Corresponding Author:

Andy Habermacher

President Human Brains Foundation

founder leading brains

Certified Master Coach (BCI).

Bleicherstrasse 4, 6003 Luzern Switzerland, T: +41 41 240 63 68, M: +41 78 815 88 37, E:

andy@humanbrainsfoundation.org

Argang Ghadiri, M.Sc.

Ph.D candidate, Bonn-Rhine-Sieg University of Applied Sciences

Prof. Dr. Theo Peters

Organization and Project Management, Bonn-Rhine-Sieg University of Applied Sciences

Describing the elephant: a foundational model of human needs, motivation, behaviour, and wellbeing

Andy Habermacher, Argang Ghadiri & Theo Peters

Abstract:

Models of basic psychological needs have been present and popular in the academic and lay literature for more than a century yet reviews of needs models show an astonishing lack of consensus. This raises the question of what basic human psychological needs are and if this can be consolidated into a model or framework that can align previous research and empirical study. The authors argue that the lack of consensus arises from researchers describing parts of the proverbial elephant correctly but failing to describe the full elephant. Through redefining what human needs are and matching this to an evolutionary framework we can see broad consensus across needs models and neatly slot constructs and psychological and behavioural theories into this framework. This enables a descriptive model of drives, motives, and wellbeing that can be simply outlined but refined enough to do justice to the complexities of human behaviour. This also raises some issues of how subjective wellbeing is and should be measured. Further avenues of research and how to continue building this model and framework are proposed.

Keywords:

Human behaviour, cognition, evolution of behaviour

The Backdrop

Needs and motivation models have aimed, in simplified forms, to give descriptions of how human beings behave and what we need for optimal functioning and wellbeing – and many authors, over the centuries, have made attempts at giving simplified models that attempt to cut through the complexities of human behaviours and desires. This can be seen as the quest to find the elusive equivalent of $E=MC^2$, a succinctly accurate model for human behaviour. To do this, different approaches have been taken over the centuries, philosophical musings, models of previous researchers updated and modified, new models proposed based on the weaknesses or strengths of others, empirical and statistical approaches, and recently updated with neuroscientific and evolutionary insights.

One would assume that these, often illustrious, scientific minds would have come at least to some agreement on general drives of human behaviour. However, when reviewing these models, it becomes quickly clear that, though some drivers of human behaviour are commonly acknowledged, there is, according to a review by Aunger and Curtis (Aunger and Curtis, 2013), and also a review by Pitman and Ziegler (Pittman and Ziegler, 2007), “an astonishing lack of consensus” between these models. This leaves us in the uncomfortable position, after centuries of philosophising, research, experimentation, and analysis, of researchers fundamentally disagreeing on what drives human beings. This is all the more surprising considering the advances in behavioural and cognitive sciences in recent decades.

Our view is that the problem lies not in the research but in being able to describe true human behaviour and the analogy that jumps to mind is that of the parable of six blind men and the elephant: each blind man touches a different part of an elephant and thus describes it according to what they are touching: thin and leathery if they are describing the ear, wet and soft if they are touching the end of the nose, etc. We can’t help but feel that this is the case with these models that have been proposed over the last century or so:

These men of science
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right
And all were in the wrong!

History of Needs Models

Models of human needs have a rich history and numerous models have been proposed over the last century or so. The first simplistic roots of needs and motivational models lie in formulations of a need and desire for pleasure over pain. This formulation stretches back millennia: Epicurus, John Bentham, William James, and as Freud's Pleasure Principle. This dual model, however, would obviously fail to encapsulate much of human experience and our refined set of needs.

Needs and motivation models can be dated back to 1815 when Bentham proposed a model of motives, his "springs of action" (Bentham and Goldworth, 1983). William James proposed his model of instincts in 1890 (James, 1890) – similarly McDougall saw instincts as motivational dispositions (McDougall, 1932) and proposed 17 instincts that linked perception, behaviour, and emotions – this is the instinct school of thought which, however, failed to gain widespread acceptance.

Murray's model of needs followed in 1938 (Murray, 1938) one of the first to be labelled a needs model. This is a refined model (see Table 1) and proposed primary needs such as desire for nutrition and sex, and secondary needs such as ambition, and affiliation, broken down into six groupings.

Table 1

Murray's Needs Model

Primary/ viscerogenic needs		
Desired Outcome	Need	Directional Force
Intake	Air Water Food Sentience	Positive Drive towards an object
Output	Sex Lactation Expiration Urination Defecation	
Retraction	Noxavoidance Heatavoidance Coldavoidance Harmavoidance	Negative Drive away from an object
Secondary/ psychogenic needs		
Domain	Need	Behaviour
Ambition	Superiority	To seek validation for power (Often split into Achievement and Recognition)
	Achievement	To accomplish difficult tasks, overcoming obstacles and becoming expert
	Recognition	To seek praise and commendation for accomplishments
	Exhibition	To impress others through one's actions and words, even if these are shocking. (Often combined with Recognition)
Materialism	Acquisition	To gain possession over an object
	Conservance	To maintain the condition of an object
	Order	To make things clean, neat and tidy
	Retention	To keep possession over an object
	Construction	To organize or build an object or objects
Status	Inviolacy	To prevent harm to self-respect or "good-name"
	Infavoidance	To avoid failure and humiliation
	Defendance	To defend oneself against attack or blame, hiding any failure of the self.
	Counteraction	To make up for failure by trying again, seeking pridefully to overcome obstacles.
	Seclusion	To be isolated from others (opposite from Exhibition)
Power	Dominance	To control one's environment or the people in it through command or persuasion
	Deference	To admire a superior person; praising them, yielding to them, following their rules.
	Autonomy	To resist the influence of others and strive for independence
	Contrariance	To act unique, different from the norm
	Infavoidance	To avoid being humiliated or embarrassed.
Sadomasochism	Abasement	To surrender and submit to others, accept blame and punishment. To enjoy pain and misfortune
	Aggression	To forcefully overcome, control, punish, or harm someone
Social-Conformance	Blame avoidance	To inhibit asocial behavior to avoid blame or ostracism
Affection	Affiliation	To be close and loyal to another person, pleasing them and winning their friendship and attention
	Rejection	To separate oneself from a negatively viewed object or person, excluding or abandoning it.
	Nurturance	To help the helpless, feeding them and keeping them from danger
	Succorance	To have one's needs satisfied by someone or something. Includes being loved, nursed, helped, forgiven and consoled
	Play	To have fun, laugh and relax, enjoy oneself
Information	Cognizance	To understand, be curious, ask questions, and acquire new knowledge
	Exposition	To find and demonstrate relations between facts

This appears to be a solid attempt to think through human needs but also failed to gain popularity. In the meantime others had latched on to human needs and the drives of human behaviour for more real-world applications, namely business, and Starch proposed a model of needs in 1923 for sales and advertising (Starch, 1923). This in itself highlights the real-world applications of needs not just as grand theories but with applications in all aspects of life.

From this follows Maslow's famous pyramid (Maslow, 1943) and in response to this, lesser known, to the layman, at least, is Alderfer's model (Alderfer, 1969) which aimed to focus on psychological needs only and to correct some obvious flaws with Maslow's pyramid such as people not necessarily moving through the levels of the pyramid. His model therefore only included three equally important needs of Existence, Relatedness, and Growth. Maslow's model it must be noted has remained conspicuously persistent despite the weaknesses of his model apparent on closer critical review.

Throughout the 1950's-1970's there was little focus on needs excepting in bringing these to more specific contexts such as business with McClelland (McClelland and Burnham, 2003) and Herzberg (Herzberg, 2003) forming two popular models. Advances were made in what can be considered related fields namely personality, and values – Dweck would attempt to consolidate these into a single framework in 2017 (Dweck, 2017), as we also propose in this paper. The world of psychology was also in the grips of behaviourism seeing little place for innate drives and motives.

The 1990s saw needs models being applied to various contexts and fields and updated or new models proposed: conflict resolution, sociology, education, and well-being and this arguably laid the base for the growth of a variety of needs models, not to mention that the human potential movement was still gaining momentum.

From 2000 onwards, as research has amassed in different fields, different models have emerged. Some have focused more on the business context, others in society development, and yet others

have developed with the cognitive and particularly neurosciences, and more recently in cognitive computing. Some of these have become well-known models such as Deci and Ryan's Self-Determination Theory (Deci and Ryan, 2000) which has become the most widely known and referenced contemporary model and has a large body of research to back it up.

We can therefore see a deep and rich history of needs and motivation models, but a wide variety of models exist, offering different explanations for human motivation, needs for optimal psychological functioning, and well-being. Many of these models remain obscure irrespective of quality, and despite this rich history and multiple lines of research, as we noted in our opening words, there remains a persistent and “astonishing lack of consensus” on what constitutes human needs, motivation, and drivers of human well-being.

A number of authors have attempted to overcome this and proposed “grand theories” of motivation in some form. Notable are Grawe and his Consistency Theory Model (CTM) (Grawe, 2007), Aunger and Curtis and their Behavioural Production Unit (BPU) evolutionary based model of human motivation and behaviour (Aunger and Curtis, 2013, 2015), Habermacher et al. have updated Grawe's CTM and matched this to evolutionarily neuroscience (Habermacher et al., 2016), and recently Caroline Dweck and her BEATS theory (Dweck, 2017). However, in line with the astonishing lack of consensus, these four models, well-researched and impressive as they are, also lack consensus amongst themselves. This leaves us with the conclusion that 1. *one* of the models is the most accurate description and the others are lacking/flawed 2. they *all miss the mark*, or 3. they are all describing the same thing in different ways, and finally 4. They are all partly correct and partly wrong. This brings us back to our analogy of the blind men and the elephant.

With the massive progress in the cognitive, social, and neurosciences in recent years and alternative methods to measure behaviour (e.g. through online behaviour and large-scale data mining) it seems that the behavioural scientific community has never before been better equipped to formulate a clear motivational and needs model – indeed there seem to be nothing in

the way of being able to form this - aside from the apparent fiendish complexity of human behaviour – maybe.

With this in mind we set out to clarify in more detail what basic human needs are, how they can be formulated and how we can align the multiple lines of evidence to build a model that satisfactorily explains motivation, needs for optimal functioning, and human nature comprehensively enough to do justice as a model of human behaviour and bring consensus amongst these models.

Literature Review

A review of the literature shows there is general acceptance of the idea of human psychological needs (see Table 2) and they are often referred to as general concepts, single needs referenced, and surprisingly Maslow's model still referenced and taken at face value to be accurate – Maslow's model does not withstand critical review.

