thesis. First, well-being is an important contributor to mental health. Second, well-being can be enhanced via intentional activity. Third, the internet can be used to deliver effective, tailored, accessible and sustainable interventions that promote well-being and prevent illness.

"To live is the rarest thing in the world, most people exist, that is all". Oscar Wilde

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Appendices

Appendix A: Explanatory statements and consent forms

Explanatory Statement

Project Title: Evaluating an internet-based program to enhance psychological health and wellbeing

Chief investigators:
Ms Joanna Mitchell, Department of General Practice, Monash University, Ph: (03) 8575 2296, Fax: 8575 2233, Email: joanna.mitchell@med.monash.edu.au
Dr Graeme Hyman, Department of Psychology, Monash University, Ph: (03) 9903 2176, Fax (03) 9903 2501, Email: graeme.hyman@med.monash.edu.au

Note: Please print or save a copy of this explanatory statement for your record

The Monash University Chief Investigators on this project are Joanna Mitchell, Research Fellow, Department of General Practice, and Graeme Hyman, Senior Lecturer, Psychology. Co-investigators on this research project are Rosanna Stanimirovic and Suzi Turner from the Australian Institute of Sport.

This study invites participation from the Australian adult (18+) community and has been promoted through Monash University and AIS email intranet, website and direct email lists. You have indicated your interest in our research project by reading our information website and completing an online registration form. The aim of this research is to evaluate an internet-based program to enhance psychological health and wellbeing.

It is anticipated that the study will take approximately 3-4 hours to complete over a period of 3-4 months. The online program consists of 3 modules and uses a step-by-step approach including information, interactive tasks, questions and homework. You can access the program via the web at times that suit you and as often as you wish within a 3 week period. The potential benefits from your involvement in this project are increased psychological health and wellbeing. There are no expected adverse effects.

To be included in the study you must be at least 18 years of age, residing in Australia and not be 'at risk' of a major anxiety or depressive disorder (as indicated by an online questionnaire). Any participant who is identified as being 'at risk' of a major depressive or anxiety disorder (i.e., if you score in the 'severe' range on the Depression, Anxiety and Stress Scales) will be automatically directed to a website containing information on referral to appropriate health services.

If you are currently concerned that you may be experiencing depression or an anxiety disorder we recommend that you contact a mental health professional for a formal diagnosis and support. This can be done via:

APS Psychology referral service	www.psychology.org.au
Your general practitioner (GP)	
Your place of work / study may provide access to counselling services	
Lifeline - 24 hour telephone counselling & referral	Tel. 13 11 14

If you are eligible for the study you will be directed towards a website where you will be asked to complete a set of online questionnaires prior to commencing the intervention program. You will be asked to complete 6 online questionnaires (i.e. Demographic information, Personal Wellbeing Index (PWI-A), Satisfaction With Life Scale (SWLS), Approaches to Happiness Questionnaire, Depression, Anxiety & Stress Scale (DASS), Subjective Happiness Scale). The questionnaires take approximately 20 minutes to complete. In general the questionnaires ask about your psychological health, wellbeing and quality of life.

Once your eligibility for the study has been confirmed and you have completed the pre-assessment questionaires you will be randomly allocated to one of three internet-based programs. Program 1 is an intervention based on positive psychology principles and developing your existing strengths. Program 2 is an intervention based on skill learning principles and developing your life skills. Program 3 is an information only group providing information about skill learning.

During the intervention phase of the study you will receive weekly e-mail reminders of the time remaining to complete the program (maximum is 3 weeks). Once you have completed the online program you will again be asked to complete the set of online questionnaires, minus the demographic questionnaire). An extra questionnaire asking you to evaluate the online intervention will also be included. Three months after the post-assessment, you will receive an e-mail requesting that you complete the set of online questionnaires (minus the demographic and evaluation questionnaires) for a final time.

Being in this study is completely voluntary and you are under no obligation to consent to participation. If you do decide to participate you may withdraw at any stage or decline to answer questions which you feel are too personal or intrusive.

The information provided by you (e.g., questionnaires) will be de-identified and coded to protect your confidentiality. Only members of the research team will have access to the data. Storage of the data collected will adhere to the University regulations and kept on the hard drive of a secure computer or

in a locked cupboard/filing cabinet for 5 years at Monash University. At the end of this period paper copies of data will be shredded and electronic data will be deleted from computer hard drives.

Any written or verbal reports resulting from this study will contain only de-identified group data. Individual participants will not be identifiable in any report. If you would like to view a summary report of the aggregate research findings please contact Suzi Turner at: Suzi.Turner@ausport.gov.au or Tel. 02 6214 1836.

If you would like to contact the researchers about any aspect of this study, please contact one of the Chief Investigators:	If you have a complaint concerning the manner in which this research is being conducted, please contact either:
Joanna Mitchell Monash University, Department of General Practice 867 Centre Road, East Bentleigh, VIC 3165 Tel: +61 3 8575 2296 Fax: +61 3 8575 2233 Email: joanna.mitchell@med.monash.edu.au	Human Ethics Officer Standing Committee on Ethics in Research Involving Humans (SCERH), Monash University, Building 3d, Research Office, VIC 3800 Tel: +61 3 9905 2052 Fax: +61 3 9905 1420 Email: scerh@adm.monash.edu.au
Mr Graeme Hyman Monash University, School of Psychology, Psychiatry & Psychological Medicine, 900 Dandenong Road, Caulfield East, VIC 3145 Tel: +61 3 9903 2176 Fax: +61 3 9903 2501 Email: graeme.hyman@med.monash.edu.au	Mr John Williams, The Secretary Australian Institute of Sport Ethics Committee Tel: +61 2 6214 1816

Thank you.
Joanna Mitchell & Graeme Hyman, Chief Investigators

Consent Form

Project Title: Evaluating an internet-based program to enhance psychological health and wellbeing

Chief investigators:

Ms Joanna Mitchell, Department of General Practice, Monash University, Ph: (03) 8575 2296, Fax: 8575 2233, Email: joanna.mitchell@med.monash.edu.au

Mr Graeme Hyman, Department of Psychology, Monash University, Ph: (03) 9903 2176, Fax (03) 9903 2501, Email: graeme.hyman@med.monash.edu.au

I agree to take part in the Monash University research project specified above. I have read the Explanatory Statement, which I can print and keep for my records or view online. I understand that agreeing to take part means that I am willing to:

> Complete a set of online psychological health and wellbeing questionnaires on three separate occasions (pre-assessment, post-assessment and at 3 month follow-up).
>
> Complete an internet-based program designed to enhance psychological health and wellbeing.

