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A Psycho-Social System Approach to Well-Being: Empirically deriving the Five Domains of Positive Functioning

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A new Psycho-Social System Approach to Well-Being is presented, in which psychological and social functioning is understood through an empirically derived framework of five domains. A quantitative co-term analysis was performed on 3466 terms within 18,401 *PsycINFO*®journal documents on topics related to positive psychology (PP) across disciplines such as psychology, education, management, business, and psychiatry. The analysis revealed that research on PP topics has concerned five broad domains: attention and awareness, comprehension and coping, emotions, goals and habits, and virtues and relationships. These domains provide a new systematic framework, the Five Domains of Positive Functioning (DPF-5), for understanding positive psycho-social functioning and exploring the underlying ways in which people function to achieve well-being outcomes. When used within the Psycho-Social System Approach, the new framework can be used in future research to clarify mechanisms of change, facilitate comparisons between different PP interventions, and suggest ways to improve intervention effectiveness.

Keywords: theory, system, happiness, text analysis, intervention, positive psychology, framework, latent semantic analysis, well-being, dynamic system

Positive psychology (PP) is a scientific field that studies the flourishing and optimal functioning of individuals, groups, and institutions (Gable & Haidt, 2005; Linley, Joseph, Harrington & Wood, 2006). The formal inauguration of the field in 1998 drew together several existing lines of research under the umbrella of PP and highlighted new lines of psychological enquiry (Rusk & Waters, 2013). Since 1998, the number of articles published on PP-related topics has grown by 410%,[1] spanning many disciplines, and covering many different topics. Literature related to PP now represents about 4% of the *PsycINFO*®article database, making it comparable with other established fields of research (Rusk & Waters, 2013). However, despite the rapid proliferation of PP literature, the field still lacks a comprehensive theoretical framework that spans its diverse range of topics, constructs, interventions and outcome measures.

The aims of the present article are twofold. First, it will present a new system-based approach to well-being, which focusses on *psychological and social functioning* (hereafter abbreviated as psycho-social functioning) as the mediator between well-being interventions and well-being outcomes. We define psycho-social functioning as the moment-by-moment psychological and social processes, states and events that contribute to well-being. Second, the present article will categorise psycho-social functioning into a set of empirically derived *domains*. These domains represent the major, conceptually distinct aspects of psycho-social functioning that are covered by PP-related research to date.

Existing positive psychology frameworks

A number of PP frameworks have already been proposed to understand the optimal functioning of individuals. However, these frameworks have not focussed on psycho-social functioning, and have proven to be limited in scope. One of the earliest such frameworks was the *Values in Action Character Strengths Framework* proposed by Peterson and Seligman (2004), which comprises a set of 24 character strengths. Examples include gratitude, forgiveness, kindness, social intelligence, appreciation of beauty and excellence, self-regulation and

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[1]This figure was calculated using data from a previous analysis by the present authors (Rusk & Waters, 2013).

humour. This framework has led to several strengths-based interventions aimed at cultivating strengths to increase psychological well-being. The field of PP has now extended well beyond the scope of this framework, and many topics, constructs and interventions cannot be integrated into the strengths framework (e.g. mindfulness, flow, posttraumatic growth). Moreover, the character strengths framework is not a process model, and as such cannot be used to investigate the processes that alter well-being.

Seligman (2011) proposed a multi-dimensional framework of five measurable elements of well-being known as *PERMA*: positive emotion, engagement, positive relationships, meaning and accomplishment. However, as PERMA focusses upon the end state of well-being (which Seligman defines by PERMA), it provides limited insight into the psycho-social processes that people undertake to achieve gains in each PERMA element. For example, a wide variety of processes and interventions influence positive emotions, but the PERMA framework provides a limited understanding of these processes. Thus, while the PERMA framework provides researchers, practitioners and lay people with a clear end point, it does not inform people of the processes used or changed to cultivate well-being.

Jayawickreme, Forgeard and Seligman (2012) proposed the *Engine of Well-Being* framework as "the prologue to any adequate theory" (p. 336) of well-being. Their framework consists of three levels: measurable inputs, subjective processes and measurable outputs. The inputs include environmental factors such as education, health, and income that afford the opportunity to engage in valuable activities and so contribute toward an individual's well-being. Inputs also include personality traits that are correlated with well-being, such as optimism, neuroticism, curiosity, values, strengths and positive affectivity. The subjective processes refer to the capabilities and subjective states that influence the choices made by individuals to engage in particular behaviours. The processes include internal beliefs, cognitions and explanations. Lastly, the measurable outputs are intrinsically valuable behaviours that the individuals chose to perform, which reflect the attainment of well-being. These different categories within the framework were developed to refine relevant measurements and focus interventions in each of the three categories. However, its three categories (inputs, processes, outputs) are very general in nature, providing only a limited window into *how* individuals function to achieve well-being.

The *Personal Activity Model* (PAM) put forward by Lyubomirsky and Layous (2013) articulates several general characteristics of both positive psychology interventions (PPIs) and participants that together influence how well a PPI fits the participant. This participant fit in turn influences the effectiveness of the PPI. Lyubomirsky and Layous (2013) claim that the mechanisms of PPIs fall within four broad categories: emotion, cognition, behaviour and need satisfaction. These categories partition human functioning in an easily-understood manner, and lend themselves to studying it in more detail. However, these categories fail to cover socially-oriented constructs, such as forgiveness, expressing gratitude, or listening skills.