In literature (see Table 3) we can see that Ryan and Deci's SDT is mostly referenced in recent research, that Maslow is referenced surprisingly often albeit mostly on older work, single needs are commonly referenced e.g. the need for attachment. What is also noticeable is that basic human needs are often referenced as if there were a clear understanding of what they are ("general"). It is also clear is that many researchers propose their own sets of needs.

Table 2

Academic database searches

	PubPsych	BASE	PsyDok	APA	Scopus	Mendeley	Google Scholar
"Human psychological needs"	2297	8880	3293	4818	21725	6559	1520
Abstract				88			
"Basic human needs"	555	21494	2158	443	27978	14233	78400
Abstract				40			
"Basic human psychological needs"	264	2411	3331	360	28932	29120	441
Abstract				10			
Total Abstract	70			138			

Accessed 01.05.2020

Table 3

Break down of search results for “Human Psychological Needs”

			Mendeley top 100		PubPsych	
			Query: "Human Psychological Needs"		Query: "Human Psychological Needs" or "Basic Human Needs" (In Abstract or Title)	
			Accessed 17.05.2020		Accessed 01.05.2020	
			6559 results		70 total results without duplicates	
			first 100 analysed			
Models			Nr		Nr	
SDT						
	Total	65	SDT	60	SDT	5
Maslow &						
			Maslow	5	Maslow	4
			Kenrick	2	Z-R	1
	Total	12		7		5
Other Needs Models						
			Staub	1	Staub	2
			Sheldon	1	Fromm	2
			Dweck	1	Tebb	2
			Schüler	1	Gibbs	1
			Cog/Exp	1	Grawe	1
			Gallup	1	Glaser	1
			10 needs	1	Kernstock	1
			Dweck	1	Bulhan	1
					Gaming	1
					PSI	1
	Total	20		7		13
Single needs						
			Relatedness	1	Attachment	3
			Autonomy	3	Significance	1
			Flexibility	1	Disgust	1
			Benevolence	1	Truth	1
			Social identity	1		
			Morality	1		
			Belonging	1		
			Impression	1		
	Total	16		10		6
Two needs						
	Total	4			Two needs	4
					Attachment	Self-esteem
					Autonomy	Relatedness
					Autonomy	Affiliation
					Competence	Accepted member
Multiple needs						
	Total	6			Multiple	6
General						
	Total	33	General	6	General	27
Contextual						
			Flow	2		
			Crimogenic	1		
	Total	3		3		
Universals						
			Schwartz	3		
			Universals	1		
	Total	4		4		
Control Theories						
			Theory Planned	1		
			Control Theory	1		
	Total	2		2		
Human & Social						
			Human rights	1	Social	1
	Total	2				
Physical						
			Water	1	Physical	1
	Total	2				

Though needs models have been developed in different academic disciplines the field of psychology has provided much of the work on needs models. However, on closer review there have been numerous other fields that have developed needs models, some of which are comprehensive models.

Psychotherapy has provided a rich field for human psychological needs particularly, obviously, with a view to dysfunctional behaviours and outcomes. Most of these have developed as single need theories, Freud's Pleasure Principle (Freud, 1923), Alder's Striving for Superiority (Bagby, 1923), Bowlby's Attachment Theory (Bowlby, 1944). Klaus Grawe more recently proposed, on writing on neuropsychotherapy, thereby combining the then latest research into the brain and brain development and his and others previous research, the Consistency Theory Model (Grawe, 2007). This model includes motivational factors, how these are updated, how they include both approach and avoidance motivation and how these can lead to psychopathology by understanding the underlying biological mechanisms.

Despite needs models being heavily grounded in the cognitive sciences and hence psychological research, other fields have also generated models such as Human Scale Development (Max-Neef, 1989) that was developed in response to global poverty and well-being in developing nations and contexts, specifically South America. Human Scale Development is a refined model that outlines needs but also ways of behaving with or without these needs, and their satisfaction or pseudo satisfaction. On a geopolitical theme Staub (2005), Bulhan (1985), and Burton (Coser and Burton 1991) have all proposed needs models as underlying causes for geopolitical conflict and resolution thereof.

With the advancement of neuroscience other models, though in the more popular than academic realm, have been proposed such as those by Rock (2008) and Häusel (2009). Other areas that have developed models of needs are also in cognitive computing (Dörner and Güss, 2013).

Similarly, there have been models developed from evolutionary sciences by seeing behaviours as evolutionary adaptations that have developed in an environment and in parallel with the

development of the brain's structures such as Bernard et al.'s Evolutionary Theory of Motivation (Bernard et al., 2005) and Auger and Curtis' BPU Theory (2013, 2015).

In the background there has also been increasing realisation that human needs are increasingly refined – basic physical needs have been generally ascribed a quick note on nutrition and water. The nature of this nutrition is important with an increasing importance shown, for example, of the microbiome, which in turn has been shown to have influences on our psychological states and mental health (for review on mental health: Rieder et al., 2017). Similarly, the sheer importance of sleep has been overlooked and similarly its important influence and interplay with psychology and psychopathology (for review: Abel et al., 2013). Similarly, the need for physical exercise or movement has strong influences on all aspects of health but notably also psychological health. Other factors may also be grouped into these physical needs – the need for sunlight, the subsequent production of vitamin D but also sunlight's influence on producing other feel good chemicals and particularly nitric oxide influencing cardiovascular health – should this also be categorised as a need? Indeed, should we not also class light in general as a basic need because of its influence on our diurnal rhythms and hormone production? What is therefore clear is that basic physical needs are much more refined than once considered and there is also a strong and clear association with psychological well-being. Therefore, simply grouping physical needs as simplified group may not be sufficient for researchers and not understanding the interplay with psychological needs could be an oversight in many needs models.

This leaves us with a complex set of previous research and proposals for human needs. For previous analysis the authors have reviewed about a dozen different needs models. However, a literature review managed to uncover multiple other models and we include a total of 54 in this review (see Supplementary Materials, *Full List of Needs Models*). In addition to these, there are a host of needs commonly proposed by authors, independent researchers, and motivational speakers but many of these lack a clear rationale and/or academic support.

This “astonishing lack of consensus”, already noted, is thus magnified – this quote was used to describe first six needs models that misaligned, and then 20 models. We now have 54 models – or 54 authors (and multiple more co-authors) all attempting to describe the elephant in different ways despite many using valid academic approaches. We will disentangle these as we progress to give a clearer description of our proverbial elephant.

Why a Needs model?

A valid question to ask at the outset is, why do we need a needs model?

There are two main reasons for a needs model:

1. Needs models serve a purpose of giving a general description of human desires and therefore of general human motivation, and subsequent behaviour. A need for sustenance will lead to prioritising search for food over other factors and a desire for affiliation will lead to human beings in general striving for friendships and protecting family and clan members. This is the needs as motives principle.
 - a. These are therefore general models of what will guide human behaviour on average in various contexts.
 - b. As a general model of human behaviour to then serve as guides for building and designing policies, structures, and guidelines, for groups of people. This may include leadership in business and organisational design; policies by intergovernmental agencies to influence behaviours; influences on crime and extremism; educational policies; etc.
2. Needs models serve a purpose of giving a general model of what human beings need for healthy functioning, for well-being and mental health. Indeed, violation of human needs has been shown to decrease well-being and been linked to multiple psychopathologies. This is the needs as requirements principle.

- a. Therefore, needs show us how to best increase well-being and avoid disruption in multiple contexts, for example, education but also in business contexts and society at large.
- b. Needs models serve as guides for optimal human function, or “thriving” as many propose. In short, they are guides for increasing subjective well-being, or in short, happiness and fulfilment. Satisfying one’s needs leads to happiness - or so the hypothesis.

These reasons also go some way to describe this astonishing lack of consensus of needs models; some are explicitly designed as models of human motivation, and others as models for optimal functioning, and others for betterment of society at large, and others in specific contexts such as education, and business.

In summary needs models serve the purposes of:

- Giving a general model of human psychological drives, motivation, and subsequent behaviour
- Giving key requirements for healthy (optimal) psychological well-being
- Informing others, in simplified terms, how to increase human well-being be that in organisational contexts, education, or public policy

In short, a needs model should give simple but accurate model of human behaviour and guide others to enable better functioning of human beings and better health. Optimistically, it should therefore give concise information to enable the betterment of the human condition in societies.

We add this should be simple enough to be accessible but complex enough to do justice to complex human behaviours. In our analogy of the elephant and the six blind men we would want a reasonably simple but accurate description of the elephant.

What do needs models describe

If the needs model is to propose a general model of human behaviour and psychological well-being, then they must be able to describe general human functioning. This in itself is problematic for different models describe levels of functioning – the previously noted “astonishing lack of consensus” also applies at this first level. Pitman and Ziegler in their review of six needs models (Pittman and Ziegler, 2007) categorized models into their level of analysis:

1. The biological level
2. The individual level
3. The social level

The biological level by Pitman and Ziegler referred to the physiological needs level i.e. nutrition and water, etc. However, considering the advances in the neurosciences and increased understanding of psychological impacts on physical systems (and vice versa) we would expand this now to include understanding biological impacts of violating or fulfilling needs. A fourth aspect not considered is that of the level of the environment i.e. influence on environment through factors such as storage (independence from environment), building shelters, clearing forests, farming and forming rivers, lakes, etc. Therefore, we propose, needs should cover all four of these levels to be able to reasonably explain human motives and psychological requirements.

1. The biological level

Biological functioning such as physiological needs but also in biological impacts of psychological needs fulfilment and violation, and biological mechanisms that drive behaviour.

2. The individual level

How this impacts individual drives, motivation, and well-being

3. **The social level**

How needs will be influenced with and for other individuals but also in social groupings and society.

4. **The environmental level**

How this impacts the (non-social) environment.

The majority of needs models explicitly focus on the individual but also on their social interactions. More recent models have made an explicit link to the biological underpinnings, particularly those rooted in neuroscience such as Grawe's CTM (2007), Rock's SCARF model (2008), and PSI (Dörner and Güss, 2013) in the field of cognitive computing. These link the underlying neuronal structures to behaviour. Similarly measuring disruption can be quantified at this level – the case for the attachment need is strengthened when one reviews the research into (disrupted) neuronal growth of rat pups that have been separated from mothers (for example: Aguggia et al., 2013). Or alternatively the positive effects of oxytocin when stimulated with attachment (for example: Adkins-Regan, 2009). With the advances in the neurosciences, aligning biological process to individual and social needs gives robust support for the needs and how these manifest. Though many needs models include physiological needs, none explicitly show how these influence psychological needs despite recent research clearly showing this. For example, exercise has a significant and well documented impact on brain health, increasing plasticity and reducing inflammation (for example: Cotman et al., 2014; McDonnell et al., 2013) and lowers symptoms of depression with a “large and significant effect size” according to one meta-analysis (Josefsson et al. 2014).