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I understand that any information I provide is confidential, and that no information that could lead to my identification will be disclosed in any reports on the project, or to any other party.

I understand that data from the questionnaires I complete will be kept in secure storage and accessible only to the research team. I also understand that the data will be destroyed after a 5 year period unless I consent to it being used in future research.

I understand that if I complete the information and click on the 'consent' button below that I give my consent to participate in the above Monash University research project.

☐ I am aged 18 years or older and currently reside in Australia

[CONSENT]

Explanatory Statement

Project Title: A well-being internet intervention

Chief investigator: Dr Dianne Vella-Brodrick,

School of Psychology, Psychiatry and Psychological Medicine, Monash University,

Ph: +61 3 9903 2542 Fax (03) 9903 2501 Email: Dianne.Vella-Brodrick@med.monash.edu.au

Note: Please keep a copy of this explanatory statement for your records

The Monash University *Chief Investigator* on this project is Dr Dianne Vella-Brodrick, School of Psychology, Psychiatry and Psychological Medicine. *Co-investigators* on this research project are Joanna Mitchell, Monash University, Dr Britt Klein, Swinburne University, Rosanna Stanimirovic, Australian Institute of Sport (AIS). This research project forms part of a PhD being completed by Joanna Mitchell, under the co-supervision of Dr Vella-Brodrick and Dr Klein.

This study invites participation from the internet community (aged 18+) and has been promoted through Monash University and AIS intranet, websites and public noticeboards. You have indicated your interest in our research project by reading the information website and completing an online registration form. The aim of this research is to evaluate an internet-based well-being program called Enhancing Well-being Online (EWO).

It is anticipated that the study will take approximately 4.5 hours to complete over a period of 4 months. The online program consists of 3-modules and uses a step-by-step approach including information, interactive tasks, questions and homework. You can access the program via the web at times that suit you and as often as you wish within a 3-week period.

The potential benefits from your involvement in this project are increased or maintained psychological health and wellbeing. There are no expected adverse effects. We do ask you questions about symptoms of mental illness (e.g. depression, anxiety and stress) and if at any stage you become concerned about your mental health we recommend that you contact a mental health professional for a formal diagnosis and support. This can be done via:

Your general practitioner (GP)	
APS psychology referral service	www.psychology.org.au
Lifeline - 24 hour telephone counselling & referral	Tel. 13 11 14
Your place of work / study may provide access to counselling services.	

If you are eligible for the study you will be directed towards a website where you will be asked to complete a set of online questionnaires prior to commencing the intervention program. You will be asked to complete a series of online questionnaires which should take approximately 20 minutes. The questionnaires ask about your subjective and psychological well-being, symptoms of mental illness, mindfulness and personality traits.

Once you have completed the consent process and pre-assessment questionnaires you will be randomly allocated to one of four groups. *Group 1* is an online program that helps you identify and develop your personal strengths. *Group 2* is the same as group 1 with the addition of email support. *Group 3* is an online program to develop your attention and present moment awareness. *Group 4* is a waitlist, which means that you will be asked to wait seven weeks and will then be allocated to either Group 1, 2 or 3. If allocated to the waitlist group you will be asked to complete the online questionnaires twice during the waiting period (at 3 and 7 weeks).

During the intervention phase of the study you will receive reminder emails of the time remaining to complete the program (maximum is 3 weeks). Once you have completed the online program you will again be asked to complete the set of online questionnaires (minus the demographic questionnaire and including a program evaluation questionnaire). One month and three months after completing the online program, you will receive an e-mail requesting that you complete the set of online questionnaires (minus the demographic and evaluation questionnaires).

Being in this study is completely voluntary and you are under no obligation to consent to participation. If you do decide to participate you may withdraw at any stage or decline to answer questions which you feel are too personal or intrusive.

The information provided by you (e.g., questionnaires) will be de-identified and coded to protect your confidentiality. Only members of the research team will have access to the data. Storage of the data collected will adhere to the University regulations and kept on the hard drive of a secure computer or in a locked cupboard/filing cabinet for 5 years at Monash University. At the end of this period paper copies of data will be shredded and electronic data will be deleted from computer hard drives.

Any written or verbal reports resulting from this study, including the PhD thesis, will contain only de-identified group data. Individual participants will not be identifiable in any report. If you would like to view a summary report of the aggregate research findings please email Joanna Mitchell at joanna.mitchell@med.monash.edu.au

If you would like to contact the researchers about any aspect of this study, please contact:	If you have a complaint concerning the manner in which this research is being conducted, please contact:
Dr Dianne Vella-Brodrick Monash University, School of Psychology, Psychiatry & Psychological Medicine, 900 Dandenong Road, Caulfield East VIC 3145 Ph: +61 3 9903 2542 Fax +61 3 9903 2501 Email: dianne.vella-brodrick@med.monash.edu.au	Human Ethics Officer, Standing Committee on Ethics in Research Involving Humans (SCERH) Monash University Building 3d, Research Office, Clayton VIC 3800 Tel: +61 3 9905 2052 Fax: +61 3 9905 1420 Email: scerh@adm.monash.edu.au

Thank you.

Dianne Vella-Brodrick
Chief Investigator

Consent Form

Project Title: A well-being internet intervention

Chief investigator: Dr Dianne Vella-Brodrick,

School of Psychology, Psychiatry and Psychological Medicine, Monash University, Australia

Ph: +61 3 9903 2542 Fax +61 3 9903 2501 Email: Dianne.Vella-Brodrick@med.monash.edu.au

I agree to take part in the Monash University research project specified above. I have read the Explanatory Statement, which I can print and keep for my records or view online. I understand that agreeing to take part means that I am willing to:

Complete a set of online questionnaires on four separate occasions over a 4-month period.