The Psycho-Social System Approach

The four frameworks above have been crafted based on the considerable expertise of well-known authors in the field of PP but are limited in that they fail to cover the full scope of inputs, intervention, processes and well-being outcomes. The VIA focusses only on character strengths; PERMA focusses only on well-being outcomes rather than the inputs and processes that lead to well-being; and PAM focusses on PPIs but not the processes and outcomes of well-being. Jayawickreme et al.'s (2012) Engine of Well-Being framework is the only framework that considers well-being as a dynamic system. However, its conception is problematic, because the system in question is not one of psycho-social functioning. From the perspective of psycho-social functioning, the nomenclature is problematic. The 'inputs' include traits such as motivation, optimism and character strengths, which would seem to be integral ingredients of psych-social functioning, rather than external inputs to the system. The 'processes' include only cognitions and emotions, which, as will be shown later, is a limited view of psycho-social functioning. Finally, the 'outputs' include preferences, behaviours and "goal-driven functionings" (p. 329), which again would seem to be integral aspects of psycho-social functioning, rather than external outputs. A clearer system model is required.

Much PP research to date has examined the effects of PPIs with respect to well-being outcomes (see the review by Sin & Lyubomirsky, 2009). To date, the research has failed to examine the underlying psycho-social processes that are triggered by PPIs and go on to create well-being. Psycho-social functioning is still largely seen as a 'black box', a metaphor for a system in which the internal mechanisms that link inputs to outputs are *not* understood (Skyttner, 2005).

The present study focuses on this 'black box', adopting a systems approach to optimal functioning taken from general systems theory (see the review by Skyttner, 2005). Jayawickreme et al. (2012) also used a

systems approach in their Engine of Well-Being Framework, however, unlike their approach, the present focus is on the psycho-social functioning of an individual.

Inputs to this system are external factors that influence psycho-social functioning. The primary inputs of interest to the system are well-being interventions (e.g. PPIs). Environmental and biological factors are two other external influences on psycho-social functioning. Biological factors include neurological, genetic and physiological influences, and environmental factors include physical and societal influences. Historical influences are incorporated by the dynamic nature of the system. Outputs of the system are well-being outcomes. Well-being here is understood as a measure of *how well* the psycho-social system is characteristically functioning, and may present itself as high levels of PERMA outcomes. In other words, well-being is typified by a system of psycho-social functioning that tends to operate 'well'. Together, these relationships between the system of psycho-social functioning for an individual, its inputs, and its outputs form the *Psycho-Social System Approach to Well-Being* represented in Figure 1. In this approach, the system of psycho-social functioning bridges the gap between well-being interventions and well-being outcomes.

What underlies psycho-social functioning?

In the new Psycho-Social System Approach presented above, it is important to understand what is inside the 'black box' - the system of psycho-social functioning. Researchers and practitioners need to understand what underlying elements of psycho-social functioning can be drawn upon to enhance well-being. Thus, the second aim of this paper is to empirically derive a set of underlying domains of positive psycho-social functioning. These domains are required to meet six domain criteria. They had to be: (a) separate and distinct, (b) readily linked to PP constructs, (c) applicable to the full range of PPIs, (d) readily linked to positive rather than negative outcomes (e) supported from PP literature, and (f) an essential aspect of optimal human functioning.

The current paper will derive these domains using an automated, empirical approach known as co-term analysis (Callon, Courtial, Turner & Bauin, 1983). This established method is widely used to quantify, structure and utilise the conceptual relationships between terms. It is based on the following principle: terms appear together in the same document more frequently with conceptually related terms than would be expected by random chance. The patterns of these co-occurring terms can be analysed statistically to investigate the conceptual structures within whole bodies of literature (Chen & Guan, 2011).

Co-term analyses have been used since the 1980s to map and analyse specific research specialities such as biotechnology (Rip & Courtial, 1984) and acidification literature (Whittaker, 1989), to name only a few. More recently, researchers have used co-term methods to analyse entire fields such as ecology (Neff & Corley, 2009), library and information science (Milojević, Sugimoto, Yan & Ding, 2011; Van Den Besselaar & Heimeriks, 2006), strategic management (Ronda-Pupo & Guerras-Martin, 2012), and PP (Rusk & Waters, 2013). The method has also been used to analyse the history of ideas within academic literature (Rooney, McKenna & Barker, 2011) and the literary output of academic institutions (Grauwin & Jensen, 2011). This analytical method will be employed in the current study so as to derive a new framework of positive psycho-social functioning.

Methodology

The present article uses co-term analysis to empirically analyse the domains of positive psycho-social functioning from a large sample of PP-related documents from the *PsycINFO®* database. This overall approach of deriving domains from a body of literature follows the precedent set by Pruitt and Olczak (1995), who drew on literature focussing on psychological disorder to identify distinct, yet interacting, domains involved in the resolution of conflict. The domains they identified were motivation, affect, cognition, behaviour, and environment. In the present article, the focus is on identifying the underlying domains of optimal psycho-social functioning. Thus, literature related to PP was used for the co-term analysis.

The overall methodology is similar to that used by Grauwin and Jensen (2011) and involved four main steps. First, PP-related documents were selected as the source literature for the analysis. Second, the terms (words or noun phrases) present in these documents were extracted and a set of terms relevant to the current task was selected. Third, a co-term analysis was performed on the selected terms to create a network of meaningful relationships between them. Finally, the co-term network was mapped to identify clusters of terms. Each cluster was manually inspected to define a domain that matched its prominent theme and met the six domain criteria outlined above. Each of these steps is described in more detail below.