Similarly, few models explicitly focus on environmental factors outside of the social environment or contexts such as healthcare and business which some models explicitly focus on. The exception is on one hand Nussbaum's capabilities (Nussbaum, 2008) which includes capabilities of *control over environment* and *relationships to other species*, and evolutionary

models which are built on the premise of human beings developing to master environmental challenges at all levels.

A further consideration is how needs models interpret their structures. Maslow famously built his as a pyramid which seems to sound intuitively correct: physiological needs must be fulfilled to survive. But this does not necessarily follow evolutionary principles: as a tribal based creature, human beings are dependent on each other to fulfil their physiological needs. Therefore, the need of affiliation may be just as important as the psychological need for food because access to food in enough quantities is dependent on group work. This highlights that needs can and most likely do operate in parallel and influence each other. Tay and Diener (2011) and their review of the Gallup World Poll (GWP) data showed that needs follow weak prioritisation but this is contextually and culturally dependent.

Pitman and Ziegler give four forms:

- **Root cause** - need as the *primary* human driver: e.g. Attachment Theory (Bowlby et al., 1992), Terror Management Theory (Rosenblatt et al., 1989), Adler's striving for superiority (Bagby, 1923)
- **Hierarchy of needs** - needs build on top of other needs: e.g. Maslow (1943)
- **Check and balance of needs** - needs operate in tandem with each other and influence one another: e.g. Epstein (Epstein and Weiner, 2003), Grawe's CTM (2007), Alderfer's ERG (1969)
- **Independent needs** - needs operate independently of each other: e.g. Ryan and Deci's SDT (2000)

In our view needs can only follow a check and balance concept or rather a *multiple (independent) modulatory system* which is supported by Tay and Diener's review of the GWP data. This is because this is the normal process in biological systems and particularly in the neurosciences: variations of this have been proposed based on neural structures and levels of

consciousness by Baars (Baars, 1998), and Dennet (Dennett, 1991) describing cognitive systems as *multiple independent specialists*; also described as *multiple independent systems* when describing the evolution of motivation by Bernard et al. (2005); and *multiple modulatory neural circuits* when describing the neurological underpinnings of emotion and decision-making by Phelps et al. (2014). We prefer the term *independent modulatory system* as this is based on the fact that biological systems are independent modulatory systems. Consider our organs: we have a heart, lungs, and liver, and brain, each are fundamental to our survival. These operate together by modulating each other's behaviour. We could prioritise each over other, but this is only useful in, for example determining how quickly one may die when one fails to function - if the kidneys pack up we have a few days, the brain a few seconds, the heart maybe a minute or so, the lungs similarly. But for our survival all are critical and each modulates and influences the other. So much so that these have also been called axis – the heart-brain axis (for example: Riching et al. 2020), the gut-brain axis (for example: Allen et al. 2017), the skin-brain axis (for example: Mueller et al. 2017), to name some of the most commonly referenced and researched.

Therefore, we consider only an independent modulatory system as able to reasonably describe human motivation and requirements for well-being and being biologically accurate.

The *needs as requirements* and *needs as motives* is a further reason for this “astonishing lack of consensus”. These we can split into four groupings:

- Needs as motives: Maslow (1943)
- Needs as requirements: Tebb (1995), Warr (1994), Gibbs (1998)
- Needs as motives and requirements: SDT (Deci and Ryan, 2000), HSD (Max-Neef, 1989)
- Needs as motives and requirements that are updated and modified: CTM (Grawe, 2007), Alderfer (1969); PSI (Dörner and Güss, 2013)

As models of human behaviour and well-being they must follow that they follow motivation as other researchers have also outlined (Sheldon and Gunz, 2009; Prentice et al., 2014; Schüller et

al., 2019). If we take the basic physiological need for nutrition, we can see that this influences first desire, then motivation, then action orientation, then satisfaction (or frustration) and well-being. Many argue that satisfying a need is not necessarily fulfilling a need such as Max-Neef (Max-Neef, 1989). This may be the case but this in itself should be explained by a needs model. Consider the example of food: we have a natural desire for high calorie food – a healthy natural adaption in the “wild” - but in our current model world where high calorie food is available with little effort this causes multiple disorders, and stuffing our faces with chocolate does not lead to deep fulfilment. The desire for high calorie food sufficiently explains our behaviour whether or not this leads to fulfilment or leads to better health or not is not relevant at first blush.

However, at second look we can see that we are violating another need, namely the need for movement, and at third look we can see that we are failing to fulfil, potentially another need of bonding in, for example a group hunting experience. Therefore, a model of needs can sufficiently explain the desire for high calorie food, the motivation for high calorie food, but also explain the imbalances this can cause and what they are. As evolutionary psychologists have long known “we have a stone age mind in a modern skull” (Cosmides and Tooby, 2006). Modern western society is a not always conducive to healthy functioning of physical or psychological needs. A needs model can then help point to effective interventions.

Another aspect that few make explicit is of optimal levels of fulfilment i.e. is more of a need better, or is there an ideal level, and, if so, what is this? This is what Peter Warr called the vitamin concept (Warr, 2007): a deficiency will cause disruptions, enough will lead to healthy functioning, but fulfilment above a certain level may no longer increase well-being. McClelland in his model saw these as hygiene factors i.e. that a factor can become accepted and then further fulfilment will not lead to a further increase in fulfilment, but a decrease will lead to disturbances (McClelland and Burnham, 2003). Needs as requirements models propose that fulfilment of the needs leads to an increase in well-being and, as an extension of this, therefore, optimal functioning. Some models are focused on specific contexts such as business and healthcare.

These are therefore concerned with, particularly in healthcare, avoidance of stress, and burnout. There have been few attempts to match this to biological markers of stress and burnout and indeed this would strongly support needs models that are explicitly built on biological underpinnings.

The question of optimal functioning can also be translated to productivity in the business world – the happy productive worker hypothesis (for review: Wright and Cropanzano, 2000). The research is not as conclusive as one might expect despite many positive benefits of being a “happy” worker - other factors can be just as important in business contexts, such as organisation, structure, and processes. Also the formulation of happy productive work has been questioned with more recent research focusing on psychological well-being (for example: Zelenski *et al.*, 2008) Another obvious factor on productivity is that satisfied needs may *lower* motivation and drives – if needs are motives to fulfil a need then it follows that drive will decrease, and resources saved when a need has been fulfilled. This is reflected in research into dopamine whose levels drop after a reward has been received (for example: Fiorillo *et al.*, 2003). An interesting aspect of this research is that motivational intensity related to dopamine which shows that dopamine is *increased* (as a proxy for motivation in this case) when research animals do *not* receive a reward at each successful attempt (for example: De Lafuente and Romo 2011) and with different probabilities – with the probability of 50% stimulating the highest level of dopaminergic neuronal activation (interestingly often seen in the sports world in the context of the final in many competitions).

Another question is that of individual updating of needs models. The working assumption of most needs models seems to be that, as human needs, all human beings need these for healthy functioning and high SWB. However, at the level of the individual we can see obvious discrepancies. Some people have higher desires for certain needs and also some people will update their motivation and needs models - on failure to achieve a motivational goal some may redouble their effort and others may give up. Some individuals may be happy with some level of

autonomy, but others may be happy to have clear goals laid out for them with little autonomy. Needs models that 1. fail to explain individuality and 2. fail to explain how these are updated, will be missing some obvious aspects of human nature.

Alderfer was probably the first to propose this with his ERG model which explicitly outlined factors influencing satisfaction (Alderfer, 1969). He named these: *satisfaction progression* i.e. building on satisfaction of needs, and *frustration regression* i.e. compensating or lowering desire for needs. Considering our biological neuroplasticity particularly in younger years, models that describe this updating process would be biologically accurate and become a model that can more accurately describe how human beings operate. Because of its grounding in cognitive computing the PSI model is one that has a very clear model for this - indeed it is built on this premise. Other models such as the Consistency Theory Model (Grawe, 2007) also show how motivation is updated and built into schemas of motivation influencing one's way of behaving. Dweck's BEATS theory (Dweck, 2017) similarly works with this principle, a model of how human beings develop.

Therefore, we can see that some models clearly aim to explain the biological and psychological mechanisms of updating motives and potentially needs. But few can explain individual differences. Obviously human needs are considered human needs because of their universality, however, disagreements on what are precisely human needs likely also arise from different interpretations, but also the personal preferences of the researchers themselves as to what constitutes a human need. We explore the needs themselves in the next section, but the concept of individuality is clearly missing in needs models. Those models that include updating of needs will, however, be accounting for individualism as individuals will over time build different motives depending on their own context. This may assume, however, that the starting point is the same rather than different, but this does not follow research into newborns which shows differences in behaviour from the earliest ages well documented over decades by "babylabs" of many leading universities.

A further motivational aspect that is conspicuously absent is that of avoidance motivation. When we understand its importance and omnipresence in the biological world, we consider this a critical and fundamental omission and flaw in the vast majority of needs and motivation theories. The approach-avoidance distinction is a well-established construct in psychology but also in multiple biological fields (for review: Elliot and Covington, 2001). Approach is moving towards positive aspects and avoidance is moving away from, avoiding, or protecting against negative aspects. An animal may look for new territory, approach, and/or protect its own territory, avoidance. This behaviour can be seen embedded in behaviours across all living organisms from a single-celled amoeba, to an earth worm, a mouse, a primate, and in human beings.

Elliot and Covington's review notes that:

“... it is clear that the distinction between approach and avoidance motivation has deep and widespread intellectual roots, represents a part of the evolutionary heritage that humans share with organisms across the phylogenetic spectrum, is instigated immediately and automatically in response to most if not all stimuli humans encounter, is grounded in the basic neuroanatomical structures of the brain, and concords with the intuitively based knowledge of how humans are motivated in their daily lives.”

And go on to state:

“As such it is surprising that in much contemporary empirical and theoretical work on motivational issues, the approach-avoidance distinction is either overshadowed or overlooked altogether.”