Complete an internet-based well-being program.

I understand that my participation is **voluntary**, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I understand that any information I provide is **confidential**, and that no information that could lead to my identification will be disclosed in any reports on the project, or to any other party.

I understand that data from the questionnaires I complete will be kept in secure storage and accessible only to the research team. I also understand that the data will be destroyed after a 5 year period unless I consent to it being used in future research.

I understand that if I complete the information and click on the 'I consent' button below that **I give my consent** to participate in the above Monash University research project.

☐ I am aged 18 years or older and I consent to participating in this research project

[CONSENT]

Appendix B: Measures

Measure	Abbreviation	Author(s)
Positive and Negative Affect Scale	PANAS	Watson, Clark, & Tellegen, 1988
Satisfaction With Life Scale	SWLS	Diener, Emmons, Larsen, & Griffin, 1985
Personal Well-being Index - Adult	PWI-A	International Wellbeing Group, 2006
Orientations to Happiness	OTH	Peterson, Park, & Seligman, 2005
Depression Anxiety Stress Scale	DASS-21	Lovibond & Lovibond, 1995
Demographic Questionnaire		Constructed for RCT 1
Program Evaluation		Constructed for RCT 1
Modified Differential Emotions Scale	mDES	Fredrickson, Tugade, Waugh, & Larkin, 2003
Psychological Well-being	PWB	Ryff & Keyes, 1995
Mental Health Continuum-Short Form	MHC-SF	Keyes, 2007
Mindful Attention Awareness Scale	MAAS	Brown & Ryan, 2003.
Ten Item Personality Inventory	TIPI	Gosling, Rentfrow & Swann, 2003.
Demographic Questionnaire (RCT 2)		Constructed for RCT 2
Program Evaluation (RCT 2), including adherence (Time & Effort)		Constructed for RCT 2
Continued Practice (Time & Effort)		Constructed for RCT 2

PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to the word. Indicate to what extent you generally feel this way, that is, how you feel on average.

Circle the number that best describes your present agreement or disagreement with each statement.	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
1. Interested	1	2	3	4	5
2. Distressed	1	2	3	4	5
3. Excited	1	2	3	4	5
4. Upset	1	2	3	4	5
5. Strong	1	2	3	4	5
6. Guilty	1	2	3	4	5
7. Scared	1	2	3	4	5
8. Hostile	1	2	3	4	5
9. Enthusiastic	1	2	3	4	5
10. Proud	1	2	3	4	5
11. Irritable	1	2	3	4	5
12. Alert	1	2	3	4	5
13. Ashamed	1	2	3	4	5
14. Inspired	1	2	3	4	5
15. Nervous	1	2	3	4	5
16. Determined	1	2	3	4	5
17. Attentive	1	2	3	4	5
18. Jittery	1	2	3	4	5
19. Active	1	2	3	4	5
20. Afraid	1	2	3	4	5

Satisfaction With Life Scale

Below are five statements that you may agree or disagree with. Read each one and then click on the dropdown list next to the statement and select the response that best describes how strongly you agree or disagree.

Response Scale

7 - Strongly agree
6 - Agree
5 - Slightly agree
4 - Neither agree not disagree
3 - Slightly disagree
2 - Disagree
1 - Strongly disagree

1. In most ways, my life is close to my ideal.

2. The conditions of my life are excellent.

3. I am completely satisfied with my life.

4. So far I have gotten the most important things I want in life.

5. If I could live my life over, I would change nothing.

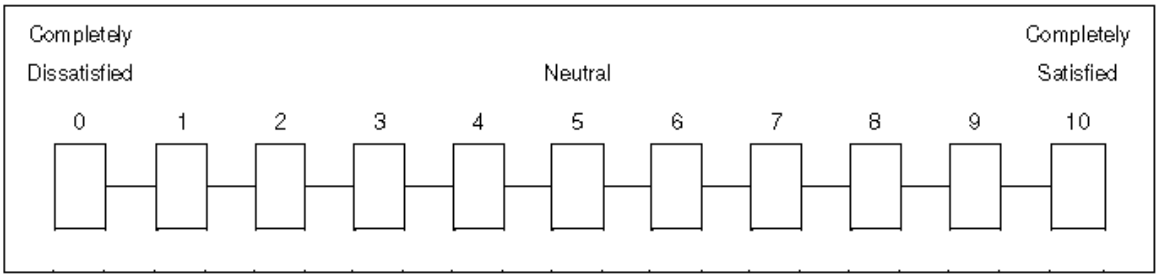
Personal Well-being Index - Adult

PERSONAL WELLBEING INDEX – ADULT (PWI-A)

The following questions ask how satisfied you feel, on a scale from zero to 10. **Zero** means you feel completely dissatisfied. **10** means you feel completely satisfied. And the **middle of the scale is 5**, which means you feel neutral, neither satisfied nor dissatisfied."

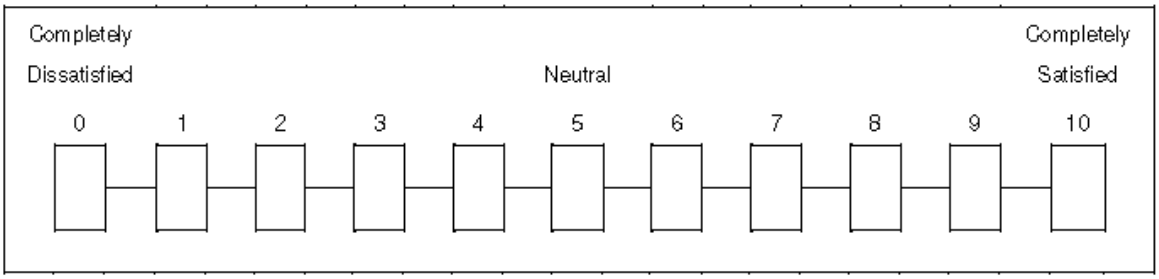
Part 1

1. "Thinking about your own life and personal circumstances, how satisfied are you **with your life as a whole ?"**