Source documents

Co-occurrence methods were used to analyse 1.7 million documents from 700 *PsycINFO®* journals us-

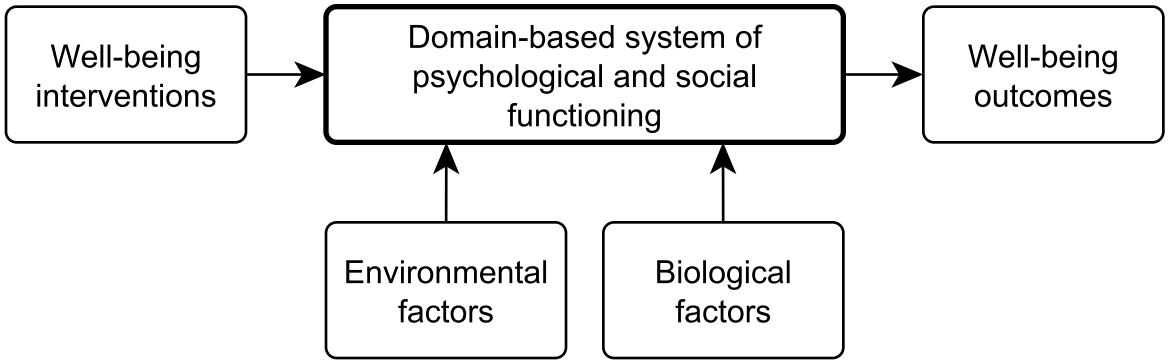

Figure 1. The *Psycho-Social System Approach to Well-Being*.

ing bibliographic information extracted from the *Web of Science*®. The titles, keywords and abstracts of the documents were used as the basis for the analysis. Terms occurring most frequently with "positive psychology" were identified, from which a set of 233 key PP terms were identified. Documents containing at least two of these PP key terms (anywhere in their titles, keywords or abstracts) were deemed as being PP-related. Two terms were used because many documents containing only one PP-related term only mentioned it in passing, and were not focussed on a PP construct. A total of 18,401 such documents were identified (see Rusk & Waters, 2013).

These PP-related documents were sourced from many disciplines, including all major disciplines of psychology, education, management, business, and psychiatry. The analysis included a broad spectrum of PP research topics, including optimism, resilience, positive emotions, happiness, life satisfaction, mindfulness, post-traumatic growth, gratitude, forgiveness, positive relationships, positive behaviour change and altruism. The documents included topics of special interest in educational psychology, such as motivation and achievement. Documents from the business and management fields were also represented, covering topics such as creativity, organisational citizenship, organisational fairness and leadership.

Selection of relevant terms

In the present work, the terms in the titles, key words, and abstracts of these 18,401 PP-related documents were analysed. The most commonly occurring 20,000 terms were identified (excluding most verbs, prepositions, pronouns and other common English-language words). The next step was to exclude terms from this list that would not help to identify domains of psycho-social functioning. First, the analysis excluded general terms such as 'appointment', 'convex', and 'co-ordinator'. Terms related to the context and methodology of studies were excluded (e.g. 'adult', 'adolescent', 'questionnaire'). Second, it excluded all neuroscientific terms (e.g. 'anterior prefrontal cortex', 'excitatory synapse', 'medial thalamus', 'magnetic resonance imaging') and other biological terms ('dopamine function', 'lipid'). Third, it excluded the names of places and people (e.g. 'Bosnia', 'Boston' and 'Bowlby'). The resulting list comprised 3466 terms related to psycho-social functioning within the PP literature. This number of terms was large enough to ensure that the structure of the final map was not sensitive to the influence of any individual term.

Co-term analysis

The goal of the co-term analysis was to derive a network of links between all of these 3466 terms described above, in which each link between two terms was a quantitative measure of how related they are to each other. This analysis is outlined as follows. A given term was deemed to 'co-occur' with another if both occurred in the same document. The number of times each term co-occurred with every other term was counted over the entire corpus of documents, resulting in a 3466×3466 matrix of co-occurrence counts. The most common terms co-occur more frequently than the least common terms, and this imbalance can distort the resultant network.

Therefore, as is common protocol in co-term analyses, this data was normalised with respect to the total number of times each term appeared in the corpus. To do this, the co-occurrence counts for each term were divided (row-wise) by the number of times each term occurred in the entire corpus of documents. This calculation resulted in the *conditional probability* (see Equation 1 in Appendix A) that term Y would appear in a

particular document, given that it contained term *X*.

The remaining task was to quantify how related two given terms are to each other. The conditional probability itself provided a poor measure of this relatedness. Therefore, again following common protocol in co-term analyses and textual analysis (Milojević et al., 2011; Ronda-Pupo & Guerras-Martin, 2012; Van Den Besselaar & Heimeriks, 2006), a measure called the *cosine similarity* was calculated between all terms (according to Equation 2 in Appendix A). This measure is widely used to establish how related terms are to each other. This process created the desired network between all terms, in which more related terms had stronger links between them (greater cosine similarity).[2]

Mapping and cluster analysis

The *Gephi* software package (see Bastian, Heymann & Jacomy, 2009) was used to map the network visually over a 2-dimensional space. The goal of this mapping was to create a map in which related terms were positioned near each other to help identify the separate domains. The location of each term on the map, called its *vertex*, was calculated with the *ForceAtlas*2 algorithm (Jacomy, Heymann, Venturini & Bastian, 2011) in Gephi using the *LinLog* energy model. This physics-based model tends to identify communities of vertices more clearly than other common energy models. It works by simulating repulsion forces between all vertices and attraction forces between only the linked vertices. The magnitude of the attraction force between two linked vertices is determined by the cosine similarity between the terms located at each vertex. The algorithm iterates the position of all vertices to balance these opposing forces, which minimises the total energy of the map and produces a near-optimal layout of the vertices. In the present case, this method positioned related terms near to each other and caused unrelated terms to be located far apart from each other.