This in essence means that most needs models through not explicitly formulating avoidance motivation are missing out on half of human drives, motivations, behaviours, and issues that have serious impacts on mental health (Grawe, 2007). The majority of needs models do not sufficiently explain the function of avoidance motivation and its necessity to the human

condition. This in itself seems to be an obvious failing most of the needs models reviewed here.

Models that explicitly state avoidance factors are:

- Murray
- Reiss 16 desires
- McClelland
- Grawe's CTM
- Bernard et al. Evolution of Motivation
- Aunger and Curtis BPU Theory
- Habermacher et al.'s SCOAP model
- Talevich et al.'s Hierarchical Taxonomy of Human Motives

Therefore, for a needs model to be fully comprehensive and provide a reasonable if simplified view of the nature of humans it must be able to describe four levels of functions:

1. Biological
2. Individual
3. Social
4. Environmental

Furthermore, though needs should have a degree of independence, which should be reflected in biological structures and processes, they will operate as:

5. Independent modulatory systems

A full model must also be able to describe:

6. Desires and motives
7. Individuality of desires and motives

8. How desires and motives are updated
9. Show that fulfilment increases well-being
10. Show that non-fulfilment decreases well-being

And describe:

11. Approach motivation
12. Avoidance motivation

The above raises the hurdles for what can truly be considered a comprehensive needs model.

Only six models fulfil these to a satisfactory degree but with numerous discrepancies.

- Bernard et al's Evolution of Motivation
- Grawe's CTM
- Dörner and Güss' PSI
- Aunger and Curtis' BPU Theory
- Habermacher et al.'s SCOAP model
- Dweck's BEATS

Habermacher et al. fulfil these criteria well because it is firstly based on Grawe's CTM, which involves a clear model of how motives are updated and sees approach and avoidance motivation as overriding principles of motivation, and secondly the latest iteration includes evolutionary aspects drawn primarily from Aunger and Curtis. This presupposes that they have identified suitable and accurate needs. Therefore, the final question is that of which specific needs should a model describe – what actually are the basic human psychological needs?

How do we know they are basic human needs?

The previous section outlines what a needs model should be able to do and at what level, but this does not answer the question of what is a basic need itself: are there three, five, or twenty-five?

In the four models we have identified that can fulfil the previous criteria best, they vary from three to twenty-five needs. The reason for this discrepancy lies in researchers' interpretations but also their line of reasoning and whether models have been built on previous models or not. The lines of research commonly used are (see Table 4): philosophical reasoning, scientific experimentation, literature surveys, self-reported questionnaires, lexical analysis, statistical analysis, cultural universals, physiological stress reactions, cognitive architecture, and evolutionary theory.

Other potential avenues for research and hypothesising would be:

- **Market analysis**

Global markets give us an indication of what human beings buy and therefore are willing to invest their money into. This will give clear indications of the wishes, desires, and needs of human beings.

- **Online behavioural analysis**

Online behavioural analysis is a large area of research using vast datasets of how individuals respond in online contexts. This may be likes on social media platforms, clicks on websites, eye tracking on web pages, downloads of free resources, etc.

- **Artificial intelligence research**

Artificial intelligence is widespread and varied and includes many facets of cognition such as embodied intelligence. This can lead to interesting insights of how cognition in general operates, how it operates in human beings and how this integrates with our physiology.

Table 4

Academic approaches for needs models

Approach	Philosophical reasoning
Description	Questioning the nature of human nature and combining this with one's own observation and work from previous philosophers, and /or researchers. The earliest take these approaches but this is also present in more modern formulations.
Examples	Bentham, James, Maslow, Dweck
Problems	Worldviews, current state of scientific knowledge that guides thought, factors that are unknown and unconscious.
Approach	Scientific experimentation
Description	Experimentation has led to new insights. For example, Harlow's famed experiments with primates lent support to Bowlby's Attachment Theory and therefore more research followed.
Examples	Attachment theory, Deci & Ryan's SDT, Grawe's CTM
Problems	Science follows paths and trends, the obvious may be tested, the non-obvious ignored. Bias in interpretation and replication issues.
Approach	Literature survey
Description	Structured literature reviews give clear insight as to what the state of play is and current state of the science and research.
Examples	SDT, CTM
Problems	Only considering one's own field of research / science follows previous paths / theory-induced blindness
Approach	Self-reported survey
Description	Some approaches had used large scale surveys to deduce personalities, motives, and needs. This gives structured data to support a theory.
Examples	Reis' 16 desires, Chulef's Motives
Problems	You only get the answers to the questions you ask, and not all motivation may have conscious affect, or this can be interpreted differently.
Approach	Lexical analysis
Description	Some approaches have analysed language of emotions and motives and from this deduced that there are different patterns.
Examples	Cattel (personality)
Problems	Language can represent one concept that could have different underlying cognitive processes. What about unconscious processes.
Approach	Factor analysis
Description	This has been used in combination with self-reported surveys and lexical analysis. Famously giving us the predecessor to the big five theory of personality.
Examples	Cattel, Reis, Chulef's Motives
Problems	Different cognitive processes can produce similar outcomes, definitions of how many factors is dependent on researchers, and interpretations/description of a factor is dependent on the researcher.
Approach	Cultural universals
Description	The anthropological approach has aimed to record and define constructs that are universal to all cultures. This therefore helps to guide what is truly a universal human need.
Examples	Schwartz's Cultural Universals
Problems	This gives large lists of universals which are hard to make sense of, for example, Brown lists 369 universals.
Approach	Physiological stress reactions
Description	More recently measuring of physiological stress responses through skin conductance or cortisol levels in saliva have lent support to human needs models.
Examples	Rock's SCARF model, Grawe's CTM
Problems	We only get data on topics we research, defining what is stress based on cortisol has limitations. Lacks definition of what could be considered "natural" stress, positive stress, negative stress, or toxic stress.

Approach	Cognitive architecture
Description	With advances in the neurosciences our understanding of cognitive architecture is increasing.
Examples	Döner & Güss' PSI, CTM
Problems	Interpretations of functions is dependent on researchers' viewpoints and labelling is often inaccurate or contradictory. For example, dopamine and its respective prefrontal circuits as pleasure, attention, or motivation (or a bit of everything). Despite the launch of multiple grand big brain projects and massive advances in understanding we still lack a clear model of the human brain.
Approach	Evolutionary theory
Description	Evolutionary psychologists state the obvious that the brain and human behaviour has developed to solve environmental problems for survival. Therefore motivations, needs, and behaviour can be deduced from evolutionary development. This will be supported by research into other animals and organisms.
Examples	Kenrick's updating of Maslow's Model, Aunger and Curtis's BPU Theory
Problems	We don't actually know how evolution developed in the human brain, modern animal models may not be earlier developments of human behaviour or the brain.

- **Corpus analytics**

Corpus analytics developed in the 1990s by collecting large datasets of real language (written and spoken) with a view to understanding how language is used in the real world and potentially updating dictionaries, grammar books, and guiding language courses. This can show us how we are thinking and drives that we are following. For example, analysis of national anthems could show common themes and constructs such as pride pointing to the need of Self-Esteem, or freedom for Autonomy or Control - only one unpublished corpus analytic review could be found (Rahimi, 2015).

Many models "sell" themselves on their approach – but each approach has its drawbacks. In our collection of 54 models we could review these models and therefore give a non-structured meta-analysis and we may be able to at least identify patterns across the researchers. Aunger and Curtis reviewed 20 motivational models (Aunger and Curtis, 2013) and concluded that only five motivational constructs are common to a majority (*affiliation, curiosity, self-assertion, sex, and nurture*) and that a third of constructs are cited by one author only. This highlights once more this "astonishing lack of consensus". We both agree and disagree with this conclusion. Our review of 54 models supports what Aunger and Curtis found but, importantly, we disagree that

there is no consensus because we see strong consensus when we consider the groupings. For example, there is clear agreement on the need for attachment, relatedness, or affiliation – we will call this construct Attachment. 49 of the 54 models class a variation of Attachment as a basic human psychological need - some do not class this because of the nature of the research e.g. academic motivation – (see Supplementary Materials: *Full List of Needs Models*). So, there is clear acknowledgement, almost across the board, of the importance of Attachment. Yet interpretations of the Attachment need show clear differences. Variations in how this need is defined in the 54 needs models are:

• Relatedness	• Intimacy	• Social contact
• Affiliation	• Love	• Parenting
• Belonging	• Romance	• Friendship
• Connection	• Mate selection /	• Positive relations
• Relationships	retention	• Social
• Nurturance	• Family	• Social support
• Affection	• Rejection (avoidance)	

What is striking is that despite broad agreement there is clear misalignment on the *form* of attachment. Social support and love are completely different concepts. On closer inspection we can see that the general concept of attachment or relatedness – the human being as a social being - is considered by some needs (e.g. relatedness, affiliation, social) whereas specific forms of this overriding concept are given by others (e.g. affection, intimacy, love, parenting, friendship). This observation goes some way to consolidating and understanding needs models and can guide us to forming a comprehensive model of needs. The outline of the elephant becomes clearer.

Therefore, by thinking in terms of large “super groups” of needs we can see some overarching agreement. Habermacher et al. showed strong alignment with 12 needs models (Habermacher et al., 2014a, 2014b) and their initial SCOAP (Self-Esteem, Control, Orientation, Attachment, Pleasure) model, this is an extension of Grawe’s CTM which in turn drew on Epstein’s model

both of which were considered reviews and summaries of extensive literature. This appears to be a valid approach - these five needs would be uncontentious and match strongly to similar models such as SDT but with more groupings and also explicitly states the necessity of approach and avoidance motivation (we review the rationale for these “super groups” below). Indeed, on doing this mapping we can see that 91.7% of the 519 psychological needs proposed by these 54 models would fall into this categorisation (see Supplementary Materials: *Needs to SCOAP*).

This may be a small epiphany but actually only leaves us with messy large “super groups” of needs without being clearly defined. What is the precise language we should use, how many groups should we have, and what constructs should fit into these, and how are they related? Another obvious point we haven’t yet approached is the actual definition of a basic need itself. Without a clear definition we are still stumbling around like the blind men with the elephant potentially proposing perfectly valid needs but without understanding how these fit together and form the full elephant.

The online Psychology Dictionary describes a psychological need as:

“As opposed to a biological need, a psychological need is something that is essential for the maintenance of mental health. The need itself can be manifested internally or externally.”

This focuses clearly on needs as requirements principle and subsequent mental health but does not guide us to what could specifically be a psychological need. The various researchers and proponents in the field have given their own definitions. For example:

Grawe (2007) said that

“Basic psychological needs, in my view, are needs that are present among all humans, and their violation or enduring nonfulfillment leads to impairments in mental health and well-being.”