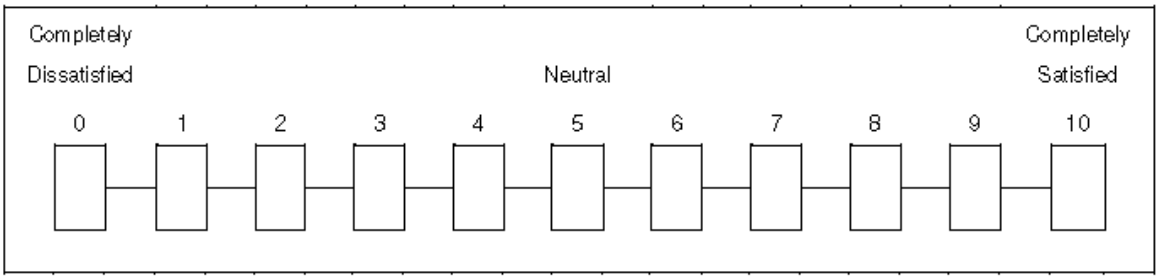


Part 2

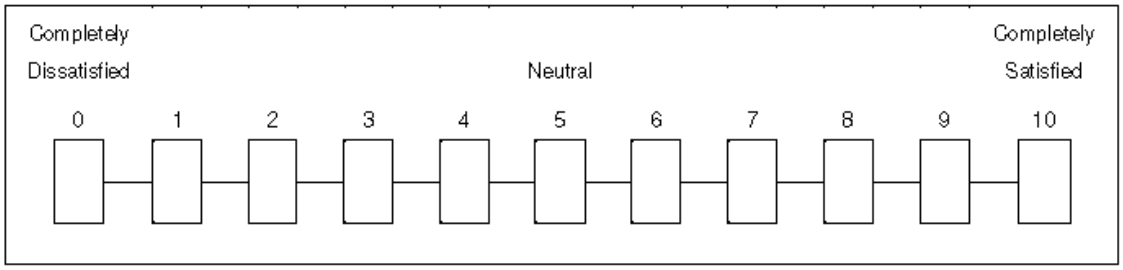
1. "How satisfied are you **with your standard of living ?"**



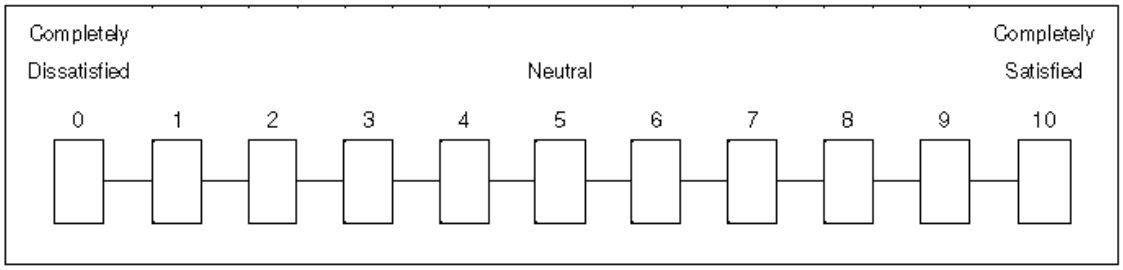
2. "How satisfied are you **with your health ?"**



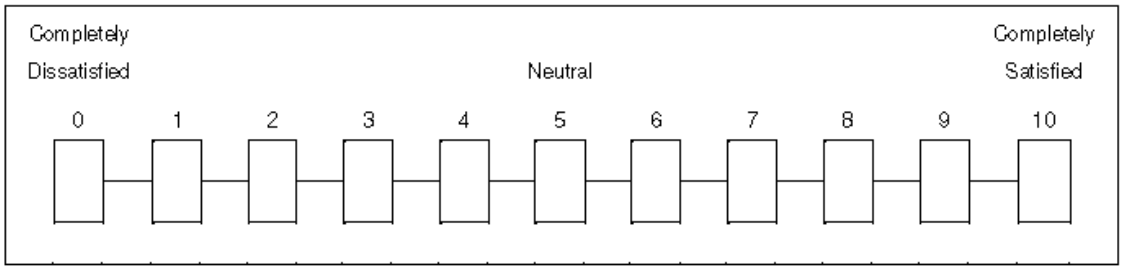
3. "How satisfied are you **with what you are achieving in life ?"**



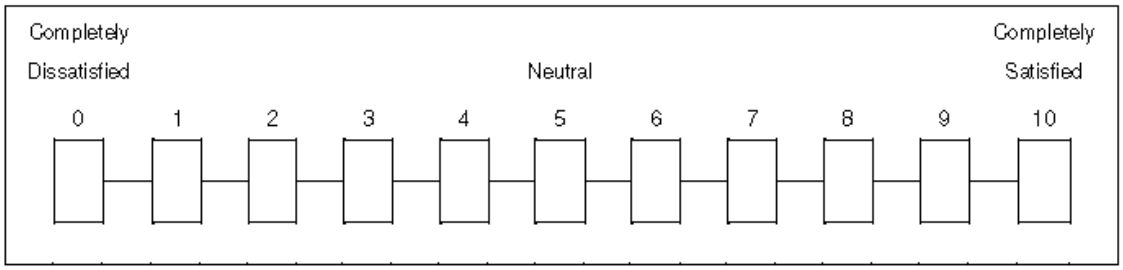
4. "How satisfied are you **with your personal relationships ?"**