It was desirable to use a mathematical clustering method as a means of objectively quantifying the distinct domains within the map. Traditional principal component and factor analysis methods were problematic because the similarity matrix underlying the network was not a correlation matrix, and it was not positive definite. Moreover, the large number of terms (3466) would have be computationally costly to factor. Hierarchical clustering and spectral clustering methods failed to cluster the mapped terms satisfactorily due to the highly-connected nature of the network, which is typical in co-term analyses. However, a common approach used to cluster such networks is based on a widely-used measure of network structure known as *modularity*. For a given division of the network's vertices into clusters, modularity reflects the degree to which the links connect vertices that share the same cluster. Modularity is one of the most widely used measures in assessing the quality of network clustering. An effective and common approach to optimise the clustering of networks like the present one is to maximise the modularity (Blondel, Guillaume, Lambiotte & Lefebvre, 2008). This approach simultaneously determines the appropriate number of clusters and finds an optimal partitioning of vertices into each cluster. The *Louvian* clustering algorithm (Blondel et al., 2008) was used to cluster the terms. Like all modularity optimisation algorithms for large networks, the clustering is somewhat dependent on initial conditions. For this reason, the algorithm was repeated several times with randomised initial conditions until the clusters obtained using this method agreed well with the community structure visually evident in the map.

The terms within each cluster formed the conceptual basis of each domain. The authors inspected the terms within each cluster to identify the most prominent themes related to psycho-social functioning. These themes were then used to define a domain based on each cluster that met the six domain criteria.

Results

An abstracted view of the map created by this analysis is shown in Figure 2. The terms clustered around five major domains, which were also evident through a visual inspection of the map. The modularity of the network with these clusters was 0.368, which supports the validity of the clustering solution.

The themes within the five clusters of terms were assessed by the authors to define each domain of psycho-social functioning. These definitions are given in Table 1, where each grouping of terms has been taken to represent one *domain* of psycho-social functioning. Collectively, these domains will be referred to hereafter as the *Five Domains of Positive Functioning* (DPF-5).

As is to be expected with a broad statistical analysis like this, considerable thematic cross-over between the domains existed. A minority of terms were located outside the domain in which they conceptually belonged by chance because of the terms with which they often co-occurred. Other terms did not appear near conceptually related terms, and hence, did not suggest any theme. As a whole, however, the dominant themes

[2] In mathematical terms, this network was a *graph*, in which the terms form the *vertices* and non-zero cosine similarities form *undirected edges* that link them.

Table 1
Definitions of each of the Five Domains of Positive Functioning in the present framework derived from the co-term analysis.

Domain	Name	Definition
1	Attention and Awareness	The consciously controlled or automatic regulation of attention toward particular aspects of sensory or cognitive information, including novel aspects.
2	Comprehension and Coping	Consciously controlled or automatic processes involved with identifying stimuli in awareness, determining processes and causal relations within past and present stimuli, deductive and inductive logic, and anticipating or predicting future possibilities. This domain includes the application of these processes to cope effectively with adversity.
3	Emotions	Present-moment experiences of emotion, identification of emotions, and emotional associations with comprehended stimuli and memories.
4	Goals and Habits	Enduring conscious or unconscious values, rules, principles and goals involved in guiding the selection of behaviour, and the habits and skills involved in the execution of those behaviours.
5	Virtues and Relationships	Enduring social relationships and momentary social interactions, including romantic, family, friend, organisational, societal and spiritual levels, and the individual virtues and behaviour that influence their quality.

within each of the five major domains were clear and closely linked. Within each domain, the dominant themes also included sub-clusters, or sub-domains, of terms (see Table 2).

Terms in Domain 1 often concerned the moment-by-moment control of attention, to focus awareness on certain stimuli while filtering out others. This 'awareness domain' gains additional support from the recent surge of interest in mindful attention. For example, interest in mindfulness-based stress reduction programs, dialectical behaviour therapy, and acceptance and commitment therapy is increasing rapidly (e.g. Davis & Hayes, 2011; Hofmann, Sawyer, Witt & Oh, 2010). There were no notable sub-domains here.

Terms that frequently co-occurred to form Domain 2 often related to how people comprehend stimuli, make predictions and deduce appropriate responses to situations from existing knowledge. These types of cognitive processes have been studied extensively across many disciplines in psychology (e.g. cognitive therapy, cognitive-behavioural therapy) and PP (e.g. Snyder & Lopez, 2009, pp. 259-382). Hence, the appearance of this 'cognitive domain' is to be expected. Several categories of functions could be sketched out in the largest sub-domain (2.1): (a) the identification/recognition of objects and processes ("What is it?", "What is happening?"), (b) explanations/attributions of causality ("Why did that happen?"), and (c) predictions/expectations of possible future states ("What is likely to happen?"). A sub-domain (2.2) associated with adversity and coping existed within Domain 2. The proximity of this sub-domain to Sub-Domain 2.1 suggests a close link between coping and cognitive processes. For example, coping strategies may be influenced by existing knowledge, beliefs, appraisal of the situation, and the predictions one makes about the situation.[3] The appearance of this 'coping sub-domain' within the larger cognitive domain is also supported by well-established psychological research (e.g. cognitive restructuring as a coping strategy).