Grawe here notes the concept of universality “present among all human being” and distinguishes between violation and non-fulfilment. This again iterates the needs as requirements for mental health and well-being but leads us no closer to what are actual basic psychological needs.

Sheldon argues, (Sheldon, 2011).

“... a definition of psychological needs as tendencies to seek out certain basic types of psychosocial experiences, to a somewhat varying extent across individuals, and to feel good and thrive when those basic experiences are obtained, to the same extent across individuals”

Sheldon includes the needs as motives aspect “to seek out” but also focuses on individuality of this “to varying extents across individuals” and then continues with the needs as requirements aspect “feel good and thrive”. Similarly, this does not guide us as to what could be considered basic psychological needs.

Deci and Ryan (2000) define them as:

“...innate, organismic necessities rather than acquired motives, and ..., we define needs at the psychological rather than physiological level. Thus, in SDT, needs specify innate psychological nutriment that are essential for ongoing psychological growth, integrity, and well-being.”

This first focuses on contrasting “organismic necessities rather than acquired motives” suggesting a motivational aspect but differentiating between learnt motives. They then focus on needs as requirements but again this does not help us distinguish the precise needs.

The descriptions above from Grawe, Sheldon, and Deci & Ryan, therefore, do not help us in identifying basic needs because many needs could fulfil these criteria.

Aunger and Curtis’ evolutionary definition would give clearer guidelines as to what could constitute a need (Aunger and Curtis, 2013):

“...a *need* can be defined as a *mechanism to carry out a task related to an evolutionary significant aspect of an animals’ ecological niche, which requires goal-directed behavior*”

This clearly defines a need as a necessity for fulfilling survival needs in one’s niche which differs to previous descriptions and would allow a clearer selection of needs. They also go on to clarify the role of motivation thereby connecting needs as requirements and needs as motives.

“We call *motivation* an aroused state of goal pursuit, and individual *motives* psychological mechanisms designed by evolution to cause animals to seek to meet a need through behaviour.”

Therefore, of these descriptions only the evolutionary description could give is clear guidance on what could be considered basic psychological needs. Indeed, an accepted list of requirements would be necessary to quantify whether a need could be classed as a basic need. Baumeister and Leary (1995) argued that basic human psychological needs

1. Produce effects readily under all but adverse conditions
2. Have affective qualities
3. Direct cognitive processing
4. Lead to ill effects when thwarted
5. Elicit goal-oriented behaviours
6. Be universal
7. Not be derivative of other needs
8. Affect a broad variety of behaviours
9. Have implications beyond immediate psychological functioning

This seems to lay the case out more clearly but still has flaws:

Consider point 1. “Produce effects under all but adverse conditions” – this seems to be contradictory – if it is a basic need it should exert influence in all conditions, especially under adverse conditions.

Consider point 2. “have affective qualities” which seems to make sense but Auger and Curtis also note (Auger and Curtis, 2013) that many of these affective qualities are missing to instigate action or are only activated post action as a measure of measuring satisfaction or non-satisfaction of a need. When we are “driven” to do something it comes from an internal drive that actually seems to lack affective qualities until achieved or frustrated.

Consider 7, “not be derivative of other needs” – this should be controversial because we could consider basic needs something like basic colours or the lowest common denominator, the simplest form of higher order needs. But in complex organisms this can quickly become mixed up: a sense of attachment will produce a positive feeling, a feeling of warmth and maybe joy. Is this feeling of pleasure also a need? Or, alternatively, is pleasure indeed the primary need that attachment underlies or is attachment the primary need that pleasure underlies? As we noted previously most biological systems operate in a multiple modulatory manner so how far can we actually separate these needs?

Consider number 6. “Universality” should not be contentious but on closer inspection is. For example, the need for power has been proposed by many as a basic psychological need and motivation. It is clear that through the history of mankind the need for power has helped shape the modern world, society, wars, corporate life and virtually all domains of human enterprise. But it is also clear that not all human beings exhibit a desire for power, in fact many exhibit the exact opposite. So, this leaves us with the quandary of categorizing power as a human need for its consistent, persistent and measurable impact on all human societies or not categorizing it as a need for it is not present in all human beings. Therefore, a model with power as a need would better be able to explain human functions, societies, and historical development but a model

without power would be better able to describe every human being on average - but not all human beings.

We outlined previously that if we consider large super groups of needs this can partly resolve this question, making space for both power and autonomy, for example, but also other constructs of control that have been proposed by researchers over the years including the constructs of locus of control as proposed by Rotter (Rotter, 1966), or self-efficacy as proposed by Bandura (Bandura, 1989). Evolutionary literature can, however, help us to formulate these needs differently and understand the importance of different needs expressed differently across different individuals. This variation is not just a variation in individuals, which may be our intuitive answer, but a *prerequisite* for the successful development of a species.

One nice, and particularly apt, example is that of the “personality” of ants: research into ants has shown that ants have different “personalities” (O’Shea-Wheller et al., 2017), which is nice to know, but that these are not just quaint artefacts of evolution but are considered important for effectiveness of a colony, their group decision-making, and their survival over time. Firstly, there are ants that are stable and accepting, when they find a new nest, they get on down to working – like an ant. And secondly those that are more explorative. Think of a fidgety, I’m getting bored type of ant - these will quickly get bored of the new nest and look for new nest locations.

Colonies with too many of one type of ant are likely to be less successful. There is therefore a requirement for some stability, but they also shouldn’t miss out on better nesting opportunities. This mix of personalities therefore becomes evolutionary balanced. In the language of needs and motives some ants are driven and motivated to stay put and get to work and others are driven and motivated to explore. Therefore, ants have, as a species, *the need for two types of ants*, in this simplified example, of exploration and stability. To not include these factors as a need for ants fails to describe how their colonies function over time and so would be fundamentally flawed.

This concept of evolutionary stable balance has important implications for needs theories: how can needs theories represent this critical evolutionary factor? If they do not, they will be too

simplistic and general to serve any real use and fail to be descriptive of human society. For example, if we do not or cannot measure the concept of egoism vs. communality, we miss a large chunk of what has developed human society and needs models will fail to give a general and simplified view of human endeavour.

This shows the importance in a human descriptive model of including needs that are drivers of human behaviour in general but that may not be strongly if at all exhibited in *all* human beings. Therefore, universality can be seen to describe general human function over society and time and not for all individuals. Indeed, this is strongly supported by Talevich et al.'s hierarchical taxonomy of human motives (Talevich et al., 2017), they, at the highest grouping, see three branches of human motives Meaning, Communion, and Agency but under Communion we can see the branches of Power, and Security & Belonging, two seemingly contrasting motives. If we move one level lower on their hierarchical groupings the contrast is magnified with motives of Dominate Others contrasting with the motive of Relate & Belong (see Figure 1). Of interest is also that Talevich et al. when updating Chulef's taxonomy of human goals (Chulef et al., 2001) "discovered" avoidance motives – lending support to our discussion on approach and avoidance.

Figure 1

Talevich et al.'s (2017) motive of Communion

Avoid Stress & Anxiety V15	Avoid Instability W10	Self-protect X6	Avoidance Motives Y4	Communion Z2
Avoid Harm V16				
Avoid Rejections V17	Avoid Rejection & Conflict W11			
Avoid Conflict V18				
Avoid Socializing V19	W12	Avoid Hassle X7		
Avoid Effort V20				
Interpersonally Effective V21	Relate & Belong W13	Security & Belonging X8	Social Relating Y5	
Social Life & Friendship V22				
Liked V23				
Sexual Intimacy V24	Intimacy W14			
Emotional Intimacy V25				
Fastidious V26	Stability W15			
Stability & Safety V27				
Better than Others V28	Dominate Others W16	Power X9		
Control of Others V29				
V30	Leadership W 17			
V31	W18		X10	
Good Family Life V32	W19	X11	Family Y7	
Close to Parents' Family V33				

A further important aspect is that some needs are critical for developmental phases of human beings. The need for attachment is such a need: universal in the need for healthy development of children but differently expressed as adults with differing expression of attachment and affiliation desires, motivations, needs, and behaviours. This also calls into question the aspect of universality, a need for children may not be a need for adults.

Therefore, we propose a revised version of Baumeister and Leary's (1995) nine criteria for basic psychological needs:

Universality:

1. Must match evolutionary theory
2. Considered essential for human survival over time as a species
3. Be present across culture, and context
4. Be present in the majority of human activity and enterprise

Cognition and goal direction

5. Direct cognitive processing
6. Elicit goal-oriented behaviours
7. Affect a broad variety of behaviours

Health

8. Lead to ill effects when violated or unfulfilled
9. Lead to positive effects when fulfilled

Our first point of matching evolutionary theory could therefore massively reduce the field of needs models that could be considered accurate and relevant. However, a model could match evolutionary theory without explicitly being focused on evolutionary theory. Psychologists and evolutionary psychologists will both agree that Attachment is a need and evolutionarily founded.

Indeed, an evolutionary approach has been made explicit by some authors. For example, Kenrick et al. updating of Maslow's model with respect to evolutionary principles therefore separating the attachment need into constructs such as mate acquisition, and mate retention (Kenrick et al., 2010). However, this presupposed that Maslow's model is an accurate representation to begin with - it is not. This leaves us with two models that are based on evolutionary theory: one by Bernard et al. (Bernard et al., 2005), and Aunger and Curtis (Aunger and Curtis, 2013, 2015), whose BPU theory gives a detailed outline of behavioural development from the level of the gene to mammals and human beings. As organisms develop in complexity so the complexity of behaviours develops, each building on top of another. This model has guided our thinking on evolutionary development of behaviours and how this relates to human needs and we will further expand on this below. However, the language and description of motivation seem to differ starkly between this evolutionary perspective and that of classic needs models. Is this a case of describing different aspects of the elephant, or a question of semantics, or is it perspective?

As such we can see the picture of the elephant becoming clearer but there still a number frustrating unclarities. We can see large super groups of needs as being sufficient to categorize most needs models but having four or five large groups of needs with vastly different descriptions is unsatisfactory from a descriptive perspective and for parsimony of detail. A needs model should be able to give a simplified view of human nature – doing justice to its complexity but be simple enough to be clearly understandable. Similarly, the five models that best fulfil the criteria so far, all agree on some aspects but also starkly differ on other aspects.