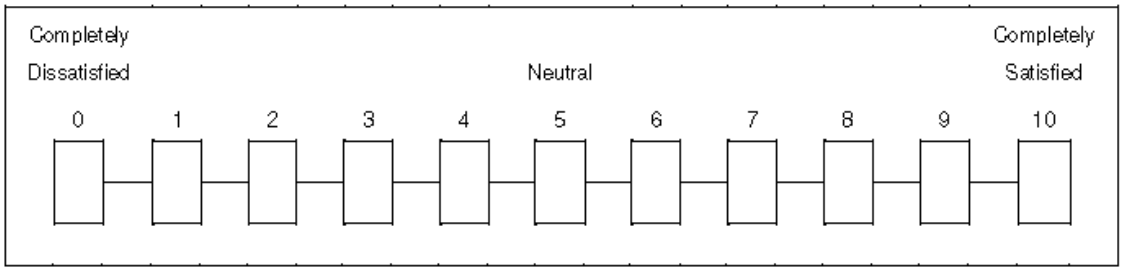
5. "How satisfied are you **with how safe you feel ?"**



6. "How satisfied are you **with feeling part of your community ?"**



7. "How satisfied are you **with your future security ?"**



Orientations to Happiness

Below are 18 statements that many people would find desirable, but we want you to answer only in terms of whether the statement describes how you actually live your life. Read each one and then click on the dropdown list next to the statement and select your response. Please be honest and accurate.

Response Scale

5 Very Much Like Me
4 Mostly Like Me
3 Somewhat Like Me
2 A Little Like Me
1 Not Like Me At All

1. Regardless of what I am doing, time passes very quickly.	-Select One-
2. My life serves a higher purpose.	-Select One-
3. Life is too short to postpone the pleasures it can provide.	-Select One-
4. I seek out situations that challenge my skills and abilities.	-Select One-
5. In choosing what to do, I always take into account whether it will benefit other people.	-Select One-
6. Whether at work or play, I am usually "in a zone" and not conscious of myself.	-Select One-
7. I am always very absorbed in what I do.	-Select One-
8. I go out of my way to feel euphoric.	-Select One-
9. In choosing what to do, I always take into account whether I can lose myself in it.	-Select One-
10. I am rarely distracted by what is going on around me.	-Select One-
11. I have a responsibility to make the world a better place.	-Select One-
12. My life has a lasting meaning.	-Select One-
13. In choosing what to do, I always take into account whether it will be pleasurable.	-Select One-
14. What I do matters to society.	-Select One-
15. I agree with this statement: "Life is short-eat dessert first."	-Select One-
16. I love to do things that excite my senses.	-Select One-
17. I have spent a lot of time thinking about what life means and how I fit into its big picture.	-Select One-
18. For me, the good life is the pleasurable life.	-Select One-

DASS21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3
18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

Demographic Information

1. Are you Male or Female? ◉ Male ○ Female

2. What is your current age (years)? [ ] Years (up to 2 digits)

3. What is your residential postcode? [ ] (4 digit number)

4. What is the highest level of education you have completed? -- Select Here --
   - No school
   - Primary (yrs 1-6)
   - Secondary (yrs 7-10)
   - Secondary (yrs 11-12)
   - Certificate/Diploma
   - Undergraduate degree
   - Postgraduate degree

5. What is your primary employment status? -- Select Here --
   - Employed
   - Unemployed
   - Student
   - Fulltime parent

6. What is your current marital status? -- Select Here --
   - Single/Never Married
   - Married
   - Divorced/Separated
   - Widowed
   - Defacto

7. How many children do you have? -- Select Here --
   - None
   - 1
   - 2
   - 3
   - 4
   - 5 or more

8. What is your gross yearly income? -- Select Here --
   - $0 – 19,999
   - $20,000 – 39,999
   - $40,000 – 59,999
   - $60,000 – 79,999
   - $80,000 – 99,999
   - $100,000 – 119,999
   - $120,000 – 139,999
   - $140,000 plus

9. How would you rate your physical health? -- Select Here --
   - 1 Extremely well
   - 2
   - 3
   - 4 Average
   - 5
   - 6
   - 7 Extremely unwell

10. Are you currently an AIS or SIS or SAS scholarship holder ◉ Yes ○ No

Program Evaluation

1. Was the content of the course relevant to you?

   (Not at all) 1 2 3 4 5 6 7 (Completely)

2. Do you feel able to apply the content of this course to your life?

   (Not at all) 1 2 3 4 5 6 7 (Completely)

3. Were you able to navigate around the website easily?

   (Not at all) 1 2 3 4 5 6 7 (Completely)

4. Are you satisfied overall with this online course?

   (Not at all) 1 2 3 4 5 6 7 (Completely)

5. What are the major strengths of this course?
   (Short answer – 100 word restriction)

6. What are the major weaknesses of this course? (Short answer – 100 word restriction)
   (Short answer – 100 word restriction)

7. How could the course be improved?
   (Short answer – 100 word restriction)

8. Would you recommend this course to other people?

   Yes / No

Modified Differential Emotions Scale (mDES)

This scale consists of a number of words that describe different feelings and emotions. Please rate how much you were feeling each of the following emotions during the **past week**? 0 - Not at all 1 - A little bit 2 - Somewhat 3 - Moderately 4 - Extremely
1. I felt amused, fun-loving, silly.
2. I felt angry, irritated, frustrated.
3. I felt ashamed, humiliated, disgraced.
4. I felt awe, wonder, amazement.
5. I felt bored, disinterested, uninvolved.
6. I felt contemptuous, scornful, disdainful.
7. I felt in control, coping well, on top of things.
8. I felt disgust, distaste, revulsion.
9. I felt embarrassed, self-conscious, blushing.
10. I felt excited, eager, enthusiastic.
11. I felt grateful, appreciative, thankful.
12. I felt guilty, remorseful, blameworthy.
13. I felt hatred, distrust, suspicion.
14. I felt hopeful, optimistic, encouraged.
15. I felt inspired, uplifted, elevated.
16. I felt interested, alert, curious.
17. I felt joyful, glad, happy.
18. I felt love, closeness, trust.
19. I felt proud, confident, self-assured.
20. I felt rejected, betrayed, left-behind.
21. I felt sad, downhearted, unhappy.
22. I felt satisfied, fulfilled, content.
23. I felt scared, fearful, afraid.
24. I felt stressed, anxious, overwhelmed.
25. I felt tired, sleepy, drowsy.