Domain 3 contained emotion-related terms. Within psychology as a whole, a large body of literature is concerned with emotions (e.g. Lewis, Haviland-Jones & Barrett, 2010). Moreover, positive emotions have been a major topic of enquiry within PP (e.g. Lyubomirsky, King & Diener, 2005)). A small subset of terms related to reactivity and memory also appeared in this domain, and these were mapped close to the awareness domain. This proximity is suggestive of functional links between memory, attention and emotion. There were no sub-domains in this emotion-related domain.

Domain 4 contained terms concerned with goal-direction and habits. There were two sub-domains. Sub-Domain 4.1 was dominant, and included terms

[3]It is noted that other factors outside this domain (e.g. social support) also influence coping. Like all the sub-domains, Sub-Domain 2.1 was linked to many of the terms throughout the map.

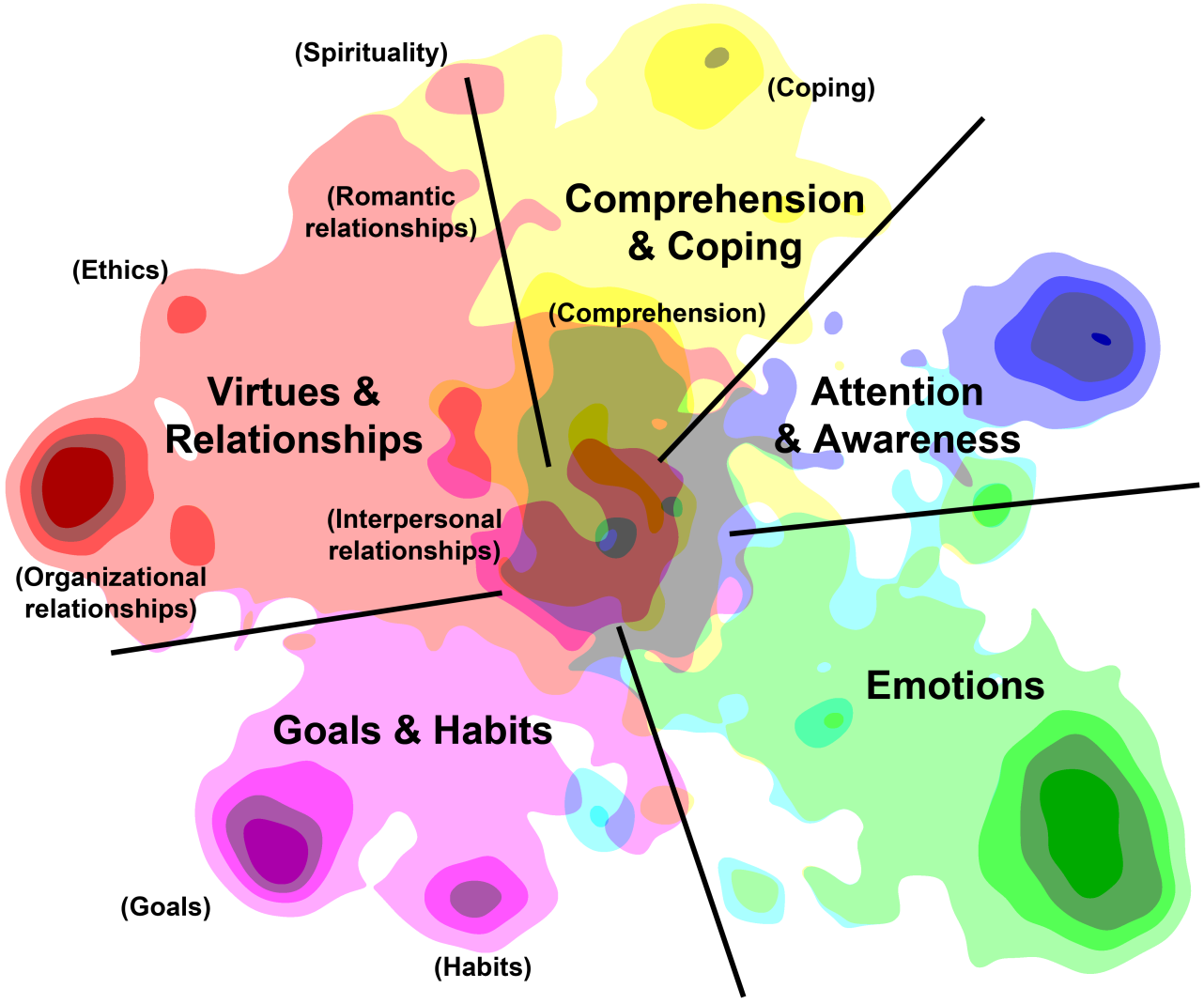

Figure 2. An abstracted view of term mapping analysis of 3466 terms from PP-related literature.

concerned with goal-striving and motivation. A smaller distinct sub-domain (4.2) involved habitual behaviour. The proximity of habit-related terms to goal-related terms is supported by Aarts and Dijksterhuis (2000) and Sheeran et al. (2005), who have argued that habits are a form of goal-directed automaticity.

Domain 5 was large, and contained terms covering a broad range of social interaction. They concerned relationships and virtues within a range of different social contexts, as evident by the several sub-domains present. Near the centre of the map, Sub-Domain 5.1 concerned social relationships, broadly construed. Sub-domains concerning more specific aspects of social functioning were located toward the outside of the map. The largest of these, Sub-Domain 5.2, concerned social functioning in a organisational context. Sub-Domain 5.3 was smaller and broader, covering romantic and family relationships. A smaller sub-domain (5.4) concerned ethics and virtues at the societal level. Lastly, the smallest sub-domain (5.5) concerned religion and spirituality.