Notable also is that Aunger and Curtis give a scientifically sound description of development of human needs, motives and behaviours but fail to align with Grawe's or Dweck's model. At this stage we seem to be close to viewing the elephant but risk misrepresenting it severely.

We therefore propose that by rethinking what human needs are and combining this with evolutionary driving forces, similar to Habermacher et al.'s latest proposal (Habermacher et al., 2016), we can accurately build a model that satisfies all the five models that best fulfil our

requirements but also the vast majority of other needs models. Similarly, we also propose that we can neatly place motives, requirements, and also personality, within the same framework.

Redefining Human Needs

As we have already shown the super groups of five needs proposed as SCOAP matches strongly to 54 needs models outlined not to mention key schools of thought in psychology and psychotherapy such as Adler and self-esteem, and Bowlby and attachment theory. A consideration is whether a three needs models such as SDT would be sufficient or not – with the notable problem that three needs models also differ in their interpretation despite being academically robust. As we previously noted with Talevich et al.'s hierarchical taxonomy of motives the highest-level clusters (also three) appear too vague to be practical having contrasting motives within them. We argue therefore argue that three is not sufficient to explain and match the majority of human functioning. For example, self-esteem is not included by Deci and Ryan, but self-esteem behaviours are obvious and preeminent in the world today and throughout history and with evidence from multiple approaches outlined previously: philosophical, scientific, self-report, factor analysis, and evolutionary theory. Another approach would be to consider the worlds' consumption of self-esteem enhancing products as a proxy for measuring human desire and motivation. These would include fashion items, jewellery, cosmetics, clothing designed to form your figures in more attractive ways, beauty parlours, success & motivational books, desire for sporting greatness, and so the list goes on. With this in mind we can see strong and robust evidence from multiple streams that self-esteem is a key factor, and not least when we consider that importance of status in tribal creatures such as human beings.

Furthermore, an evolutionary approach would see self-esteem not as just a status factor but as a primary life force – the prioritisation of the individual a concept of “self” at the lowest evolutionary level. Torday and Millar (Torday and Miller, 2016) writing on the evolution of the mammalian brain note: “That answer lies within physiologic mechanisms that extend forward from unicellular roots. These are based upon stable principles of evolutionary development that

can be traced from those unicellular origins as thermodynamically effective outcomes for the maintenance of cellular identities and cellular homeostasis directed by a sustaining ‘self’. This point of seeing “self” as a primary driving force of all biological organisms, of life itself, points us to another philosophical approach that should be robustly supported by evidence in multiple disciplines and in evolutionary theory. This would shift the focus on what are basic human psychological needs to what are *requirements for life that will therefore manifest as needs across all human (animal) behaviours*. This thinking of needs as biological driving forces is not common but has been approached by evolutionary philosopher Ed Gibney (Gibney, 2019) but also by Karl Friston and his Free Energy principle (Friston, 2012) which aims to explain how life can for a period seemingly counteract the laws of thermodynamics. This, for example, sees surprise minimisation as a key driving force for all living things – notably, and insightfully, Dweck proposed Prediction as a basic need in her BEATS theory but *without* citing Friston and his concept of surprise minimisation.

Therefore, if we applied this approach to all living organisms, we see four requirements:

1. A sense of “self”
2. An ability to control aspects of the self, and environment
3. Mechanisms to identify suitable elements for survival i.e. nutrition, toxins, threats, optimal temperatures, moistures, etc.
4. An ability to reproduce (and protection in numbers).

These are therefore fundamental life requirements which would become ever more refined and include different facets as an organism develops into a more complex organism. These therefore translate into four fundamental life requirements of:

1. Self-esteem - a sense of self
2. Control – an ability to control aspects of the self and environment

3. Orientation - mechanisms to identify suitable elements for survival

4. Attachment – an ability to reproduce, protection of kin, and safety in numbers

An addition is that energy generation and cellular homeostasis is essential from external sources and that there must be a stable (but fluctuating) environment that provides access to energy to be metabolised. These requirements develop with organisms from the unicellular, to simple multicellular organisms, and therefore will provide constant themes of behaviour across all organisms – this is therefore why they have been identified by multitudes of researchers as key themes for human life, but their description and categorizing has failed to match each other. This approach points to a clearer understanding of basic psychological needs as *higher order manifestations of basic life requirements that must be present in all human beings as a living organism*. The precise representation of these requirements does, however, need to be clarified and this can be conceptualised and put into a framework by understanding evolutionary development of life forms, specifically mammals, and ultimately human beings.

However, first we must also understand a discrepancy to what we had outlined a few paragraphs earlier namely that SCOAP seemed to encapsulate much of previous work on motivational and needs theories. With this new perspective we can see that this four-factor model ignores the simple dual model of all human behaviour: pleasure and pain. This can be easily explained from an evolutionary perspective: pleasure and pain would then become an overriding model when an organism has developed to be able to represent pain/discomfort and pleasure with its chemical triggers and communication. When this is possible pleasure and pain become linked to an overriding biological communication strategy of an organism. Pleasure can then develop as an independent need, pleasure for the sake of pleasure, and be a proxy for fulfilling many other needs. Pleasure is therefore classed as a primary human psychological need without it being a life requirement – therefore as a small “p”: SCOAp.

Therefore, a five-factor model of needs would be grounded in evolutionary principles, from the simplest chemical interactions of an amoeba, to our reflexes, instincts and to the most complex human social behaviours. We have already shown this encapsulates the majority of work on motivation and needs we have collected but fails to explain how the differing constructs and concepts are related. If we follow this evolutionary developmental principle, we can, now, also identify the key constructs in each category. Taking this approach, our elephant suddenly becomes clearer. For example, the need for Attachment would include in this order:

Level of gene:	Genetic replication	
Level of organism:	Reproduction	
Level of sexual reproduction:	Lust	Sexual desire
Level of mammals:	Pair bond	Love, affection, loyalty
Level of mammals:	Nurture	Care, affection, warmth, connection
Level of mammals:	Family	Care, affection, warmth, belonging, support
Level of tribes:	Friendship	Care, affection, trust, loyalty, support
Level of nature:	Pets	Care, affection, warmth
Level of humans:	Ultra social	Charity, benevolence, greater good

These succinctly places key constructs into the attachment need and includes key desires, motives, needs, which may also be expressed differently in different individuals. Thus, we can see concepts and constructs proposed by the different researchers as falling neatly (mostly) into this framework and our analogy of the blind men and the elephant becoming ever more accurate. The individual researchers have mostly proposed valid descriptors of parts of the elephant but have failed to see the elephant – indeed only through relatively recent development in the neurosciences, evolutionary thinking, and research has this even been possible.

This interpretation of the Attachment need can therefore see Attachment as a single overriding super construct and include *all* the terms proposed by the 54 other authors and give this a clear structure and reasoning as to why it should fit and specifically where it fits in the model. This satisfies and consolidates all the previous approaches: literature review, market analysis, philosophical and evolutionary and matches neurological development, structures, and circuits.

We can repeat this process with all needs and come up with a model that can reasonably incorporate major schools of psychological thought with little contradiction and places these into a coherent framework that matches evolutionary development of the brain and behaviour.

Constructs to SCOAP in Supplementary Materials lists the language used in the 54 models to SCOAP, Table 5 gives a simplified version of themes at different evolutionary levels and *Needs to SCOAP Evolutionary* in Supplementary Materials maps constructs proposed by 54 models to the evolutionary framework outlined below.

For simplicity this can be reasonably grouped into three levels of motives and behaviour production. MacLean famously proposed a tripartite model of the brain (MacLean, 1990) – though criticised for being overly simple it still serves as a reasonable simplified model for human functioning. Similarly, Aunger and Curtis also propose a tripartite model (Aunger and Curtis, 2015), but their language reflects better the function of motivation and behaviour. Namely that of 1. reflexes and instincts, 2. motivational (emotional), and 3. planned behaviour (or executive). This follows structures of the brain and our best understanding of the evolutionary development of the human brain. This semantic reformulation also neatly aligns the language from previous researchers such as James’ “Instincts” or Chulef’s “Motives”.

Table 5

Constructs matched to SCOAP and evolutionary development

	Self-Esteem	Control	Orientation	Attachment	Pleasure
	Survival				
Cellular level	Genetic Identity	Chemical Control	Chemical Orientation	Duplication	-
	Markovian blanket	Receptors	Receptors	Reproduction	-
	Separation	Movement	Genetic	Proximity	-
Simple organism	Survival mechanisms	Motor control	Senses	Mating	Comfort
	Prioritising of "self"	Hoard / Collect	Hunger (desire for nutrients)		Fear/Disgust
	Defence / Aggression	Create	Curiosity / exploration		
Mammalian	Health	Autonomy	Functional knowledge	Courting	Play
	Physical ("honest signals")	Self-efficacy	Social knowledge	Nurture	Fun
	Attributes	Influence	Environmental knowledge	Pair Bond	
	Status	Power		Clan / Tribe / Group (Nature)	
	Social value	Environmental control		(Objects)	
Human	Primacy of humanity				
	Conscious health	Restraint	Abstract knowledge	Ultra social	Savour
	Self concept	Cognitive control	Planning	Charity	Humour
	Ideal self	Planning	Theory of mind	Nature connection	Games
	Fairness	Environmental control	Environmental knowledge		Awe of nature
	Justice		Environmental research		Awe of manmade products
	Respect				

Another dimension that could be added, similar to that proposed by Auger and Curtis is the biological function of the behaviour: Nutrients serve an *individual* purposes; Status serves a *social* purpose; Create / Build serves and *environmental* purpose. This may be adding too much complexity for a simple needs model but would be a more accurate albeit brief taxonomy of human behavioural production units as Auger and Curtis called them. Full mapping of needs proposed by the 54 models and related to evolutionary levels and functions can be seen in Supplementary Materials *Needs to SCOAP Evolutionary*. This is summarized in Table 6.