Psychological Well-Being (PWB) 42-item scale

The following set of questions deals with how you feel about yourself and your life. Please remember that there are no right or wrong answers. Select the response that best describes your present agreement or disagreement with each statement.

Response Scale

Strongly disagree	(1)
Moderately disagree	(2)
Slightly disagree	(3)
Slightly agree	(4)
Moderately agree	(5)
Strongly agree	(6)

1. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.
2. In general, I feel I am in charge of the situation in which I live.
3. I am not interested in activities that will expand my horizons.
4. Most people see me as loving and affectionate.
5. I live life one day at a time and don't really think about the future.
6. When I look at the story of my life, I am pleased with how things have turned out.
7. My decisions are not usually influenced by what everyone else is doing.
8. The demands of everyday life often get me down.
9. Maintaining close relationships has been difficult and frustrating for me
10. I have a sense of purpose and direction in life
11. In general, I feel confident and positive about myself.
12. I tend to worry about what other people think of me.
13. I do not fit very well with the people and the community around me.
14. I think it is important to have new experiences that challenge how you think about yourself and the world.
15. I often feel lonely because I have few close friends with whom to share my concerns.
16. My daily activities often seem trivial and unimportant to me.
17. I feel like many of the people I know have gotten more out of life than I have.
18. I am quite good at managing the many responsibilities of my daily life.
19. When I think about it, I haven't really improved much as a person over the years.

20. I enjoy personal and mutual conversations with family members or friends.
21. I don't have a good sense of what it is I'm trying to accomplish in life.
22. I like most aspects of my personality.
23. I tend to be influenced by people with strong opinions.
24. I often feel overwhelmed by my responsibilities.
25. I have the sense that I have developed a lot as a person over time.
26. I have confidence in my opinions, even if they are contrary to the general consensus.
27. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.
28. I enjoy making plans for the future and working to make them a reality.
29. In many ways, I feel disappointed about my achievements in life.
30. It's difficult for me to voice my own opinions on controversial matters.
31. For me, life has been a continuous process of learning, changing, and growth.
32. People would describe me as a giving person, willing to share my time with others.
33. My attitude about myself is probably not as positive as most people feel about themselves.
34. I have difficulty arranging my life in a way that is satisfying to me.
35. I gave up trying to make big improvements or changes in my life a long time ago.
36. I have not experienced many warm and trusting relationships with others.
37. Some people wander aimlessly through life, but I am not one of them.
38. I judge myself by what I think is important, not by the values of what others think is important.
39. I have been able to build a home and a lifestyle for myself that is much to my liking.
40. I know that I can trust my friends, and they know they can trust me.
41. I sometimes feel as if I've done all there is to do in life.
42. When I compare myself to friends and acquaintances, it makes me feel good about who I am.

Mental Health Continuum – Short Form

Please answer the following questions about how you have been feeling in the last week. Please select the response that best represents how often you have felt each feeling.

0 – Never
1 – About once per week
2 – 2 or 3 times per week
3 – 4 or 5 times per week
4 – Almost everyday
5 – Everyday

In the past week how often did you feel?
1. Happy
2. Interested in life
3. Satisfied
4. That you have something important to contribute to society
5. That you belonged to a community (like a social group, neighbourhood, city)
6. That our society is becoming a better place for people
7. That people are basically good
8. That the way our society works makes sense to you
9. That you like most parts of your personality
10. That you are good at managing the responsibilities of your daily life
11. That you have warm and trusting relationships with others
12. That you have experiences that challenge you to grow and become a better person
13. Confident to think or express your own ideas and opinions
14. That your life has a sense of direction of meaning to it

Mindfulness Attention Awareness Scale (MAAS)

Instructions: Below is a collection of statements about your everyday experience. Using the 1-6 scale below, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

1	2	3	4	5	6
Almost Always	Very frequently	Somewhat Frequently	Somewhat Infrequently	Very Infrequently	Almost Never

1. I could be experiencing some emotion and not be conscious of it until some time later.
2. I break or spill things because of carelessness, not paying attention, or thinking of something else.
3. I find it difficult to stay focused on what's happening in the present.
4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.
5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention.
6. I forget a person's name almost as soon as I've been told it for the first time.
7. It seems I am "running on automatic," without much awareness of what I'm doing.
8. I rush through activities without being really attentive to them
9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there
10. I do jobs or tasks automatically, without being aware of what I'm doing.
11. I find myself listening to someone with one ear, doing something else at the same time
12. I drive places on "automatic pilot" and then wonder why I went there.
13. I find myself preoccupied with the future or the past.
14. I find myself doing things without paying attention.
15. I snack without being aware that I'm eating.

Ten-Item Personality Inventory (TIPI)

Here are a number of personality traits that may or may not apply to you. Please indicate the extent the extent to which you *agree* or *disagree with that statement*. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Response Scale

1- *Disagree strongly*
2- *Disagree moderately*
3- *Disagree a little*
4- *Neither agree or disagree*
5- *Agree a little*
6- *Agree moderately*
7- *Agree strongly*

I see myself as:
1- Extraverted, enthusiastic
2- Critical, quarrelsome
3- Dependable, self-disciplined
4- Anxious, easily upset
5- Open to new experiences, complex
6- Reserved, quiet
7- Sympathetic, warm
8- Disorganised, careless
9- Calm, emotionally stable
10- Conventional, uncreative

Demographic Survey (RCT 2)