Finally, the five main domains were found to overlap in the centre of the map. The terms in this region did not form any distinctive, common theme. This region is best understood as simply containing the most common terms in the dataset, which co-occurred most widely with the other terms on the map.

Table 2
Terms within each sub-domain representing their dominant theme, structured according to the main domains determined by the analysis.

Domain	Sub-domain	Dominant theme	Terms within the sub-cluster representing the dominant theme
Attention and Awareness	1.1	Attention and Awareness	Attention, awareness, focus, mindfulness, meditation, rumination, imagery
Comprehension and Coping	2.1	Comprehension	Thinking, attribution, appraisal, mindset, counterfactual thinking, construal, cognitive strategy, explanatory style, realism, expectancy, hope
	2.2	Coping	Adjustment, coping, reappraisal, posttraumatic growth, reframing, resilience, adversity, hardiness
Emotions	3.1	Emotions	Positive emotion, positive affect, negative emotion, mood, arousal, reactivity, emotional expression, facial expression
Goals and Habits	4.1	Goals	Motivation, goals, engagement, efficacy, choice, decisions, planning, self-regulation, success, self-determination, mastery, achievement, persistence, striving, grit, perseverance
	4.2	Habits	Habit, change, automaticity, cuing, lifestyle change, behavioural change, change behaviour, behavioural maintenance, physical exercise, habit strength
Virtues and Relationships	5.1	Social Relationships	Interpersonal relationships, prosocial behaviour, norms, attachment, social relationships, community, caring, friendship, altruism, gratitude, empathy
	5.2	Organisational Relationships	Organisational citizenship, employment relationship, transformational leadership, loyalty, volunteerism, commitment, authentic leadership, fairness, responsibility, trust, co-operation
	5.3	Romantic Relationships	Marriage, romance, relationship satisfaction, closeness, forgiveness, relationship commitment, attraction
	5.4	Morality and Ethics	Virtue, ethics, morality, equality
	5.5	Religion and Spirituality	Religion, spirituality

Discussion

The purposes of this paper were twofold: (1) to put forward a new system-based approach to well-being that identifies the importance of psycho-social functioning; and (2) to empirically derive the broad domains that constitute positive psycho-social functioning. The first of these, the Psycho-Social System Approach to Well-Being, draws on general systems theory to refine the Engine of Well-Being framework of Jayawickreme et al. (2012). Interventions are 'inputs' to the new system model, while well-being outcomes are measured 'outputs'. Psycho-social functioning represents the *system* within this model, which needs to be understood as more than a 'black box' to future theory and practice within PP.

To address this need, the current study analysed and defined the major aspects of psycho-social functioning within this 'black box' using an empirical co-term methodology. Documents related to PP topics were used to do this, since they are devoted to the study of optimal psychological and social human functioning. The results of the mapping showed five conceptually distinct domains: *Attention and Awareness*, *Comprehension and Coping*, *Emotions*, *Goals and Habits*, and *Virtues and Relationships*. Consequently, this new framework is termed the Five Domains of Positive Functioning

(DPF-5). It provides a parsimonious and empirically-based categorisation of positive psycho-social functioning, with each domain covering a different aspect of how individuals function to achieve well-being. Thus, the new framework provides insight into the 'black box' of psycho-social functioning.

Implications for theory

The DPF-5 raises theoretical implications about the dynamic, and potentially non-linear, ways in which the psycho-social system operates. Upon consideration of each domain, it is evident that no one domain can function effectively in isolation. Indeed, the map showed many inter-linkages, suggesting that the domains are inter-dependent. The DPF-5 helps to direct research into possible interactions between domains through consideration of the ways in which each domain requires input from other domains, and in turn, provides input to others. For example, attention and awareness (Domain 1) needs to be guided by the goals of the individual (Domain 4) and their comprehension (Domain 2). Attention (Domain 1) is also directed through emotion (Domain 3), since when people feel negative emotions their attention shrinks and when they feel positive emotions their attention expands (Fredrickson, 2004). The Virtues and Relationships Domain is, perhaps, the most complex, and relies on many inputs from the other domains. Thus, although the current analysis identified five distinct domains of optimal psycho-social functioning, it also shows that these domains are inter-related. In this way, these domains provide a framework with which to unravel and understand the inherent complexities of positive human functioning.

The inter-dependent nature of the domains suggests that psycho-social functioning can be understood as a *complex dynamic system*, in which each domain influences and interacts with the others. This dynamic systems perspective on positive human functioning sheds light on the nature of well-being itself. It naturally incorporates the 'feedback effects' hypothesised in Jayawickreme et al.'s (2012) Engine of Well-being framework. It implies that interaction effects between domains are not only possible, but likely. Fredrickson's (2004) Broaden and Build Theory of Positive Emotions articulates some of the ways in which emotions (Domain 3) can influence the functioning in other domains. According to Fredrickson (2004), positive emotions can broaden attention (Domain 1: Attention and Awareness), broaden repertoires of thought (Domain 2: Comprehension and Coping), broaden habitual action tendencies (Domain 4: Goals and Habits), and promote social interactions (Domain 5: Virtues and Relationships). These can in turn cultivate more positive emotions, creating "upward spirals" (Fredrickson, 2004, p. 1373), which can be understood as series of mutually-reinforcing, positive interactions between domains.

The DPF-5 framework also has implications for a number of theoretical constructs in PP. Some PP concepts fall predominantly within one DPF-5 domain (e.g. joy), yet a number are constructs containing several elements that span several domains (e.g. gratitude). These domain-spanning constructs can be apportioned into the DPF-5 domains in several different ways. It is hoped that this framework will allow a more nuanced understanding of these constructs, through consideration of how they relate to each domain of psycho-social functioning.