Table 6

Constructs + SCOAP + Evolutionary Levels

		Self-Esteem	Control	Orientation	Attachment	Pleasure
		Survival				
Reflexes	Biological	Survival	Chemical Control	Chemical Orientation	Duplication	-
		Genetic Identity	Complex chemical interactions	Complex Chemical Orientations	Reproduction	-
	Individual	Markovian blanket	Movement	Senses (9-21)		-
	Social			Genetic	Proximity	-
	Environmental	Separation	Receptors Physical	Receptors		- -
Instincts	Biological					Comfort
	Individual	Survival mechanisms Prioritising of "self"	Motor control	Hunger Curiosity / Exploration	Lust	Fear/Disgust
	Social	Defence / Aggression				Fear/Disgust
	Environmental		Hoard Create / Build	Navigation		Fear/Disgust
Motivational	Biological	Health Physical ("honest signals")				Play
	Individual	Attributes Status	Autonomy Self Efficacy	Functional knowledge	Courting	
	Social	Parental value Romantic value Social value	Influence Power	Social knowledge	Nurture Pair Bond Clan	Fun
	Environmental	Primacy of humanity	Environmental control	Environmental knowledge	(Nature) (Objects)	
Executive	Biological	Conscious health	Restraint	Abstract knowledge Planning		
	Individual	Self concept Ideal self	Cognitive control Planning	Abstract knowledge Planning		Savour Connoisseur
	Social	Fairness Justice	Cognitive control Planning	Theory of Mind Planning	Ultra social Charity	Humour Games
	Environmental	Respect	Environmental control	Environmental knowledge Environmental research	Nature connection	Awe of nature Awe of manmade products

This therefore enables a first level of simplicity with just five core needs SCOAP that can be broken down into single needs at different evolutionary levels. This not only aligns strongly with the 54 models we have analysed but gives an evolutionary rationale for where previously

proposed “needs” will be positioned and for what reason. Our elephant becomes even clearer: this satisfies simplicity and also complexity simultaneously – being refined enough to justify complexity of human drives, motives, and behaviours.

Approach-Avoidance

Approach-avoidance motivation we noted earlier has been notably absent in motivation theories, not least because of the grounding in positive psychology. This is a major flaw as any model would fail to explain sufficiently any form of behaviour in the animal and human world.

Defensive behaviours, and aggression are critical factors for survival – evolutionary theories have tended to list these as separate behaviours. Aunger and Curtis position these as tactics that serve a motivational goal – aggressiveness or submission could be interpreted as a tactic for survival. It is clear that avoidance and defence mechanisms are a critical aspect of human nature. If we took a market-based approach and analysed products sold, we would see a clear focus on “defensive” products: anti-aging creams, insurance policies, protection for ones’ home, antitheft devices, security companies, the police force, armies, weapons, anti-virus software, and so the list goes on. It seems we human beings spend a lot of money and are constantly concerned with protecting ourselves as much as we are concerned with achieving more.

Eysenck famously ascribed this to personality in the 1960s (Eysenck, 1963), specifically with relationship to extraversion; the extravert attracted towards stimuli, the introvert avoiding stimuli. We could argue that approach-avoidance is the most primal of all personality traits as this is present in all living organisms (see review: Elliot and Covington 2001) and hypothesize that this is in an evolutionary balanced state in most societies with some cultural variations.

Therefore, we propose the concept of approach and avoidance is built across all needs rather than classing these as separate needs as Murray did, or tactics as Aunger and Curtis do, or separate motives as Talevich et al. showed. This would translate into some individuals being generally more defensive and focused on avoidance and others more forward thinking and focused on

achieving goals. There will, of course, be individual differences in how strong these approach or achievement and avoidance or protect mechanisms are expressed by individuals and in different contexts and needs. Some individuals may be well-balanced, others may be more strongly achievement focused, and yet others will be more strongly protect focused. This would match personality theory and how we know human beings differ.

Similarly, Auger and Curtis also see fear and disgust as two separate motives driven by the need of avoiding personal damage – fear from external physical sources and disgust from internal i.e. toxic sources. We see these as higher order functions of the basic approach-avoidance distinction which then becomes a part of a general communication strategy of the organism hence explaining why fear and aggression can be encountered in multiple contexts. Importantly we also see this as a component of individual representation i.e. personality, and a part of evolutionary balanced systems.

Understanding avoidance, or protection, as we have termed it, is also critical for SWB. One can achieve a motivational goal by fulfilling a need and therefore generating a positive state of satisfaction but also by protecting a need and avoiding damage to it - think of the relief of avoiding a negative outcome. Grawe also postulated this as an important factor, and it could be that this factor is more important than many would think when it comes to disruption of SWB and also risk of psychopathologies (Grawe, 2007). We review personal SWB and the implications of failure to protect one's needs below.

In summary this five-core need model of SCOAp is complemented by a dual model of motivational direction, approach-avoidance (we have labelled these *Achieve* and *Protect* respectively) present across all five core needs. These core needs we can consider general overriding themes of human beings but, importantly, these can be expressed to different intensities in individuals. This would therefore enable a descriptive model that is not only universal but individualised simultaneously.

Personal representation

We have already drawn attention to some problems with universality vs. individuality and that most needs models have failed to sufficiently outline and explain these factors.

To recap, the first important issue is that of evolutionary balances – some needs are expressed differently across population groups in such a way that benefits the population in general over time. Examples of these are:

- Egoism vs. communality
- Dominance vs. submissiveness
- Exploration vs. desire for stability

One argument would be that these are equally balanced over population groups. There is also an argument that this is cultural. For example, a piece of research of the serotonin alleles showed that collectivist cultures and individualistic cultures have different expression and balance of these alleles (Chiao and Blizinsky, 2010). Whether culture leads to epigenetics changes across a population group over time or whether the genes drive culture is open to interpretation at this stage.

The second issue is that of personal representation of needs. Even needs that can be considered universal to all human beings will have variations between individuals:

1. Through the starting biology which has natural variations:

For example the neuromodulator oxytocin is considered strongly related to the attachment need. Oxytocin stimulates labor in women during childbirth and also lactation in pregnancy and this is exchanged between mother and child (for review: Gordon et al. 2010). Attachment behaviour such as caressing the child simulate oxytocin (for example: Holst et al. 2005). However, research shows that responsiveness to oxytocin is dependent on receptors on synapses (there are multiple receptors on synapses of neurons for each

transmitter or modulator). The proliferation of these receptors is dependent on genetics (for example: Insel and Shapiro 1992). Similarly, different networks in the brain grow with different variations strengthening or weakening different circuits which can be directly or indirectly related to basic needs. In short different people will have different biological responses to attachment and hence greater or lesser desire for attachment.

2. Through updating of motives from previous successful or unsuccessful experiences of fulfilling or protecting motivational goals (related to needs):

This will be modulated by

- i. Our biological starting point, and also natural propensity for achieve motivation or protect motivation
- ii. Responsiveness to success or failure, our sensitivity and emotional intensity of the experience
- iii. Environmental factors e.g. a supporting figure to help guide or alternatively harshly critical peers or elders. In the worst case this can lead to toxic stress whereby the stress causes biological disruptions and disrupted neuronal growth (for review: Shonkoff and Garner 2011).

3. Speed with which one can update motives and “learn” new behaviours:

This will depend on multiple factors such as cognitive abilities but also underlying neural plasticity which is also influenced by

- i. Our biological propensity to plasticity. Though all children have plasticity, research has shown levels of plasticity and therefore adaptability are higher in some than others—obviously as this would also underlie natural biological variation (for review: Bouchard and McGue 2003).
- ii. This may have been positively or negatively influenced by point 2 above and toxic stress (for review: Kolb et al., 2017)

4. Local contexts and environment may focus on certain factors and exclude other factors making these more important within a context. Individuals will be influenced by this, but their genetic make-up will influence to what extent. Also, the old adage of “use it or lose it” applies to the brain across our lifespan.

The above will unlikely surprise most readers but this is rarely clarified and when we review the biological and neurological with the psychological, the processes become clearer.

What is also striking is that this also explains certain developmental factors from baby to child, to adulthood. Needs models again have generally failed to explain or approach this subject. The exceptions are those five models we have already identified as being the most descriptive and some that are explicitly focused on educational contexts. Klaus Grawe talks about the socialisation process but fails to explicitly approach the subject of children and development. Dweck is more explicit in her model being a model of development – not unsurprising considering her recognition in the field of developmental psychology. Auger and Curtis recognise needs such as nurture but do not explicitly focus on how individuals develop. This process should not be underestimated because needs can and will change over time. The concept of self-esteem is such a need: we go through different phases in childhood, teenage years, early adulthood, parenthood and in older years. The core need of Self-Esteem remains strong, but its expression will shift over time in predictable patterns. This is conceptualised and taken into account when we consider personalised subjective well-being in the next section.

Personal representations can also be considered an expression of personality. This is, in our minds, not a separate domain of personality psychology but mutually integrated in the model we have built. Personality is after all is a deviation from a norm of behaviour that can be considered personal. Personality is therefore a description of behaviour and ways of interacting with the world that have variation.

Therefore, we see personality as a variation of behaviour – we argue, as does Dweck (Dweck, 2017), that personality is an extension of the needs and drives that we express as human beings. With the SCOAp model however, we can better describe the majority of personality in contrast to, for example, a three-needs model. This would also allow an evolutionary analysis of behaviour and personality and for example extraversion which includes a majority of approach, or achievement, behaviours – therefore rather than thinking of extraversion it may be more accurate to think of approach behaviour and then aspects of this such as social approach, or curiosity approach to give more accurate personality descriptions – Jonathon Cheek, for example, has updated the concept of introversion to include some of these factors (Cheek and Norem, 2011). Intriguing as this is, personality does, however, not fall within the scope of this paper.

Personalised SWB

We have now outlined how drives, motives and needs will be expressed differently based on evolutionary balanced systems, personal biological differences, and environmental and developmental factors. This personalisation will also necessitate thinking how we consider subjective well-being and optimal functioning. Similarly, the concepts of approach and avoidance motivation is also critical for well-being with avoidance having been generally ignored by well-being models. But first let us revisit Grawe's CTM which clearly formulated a model for well-being and mental health, designed two scales for use by therapists (Grosse Holtforth and Grawe 2003; Grosse Holtforth and Grawe 2000), and has research to back up the model (Smith and Grawe, 2003; Gassmann and Grawe, 2006; Holtforth et al., 2006; Stein et al., 2013).

Grawe's Consistency Theory Model proposed striving for consistency as the general drive for all human beings. By consistency he meant the satisfaction of basic psychological needs in the four groups he proposed: Self-Esteem, Control & Orientation, Attachment, Pleasure. If these needs are violated or unsatisfied this will increase the risk for pathologies. A key insight, and

potentially controversial at the time, was that violation or non-satisfaction increases the chance of *any* psychopathology. He in essence proposed a general factor for psychopathology. This has met with more acceptance recently (Jones, 2020).

Consistency is therefore when the perceived reality is consistent with one's personal motivational goals – which are directly related to the psychological needs. This in Grawe's view increases SWB and violation, especially severe violation over long periods of time, decreases well-being and increases risk of mental illness.