1. Are you Male or Female?	☐ Male ☐ Female	Male (1) Female (2)
2. What is your current age (years)?	Select her	18 to 99 years (18-99)
3. What is your country of residence?	Select her	Country list
4. What best describes your residential location?		Urban (1) Suburban (2) Rural (3) Remote (4)
5. What is the highest level of education you have completed?	-- Select Here --	No school (1) Primary (yrs 1-6) (2) Secondary (yrs 7-10) (3) Secondary (yrs 11-12) (4) Certificate/Diploma (5) Undergraduate degree (6) Postgraduate degree (7)
6. What is your primary employment status?	-- Select Here --	Employed (1) Unemployed (2) Student (3) Fulltime parent (4) Retired (5)
7. What is your current marital status?	-- Select Here --	Single/Never Married (1) Married (2) Divorced/Separated (3) Widowed (4) Defacto (5)
8. How many children do you have?	-- Select Here --	None to 19 (0-19)
9. What is your gross yearly income in Australian dollars?	-- Select Here --	$0 – 19,999 (1) $20,000 – 39,999 (2) $40,000 – 59,999 (3) $60,000 – 79,999 (4) $80,000 – 99,999 (5) $100,000 – 119,999 (6) $120,000 – 139,999 (7) $140,000 plus (8)
10. How would you rate your physical health?	-- Select Here --	1 Extremely well (1) 2 (2) 3 (3) 4 Average (4) 5 (5) 6 (6) 7 Extremely unwell (7)

Program Evaluation (RCT 2)

1. Overall, how satisfied are you with this online program?
   (Not at all) 1 2 3 4 5 6 7 (Completely)

2. How relevant to you was the program content?
   (Not at all) 1 2 3 4 5 6 7 (Completely)

3. Were you able to apply the program content to your daily life?
   (Not at all) 1 2 3 4 5 6 7 (Completely)

4. Were you able to navigate around the website easily?
   (Not at all) 1 2 3 4 5 6 7 (Completely)

5. How much effort did you put into completing this program?
   0 - no effort
   1 - minimal effort
   2 - moderate effort
   3 - maximum effort

6. How much time per week (on average) did you spend completing this program?

	(Administration scoring)
No time	*(0)*
Up to 30 mins	*(1)*
30 to 60 mins	*(2)*
1 to 2 hours	*(3)*
2 to 3 hours	*(4)*
3 to 4 hours	*(5)*
4 to 5 hours	*(6)*
5 to 6 hours	*(7)*
6 to 7 hours	*(8)*
More than 7 hours	*(9)*

7. What are the main strengths of this program? (Short answer)

8. What are the main weaknesses of this program? (Short answer)

9. How could the program be improved? (Short answer)

10. Would you recommend this program to other people? (radio buttons)

	(Administration scoring)
Yes	*(1)*
No	*(2)*

Continued Practice (Time & Effort)

The Enhancing Wellbeing Online (EWO) Program introduced you to information and skills to enhance your well-being.

1. Since completing the EWO Program how much effort have you put into applying these information/skills in your daily life??

   0 - no effort
   1 - minimal effort
   2 - moderate effort
   3 - maximum effort

2. Since completing the EWO Program how much time per week (on average) have you put into applying these information/skills?

	(Administration scoring)
No time	*(0)*
Up to 30 mins	*(1)*
30 to 60 mins	*(2)*
1 to 2 hours	*(3)*
2 to 3 hours	*(4)*
3 to 4 hours	*(5)*
4 to 5 hours	*(6)*
5 to 6 hours	*(7)*
6 to 7 hours	*(8)*
More than 7 hours	*(9)*

Appendix C: Website content

Website #1 Development and Testing

URL	http://epw.janison.com/registration/
Content Author	Joanna Mitchell
Content Editing	Joanna Mitchell & Rosanna Stanimirovic
Web Developers	Janison
Beta Testing	Suzi Turner, Britt Klein, Rosanna Stanimirovic, Gene Schembri, Jason Patchell, Tania Donaldson, Ciaran Pier, Kathryn Gilson, Clare Hawthorne, Michael Martin, Graeme Hyman, Justin McNamara, Tom Cotteril, Lauren MacNamara, Jo Mitchell and 5 Australian Sports Commission HR staff.
Content	
Program 1	Strengths (selected screen shots provided)
Program 2	Problem Solving
Program 3	Placebo Control

Website #2 Development and Testing

URL	www.wellbeingonline.org
Content Author	Joanna Mitchell
Content Editing	Joanna Mitchell, Rosanna Stanimirovic (program 1 & 2) & Craig Hassed (program 3).
Web Developers	David Shields & Donna Moore, Raison Studios
Beta Testing	Ciaran Pier, Allison Mitchell, Rosanna Stanimirovic, Britt Klein, Dianne Vella-Brodrick, Jacolyn Norrish, Lisa Ciechomski, Marty Rabjohns, Gene Moyle, Jo Mitchell, Tania Donaldson, Jo Abbot, Kerrie Shandley, Dean Janover, Britt Klein, Rosanna Stanimirovic, Maggie Mitchell & Georgia Ridler.
Content	(Available on CD)
Program 1	Strengths
Program 2	eCoach
Program 3	Mindfulness
Program 4	Waitlist Control

ADDENDUM

p 21, para 1: Replace last sentence with: “Well-being levels vary and, while the direction of causality is unclear, higher levels of well-being are related to positive implications for quality of life, psychosocial functioning and physical health.”

p 22, para 3: Comment: The effect size is denoted as r, the equivalent Cohen’s d category is provided as extra information.

p 74, para 2: Comment: As stated in the thesis participant recruitment was conducted both offline and online. The positive psychology listserv was one of many websites used to promote the study online. Advertising on the positive psychology listserv, as well as other listservs, was intended as a distribution point, so other academics and practitioners could further promote the study, creating a snowball effect on recruitment.

p 72, para 2: Comment: The mDES was included as a measure of positive and negative affect for three reasons: (i) the affect measure used in the first study, the PANAS, was limited because it did not measure activated emotions; (ii) the PANAS-X, a revised version of the PANAS that did include activated emotions, increased the size of the measure threefold making it too large to use in the current study given the premium on participant time, and; (iii) consultation with industry experts indicated that the mDES, which was constructed in a world leading emotions lab, was a brief 20-item measure of both activated and de-activated emotions. However, the mDES was limited by a lack of peer-review publications with psychometric data at this stage in its development. The use of the mDES is a limitation of the current study that should be considered when interpreting the results.

p 68, last para: Add after the second last sentence: “However, all this data is limited by being correlational and so the direction of the relationship between variables cannot be determined.”