Implications for positive interventions

The DPF-5 has six major implications for PPI research and practice. First, it would clarify what it is that PPIs do, in fact, change in order to produce well-being outcomes. It would also allow researchers to identify mechanisms common to several PPIs. Third, it would illuminate ways in which PPIs focusing on the same construct may operate through different mechanisms. Fourth, it highlights the importance of interactions between domains which may provide indirect mechanisms by which PPIs operate. Fifth, it prompts new research into the design and selection of PPIs. Six, a practitioner-friendly inventory of positive psycho-social functioning based on the DPF-5 could be developed. Each of these four suggestions will now be discussed more fully.

First, the DPF-5 helps to clarify the ways in which PPIs may influence and modify psycho-social functioning, complimenting the PAM framework of Lyubomirsky and Layous (2013). Assessing PPIs using the framework can, for instance, reveal different mechanisms which may be at work in the same PPI. Consider the 'strength activation' PPI (Seligman, Steen, Park & Peterson, 2005) as an example, in which participants identify their top five character strengths and use one of these top strengths in a different way every day for one week. Research has clearly shown that this strength activation PPI leads to increases in well-being, but to date, the underlying domains of psycho-social functioning triggered by it have been unclear.

The PPI is focused ostensibly on strengths, yet it may enhance psycho-social functioning in different ways in each of the DPF-5 domains. For example, the PPI provides participants with potentially new, positive information regarding the strengths they possess, which may positively change schemas and self-efficacy beliefs in the Comprehension and Coping Domain. Par-

ticipants are asked to set goals and plan to use their strengths, and then follow through on that plan, which involves the Goals and Habits Domain. These goals are likely to be self-concordant, and Coote and MacLeod (2012) have shown that a self-concordant goal setting and planning PPI can itself boost well-being. Moreover, the specific activities that participants plan vary greatly, depending on the strength chosen. Participants engaging their strength of gratitude may focus on simple pleasures to enjoy in the present moment, which utilises the Attention and Awareness Domain. Such an activity differs greatly from the activities of people engaging their strengths leadership, which utilises the Virtues and Relationships Domain. Thus, using the DPF-5 framework illuminates the many and varied pathways through which a single PPI such as strength activation boosts well-being.

Second, the DPF-5 can reveal ways in which different PPIs may influence psycho-social functioning in similar ways. Compare, for example, the Three Good Things (TGT) gratitude intervention (Seligman et al., 2005) and positive writing interventions (e.g. Burton & King, 2004; Lyubomirsky, Sousa & Dickerhoof, 2006). Both of these interventions engage the Attention and Awareness Domain, requiring participants to regularly focus attention on positive aspects of situations. Benefit finding is another type of PPI (e.g. McCullough, Root & Cohen, 2006; Watkins, Cruz, Holben & Kolts, 2008), which again involves focussing attention onto positive aspects of situations. This time, the situations are ostensibly negative, and participants look for possible benefits arising from them. Finally, a 'positive visualisation' PPI has also tested the focussing of attention onto positive aspects of imagined future events, with benefits to happiness (Quoidbach, Wood & Hansenne, 2009). Thus, by comparing how four ostensibly different PPIs all engage with the Attention and Awareness Domain, it can be seen that they all involve directing attention toward positive aspects of situations. Understanding such similarities between different PPIs will help to uncover the mechanisms by which they operate.

Third, the DPF-5 can help to reveal the ways in which PPIs concerning the same construct may, in fact, influence psycho-social functioning in different ways to cultivate well-being. Take, for example, the TGT intervention of Seligman et al. (2005), which concerns gratitude and engages both the Attention and Awareness and Emotions domains. This PPI asks participants to write down three good things each day in a journal. The gratitude visit PPI (Seligman et al., 2005) also concerns gratitude, yet it draws upon more domains of positive functioning. As in TGT, individuals engage the Attention and Awareness Domain, directing their attention toward ways in which others have benefited them to identify a person to thank and a reason for doing so. As in TGT, participants are also likely to experience affective gratefulness in the Emotions Domain as they recall the reasons for thanking their benefactors. Yet, the gratitude visit differs from TGT in the Goals and Habits Domain. The TGT intervention involves a habit of gratitude journalling, while the gratitude visit requires setting a goal to write and deliver the letter of gratitude. Moreover, the gratitude visit activates the Virtues and Relationships Domain, which TGT does not, by requiring participants to activate strengths such as courage and kindness to read their letter of gratitude in person. This expression of gratitude is likely to enhance the participant's relationship with that person. Thus, the gratitude visit involves a greater number of psycho-social domains than the TGT. Without considering such differences, these two gratitude interventions might be deemed to be causing the same underlying change, since they both target gratitude. The DPF-5 framework helps to reveal how the gratitude visit influences psycho-social functioning in way that differs from the than the TGT exercise to effect positive change.

Fourth, the DPF-5 highlights the importance of approaching well-being as a complex system and considering how domains may interact in PPI research. If a PPI influences the functioning in a given domain, it could in turn influence the functioning in a second domain, when in turn could influence well-being outcomes. In this example, the second domain represents a mediator between the primary changes caused by the PPI in the first domain and the outcomes. The DPF-5 suggests that mediated effects are to be expected. Indeed, existing research has shown many such mediation pathways exist. For example, gratitude interventions can directly influence the Emotions Domain by cultivating affective gratitude (Emmons & McCullough, 2003; Lambert, Fincham & Stillman, 2012). These positive emotions can then in turn influence social, cognitive, and physical functioning (Fredrickson, 2004) in other domains to increase well-being.