p 135, last para: Add before the last sentence: “Despite the statistical techniques employed to minimise bias due to high study attrition levels, potential bias should be considered when interpreting the results.”

p 120, Results section: Comment: Post-hoc power calculations were reported and indicated adequate power. Pre-study power calculations estimated that 96 participants were required per group, assuming 80% power, 80% participant attrition (based on the first study), a significance level of 5%, and a moderate effect size. The actual participant numbers exceeded 149 per group (N = 623). Pre-study and post-hoc power calculations both indicated adequate power.

p 117, last para, last sentence (ends on p 118): Add: “(e.g., Australian Psychological Society website, Positive Psychology listserv, International Society for Research on Internet Interventions listserv).”

p 117, Procedures section: Comment: The revised Declaration of Helsinki, released in October 2008, recommended that "Every clinical trial must be registered in a publicly accessible data base before recruitment of the first subject." (See http://www.anzctr.org.au/). Recruitment for the final trial of the thesis began early 2009 and at that time the researcher was unaware of the revised Declaration of Helsinki. Currently some, but not all publications, require the trial registration reference. The researcher can only apologise for this unintended omission and note it as a limitation of the research procedure.

p 158, para 1: Add before line 1: This chapter reports evaluation data that were collected about the participants’ experience of the Wellbeing Online programs from the final study (i.e., strengths and mindfulness). A purpose built questionnaire was created (see Appendix B) to explore how much time and effort participants put into the respective programs, participant satisfaction with the programs, how relevant and applicable the participants found the program content and ease of website navigation.

p 158, para 1: Add after last line: The results are unsurprising and confirm that participants put the predicted amount of time and effort into the program. It was reassuring to see that there were no major differences between participant experiences of the different programs, suggesting similarity between the programs in terms of perceived satisfaction, relevance, applicability and ease of navigation. The results indicate that most, but not all, participants found the program satisfying, relevant, applicable, easy to navigate and would recommend it to a friend. The data are limited due to their descriptive nature. Overall, the data supports the ecological validity of the Wellbeing Online program while suggesting to the program developer that there is still room to improve.

ERRATA

p 6, para 2, line 4: “support; hence, two” for “support, hence two”

p 9, para 1, last line: “2002); hence, the” for “2002), hence the”

p 10, para 1, line 13: “adaptation; for” for “adaptation, for”

p 11, para 1, line 13: “adaptation” for “adaption”

p 14, para 1, line 5: “research. This is followed” for “research, and then”

p 15, para 2, line 2: “disorders; however, “ for “disorders, however,”

p 21, para 2, line 4: “however, Keyes” for “however Keyes”

p 23, para 1, line 6: “assignment; however, the” for “assignment, however, the”

p 25, para 2, line 7: “interventions; however, after” for “interventions, however after”

p 25, para 2, line 12: “however, research” for “however research”

p 26, para 2, line 6: “limited; however” for “limited, however”

p 27, para 2, line 1: “advantages; most” for “advantages, most”

p 29, para 1, line 7: “ratings; however, this” for “ratings, however this”

p 31, para 2, line 6: “however, like” for “however like”

p 32, para 2, line 4: “SHI; this” for “SHI, this”

p 33, para 1, line 3: “measures. In the meantime” for “measures, meantime”

p 72, para 3, last line: “caution; hence” for “caution, hence”

p 73, para 2, line 5: increase font size to 12 point.

p 74, para 1, line 5: “measures; however, the” for “measures, however the”

p 77, para 3, final line: “analysis” for “analyses”

p 78, para 2, line 3: “predictive” for “predicative”

p 82, para 2, final line: “vice versa” for “vica versa”

p 84, para 1, line 9: “effect” for “affect”

p 84, para 1, final line: “mentally healthy” for “mentally health”

p 84, para 2, second line: “distinguishing” for “distinguish”

p 84, para 2, line 9: “interventions. For” for “interventions, for”

p 98, para 2, line 7: “values; however” for “values, however”

p 99, para 1, line 3: “whereby” for “where by”

p 99, para 2, line 6: “but also facilitates” for “but facilitates”

p 99, para 2, line 8: “which leads to” for “which results in”

p 99, para 3, line 1: “as a wellbeing intervention” for “as wellbeing intervention”

p 99, para 3, line 3: “positive affect” for “positive affective”

p 100, para 2, line 2: “growing; however, it” for “growing, however it”

p 101, para 1, line 5: “larger pre-post effect” for “larger effect”

p 101, para 1, second last line: “professionals” for “professional”

p 103, para 2, line 3: “however, this” for “however this”

p 106, para 1, line 16: “found: for” for “found, for”

p 108, para 2, line 1: “success; in” for “success, in”

p 109. para 1, line 14: “studies; however” for “studies, however”

p 110, para 2, line 16: “well-being; however” for “well-being, however”

p 111, para 2, line 14: “outcomes. For” for “outcomes, for”

p 112, para 1, line 3: “support (Barak,” for “support(Barak,”

p 112, para 2, line 11: “well-being. For” for “well-being, for”

p 118, para 2, fourth last line: “was” for “were”

p 120, para 2, line 3: “analysis” for “analyses”

p 120, para 3, line 4: “transformations” for “transformation”

p 123, para 2, line 3: “particular, the” for “particular the”

p 124, para 1, line 10: “groups; however” for “groups, however”

p 126, para 3, last line: “pattern; however, the” for “pattern however the”

p 128, Para 1, line 4: “efficacy; however, the” for “efficacy, however the”

p 131, para 2, line 2: “group; however, there” for “group, however there”

p 132, para 2, line 4: “ways; First” for “ways, first”

p 135, para 1, line 3: “such as readiness” for “such readiness”

p 158, para 1, line 3: “was” for “were”

p 162, para 2, line 6: “outcomes; however, this” for “outcomes, however this”

p 165, para 3, last line: “(e.g., OTH, SWLS); however” for “(e.g., OTH, SWLS), however”

p 166, para 2, line 6: “*4*; however, the” for “*4*, however the”