Another example of these mediated pathways comes from research into benefit finding, which involves the Attention and Awareness and Comprehension and Coping domains. McCullough et al. (2006) showed that benefit finding influences the Emotions and/or Virtues and Relationships domains by facilitating forgiveness, which in turn positively influences health and well-being through several mechanisms (Lawler et al., 2005). Failure to consider such mediation pathways may obscure rather than clarify the complex ways in which

PPIs influence psycho-social functioning to increase well-being. This new framework provides a timely tool to guide investigations into these complex dynamics.

Fifth, the DPF-5 invites new research into the design of selection of PPIs. Might it be that PPIs that influence multiple domains are more effective than single-domain interventions? Alternatively, perhaps programs combining several PPIs that all influence the same domain may be more effective. For example, gratitude exercises could be combined with a mindfulness PPI to target the Attention and Awareness Domain. These possibilities invite research into the interaction effects between PPIs, or their 'active ingredients', whereby particular combinations may reinforce each other. Factorial experimental designs could be used to investigate such possible interaction effects.

Sixth, a practitioner-friendly inventory of positive psycho-social functioning could be developed using the DPF-5 framework. Individuals might be assessed using such an inventory to provide a clearer insight into the manner in which they are functioning. This insight could be used to strengthen areas of poor functioning or build on the existing strengths with appropriate intervention strategies. For example, participants low on positive emotions could be advised to adopt PPIs that target the Emotions Domain in particular. Alternatively, participants who are already strong in positive emotions might be advised to engage in a PPI that enhances attention. In this way, an inventory of psycho-social functioning based on the DPF-5 may provide more actionable information than broader measures of well-being and life satisfaction.

Implications for measurement

The new DPF-5 framework also has implications for how psycho-social functioning is measured. Typically, psycho-social functioning is measured at the level of constructs (e.g. gratitude), yet there are often several domains of psycho-social functioning that contribute to a PP construct. The DPF-5 invites the development of new instruments which measure the underlying aspects of psycho-social functioning in each domain as pertaining to a given construct. For example, in addition to the global gratitude construct, the new DPF-5 suggests that gratitude can be measured with respect to attention, comprehension, emotions, goals and habits, and virtues and relationships. In this way, it may help to bring clarity to the current vagueness of PP constructs highlighted by Jayawickreme et al. (2012). Measuring psycho-social functioning within each domain will provide clearer insight into how different moment-by-moment psychological and social processes, states and events collectively influence existing PP constructs.

The DPF-5 domains also have implications for measures of how well a person is characteristically functioning - that is, measures of well-being outcomes. Seligman's (2011) PERMA is a framework of well-being. We suggest that the DPF-5 shows the processes that lead to PERMA. For example, the Goals and Habits Domain involves motivation, goals, and planning, which can lead to the well-being outcome of a high sense of achievement. The Virtues and Relationships Domain involves forgiveness, relationship commitment, morality and prosocial behaviour, which may contribute to the well-being outcome of positive relationships. In this way, the new DPF-5 can be used to direct people to find more concrete ways to achieve the PERMA well-being outcomes by identifying the specific domains of psycho-social functioning they need to utilise.

Limitations and future research

This framework is an initial attempt and refinements to the DPF-5 are to be welcomed as the field of PP develops and grows. The present domains are based on existing PP-related documents published in *PsycINFO*®over the last two decades from a wide range of disciplines. The literature covers a broad spectrum of psycho-social functioning. However, other domains of psycho-social functioning may emerge as new topics become researched.

Limitations of the present analysis allow scope for improvement in further research. The present framework is based on a numerical analysis of the titles, abstracts and keywords present in the sample of PP-related documents. This method allows for a very high-level statistical analysis of *large numbers* of articles (18,401) that represent the broad field of PP. This breadth and representativeness is traded-off, however, for depth of analysis, which could be achieved through reading and coding the full text of a smaller number of PP-related documents by hand. The present analysis relies on the collective information gathered by investigating 3466 terms related to PP, and the large-scale domain structure incorporates tens of thousands of correlations between these terms. Any future in-depth analysis would, therefore, require the coding of a very large number of articles to generate the number of correlations required to derive a similar set of domains.

Conclusion

The field of PP seeks to study and understand optimal psycho-social functioning, yet it has lacked an empirically derived framework of psycho-social functioning. The present article has put forward the

Psycho-Social System Approach to Well-Being (see Figure 1) to address this lack. Adopting this approach, a co-term methodology was used to identify five domains of positive psycho-social functioning (Table 1). This new framework may offer fertile ground in which psycho-social functioning can be understood as a complex dynamic system. Interventions, environmental factors and biological factors constitute the inputs of interest to this system. How well the system characteristically functions is measured by well-being outcomes, which constitute the outputs of interest. It is hoped that the Psycho-Social System Approach utilising the DPF-5 framework will stimulate further research into how positive interventions can increase well-being.

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Appendix A - Equations

The conditional probability is given by Equation 1:

$$P(i|j) = \frac{n_{ij}}{N_j} \tag{1}$$

where $P(i|j)$ represents the conditional probability of term i being present in a document given that term j is present, n_{ij} is the total number of documents in which i and j co-occur, and N_j is the total number of documents that contain term j.

The cosine similarity between term i and term k, s_{ik}, can be written here as:

$$s_{ik} = \frac{\sum_{j=1}^{a} P(i|j) \times P(k|j)}{\sqrt{\sum_{j=1}^{a} P(i|j)^2} \times \sqrt{\sum_{j=1}^{a} P(k|j)^2}} \tag{2}$$

where a is the total number of terms (180227).

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