Grawe referred to incongruence as the mismatch between a specific goal and reality which leads to emotional disruption, stress, and risk of psychopathology, if intense and prolonged enough.

We, however, propose that there are four specific levels of congruence/incongruence:

- **Achieve Congruence:** we fulfil our motivational goals i.e. we achieve what we want to achieve.
- **Achieve Incongruence:** we fail to fulfil our motivational goals i.e. we don't achieve what we want to achieve.
- **Protect Congruence:** we protect our needs i.e. we successfully protect our needs from damage.
- **Protect Incongruence:** we fail to protect our needs i.e. we are unsuccessful in protecting our needs from damage.

Each of these will be related to different feelings and, depending on context and how these are personally valued, will cause more, or less, intense feelings and expressions. Continued incongruence leads to inconsistency. Grawe only referenced fulfilling needs in general and matched these to norm groups. In contrast we state that incongruence can only be related to a *personal* standard. Some people may have a high desire for status and therefore build strong motivational patterns around this and therefore also experience great disappointment if this is unfulfilled. Another person will not. In this way we can clearly propose a method whereby we

match personal motives to general motives and resolve the human universal vs individuality paradox noted earlier. This will have measurable impact and has dramatic consequences for SWB research and also for defining motivational factors in individuals. Warr's analogy of vitamin is therefore suitable here but *personalised* rather than generalised for all human beings. This therefore means that SWB will be dependent on fulfilment of personal needs to a *personal perceived level* of importance. Indeed, Ghadiri showed that taking a measure of personalised congruence and matched to neuroticism (sensitivity of system responses) was a much better predictor of SWB and vitality than either fulfilment or violation of needs in general in a business context (Ghadiri, 2017).

An important aspect of the Consistency Theory model and SCOAp model is that of updating motivational schema. On achieving or not achieving a goal, Grawe argued that the motivational model will be updated. This we can consider a standard human pattern. One may therefore increase the energy to achieve a goal or reduce the desire for a goal. Both would be valid approaches – from an evolutionary perspective both are valid approaches. In the motivational literature and in positive psychology we may consider redoubling effort as a “better” approach. However, other research shows that those with more cognitive flexibility have lower stress (for example: Demirtas and Yildiz 2019). Indeed, cognitive flexibility itself has been proposed as a fundamental aspect of human health (Kashdan and Rottenberg, 2010). What is clear is that continual violation of needs causes disruption and Grawe's research shows clear correlations to psychopathologies and that reducing these disruptions improves the state of psychotherapy patients (Smith and Grawe, 2003). Similarly Del Giudice et al. argue that “stress occurs when a biological control system detects a failure to control a fitness-critical variable, which may be either internal or external to the organism” (Del Giudice et al., 2018).

Alderfer proposed compensation mechanisms in case of unfulfilled needs – we speculate that this is valid, but this will also not fall within the scope of this paper.

In summary, subjective well-being is subjective and therefore can only follow personalised model of needs and not a standardised model of needs. Therefore, needs fulfilment and violation can only be measured against a personal scale of how these are valued by an individual. This therefore has serious repercussions for many well-being at workplace questionnaires and scales. These well-being and workplace satisfaction and “engagement” scales mostly measure against a general level of fulfilment which is considered an ideal by researchers and not matched to individuals. This will likely provide inaccurate results not to mention that they may be imbalanced as they fail to capture all core-needs in equal measure.

From Individuals to Groups

Space will not allow us to review group behaviours in detail, but our hypothesis is that individual behaviours are closely matched to group behaviours. Groups are after all collections of individuals, but the real question is can we match the SCOAp model to group behaviours? Do groups on average exhibit self-esteem enhancing behaviours and self-esteem protection behaviours, for example? In clear groups, we claim this seems to be the case but would need further corroboration and analysis. Obvious examples are:

- Sports teams
- Political parties
- Companies
- Interest groups

We provide a preliminary analysis of how their behaviours can be neatly matched to the SCOAp framework in Table 7.

Table 7

Detailed mapping of SCOAp Model

	Self-Esteem								
	Survival								
	Construct	Instinct/Drive/Desire	Motives				Group example	Personality	Extreme
			Achieve motives	Achieve Products	Protect Motives	Protect Products			
Instincts	<i>Dominance</i>	Drive for dominance	Motivation to be the boss	Doping Weapons	Protection of position	Weapons (defensive) Castles	Crush the opposition (Sports)	Dominant personality	Psychopath Submissive
Motivational	<i>Attributes Status Social value</i>	Drive to look good Drive for status Drive for appreciation	Motivation to look good Motivation for titles Motivation to be recognised	Beauty products Expensive brands Advertising	Avoid ageing Protection of titles Protect brand	Anti-ageing products Lawyers Legal protection	Uniforms Be the best Have large following	Dependent on attribute e.g. vain Vain Needy	Narcissism Narcissism Narcissism
Executive	<i>Self concept Ideal self Justice</i>	Drive to build ideal self Drive for justice	Become "successful" Motivation to have justice	Self-help literature Social movements	Protect the weak	Police / legal system	Nationality National pride Be a just society	Strong sense of self Visionary Fair and just	Fragile self Grandiosity Sadism

	Control								
	Survival								
	Construct	Instinct/Drive/Desire	Motives				Group example	Personality	Extreme
			Achieve motives	Achieve Products	Protect Motives	Protect Products			
Instincts	<i>Motor ability Hoard Create</i>	Improve abilities Collect things Build things	Be good at sport Stamp collecting Gardening	Athletic Collector Gardening / Building	Avoid ageing Protect products Protect against damage	Exercise courses Dehumidifiers Protective coatings	National emergency supplies Create an industry	Athletic Collector Creator/maker/builder	Excessive sports Hoarding Excessive creativity
Motivational	<i>Autonomy Self efficacy Influence Power</i>	To be free To be self sufficient To be influential To be powerful	Be own boss Financial independence Be an authority Have authority	Independent Independent Influential Authoritative	Protect position Protect position	Freedom & independence Self sufficiency Success Power through politics / army Legal	Freedom & independence Self sufficiency Success Power through politics / army	Independent Independent Influential Authoritative	Hermit Hermit Fame addiction Psychopathy
Executive	<i>Cognitive control Planning</i>	Be focused Plan things	Get what want Plan what want	Controlled Retirement funds	Avoid dementia Avoid disorder	Medication Planning products	Strong leadership Business planning	Controlled Planful	Inflexible Inflexible

	Orientation								
	Survival								
	Construct	Instinct/Drive/Desire	Motives				Group example	Personality	Extreme
			Achieve motives	Achieve Products	Protect Motives	Protect Products			
Instincts	<i>Hunger Curiosity Navigation</i>	Satiation Novelty Certainty	Be good at something Have new experiences Have certainty	Food Holidays / entertainment Maps	Protect supply Secrecy	Refrigerator	Canteen News Organigram	Impulsive Novelty seeking Uncertainty avoidance	Impulsive Impulsive OCD
Motivational	<i>Functional knowledge Social knowledge</i>	Competence Special information	Be good at something Find out about a person	Learning courses LinkedIn	Secrecy Secrecy	Knowledge storage Knowledge storage Intelligence agencies	Spying Intelligence agencies	Competent Gossip	Perfectionism Gossip
Executive	<i>Learning Planning</i>	Learn new things Planning	Learn something Planning	Encyclopaedia Planning	Secrecy Secrecy	Knowledge storage Knowledge storage	Knowledge (to get an edge) Planning	Knowledgeable Planful	Smarty pants Planful

	Attachment								
	Survival								
	Construct	Instinct/Drive/Desire	Motives				Group example	Personality	Extreme
			Achieve motives	Achieve Products	Protect Motives	Protect Products			
Instincts	<i>Lust</i>	Sex	Have more sex	Flirting products	Avoid loss of libido	Erectile dysfunction	Swinger scene	"Womanizer"	Sex addiction
Motivational	<i>Nurture Pair Bond Clan</i>	Have children Romance Have friends	Have children Find partner Find friends	Parenting products Dating apps Group activities	Childhood protection Partner protection Protect clan	Protective devices Tracking devices Security products	Community Community Team bonding	Motherly/fatherly Romantic Friendly	Excessive broodiness Hopeless romantic Anti-social
Executive	<i>Ultrasocial Charity</i>	Community Be charitable	Work for community World for the greater good	Community projects Charities	Protect community Protect charity	Social services	Community engagement Community engagement	Communal Charitable	Devoted to community Devoted to charity

	Pleasure								
	Survival								
	Construct	Instinct/Drive/Desire	Motives				Group example	Personality	Extreme
			Achieve motives	Achieve Products	Protect Motives	Protect Products			
Instincts	<i>Comfort</i>	Comfort	Modify temperatures	Central Heating	Avoid cold	Clothing	Group warmth	Discomfort sensitivity	High sensitivity
Motivational	<i>Fear /Disgust Play Fun</i>	Fear avoidance To play To have fun	Play games Have fun	Games Entertainment products	Avoid crime Avoid loss Avoid loss FOMO	Anti-crime products Subscriptions Subscriptions	Group protection Spontaneous games within groups Group fun	Fearful Playful Fun	Anxiety disorders Lack of seriousness Lack of seriousness
Executive	<i>Savour Humour</i>	To savour To be humorous	Savour wine Watch a comedy	Gourmet products Comedies	Avoid blandness Avoid boredom	Seasoning Entertainment	Group appreciation (food, sports, etc.) In-jokes	Connoisseur Humorous	Snob Mistaking reality

SCOAp as a model of the Elephant

We set out at the outset to give a simplified model of human behaviour that would include desires, motives, and needs that would be able to accurately describe human functioning and be able to describe the proverbial elephant that so many researchers have tried to describe but with “astonishing lack of consensus”.

We have outlined how this “astonishing lack of consensus” has come about and how to resolve this. Apt to our analogy of the blindmen and the elephant, most researchers have proposed valid needs as basic needs but failed to see the general picture. Indeed, this general picture has arguably only been possible to be formulated with the masses of research over recent decades but also the research that this has been built on over the last century. By reconsidering what human needs are and seeing this as the “super” needs of fundamental life forces and matching this to an evolutionary framework, we can suddenly see a clear elephant.

Evolutionary requirements giving five core needs, two motivational patterns, and three evolutionary levels gives us our starting point. Within this framework (Figure 2) we can then add, what Aunger and Curtis called *Behavioural Production Units*, single needs that drive motives, behaviour, and influence wellbeing. Personal biology of each individual will express these needs differently but in similar and generally predictable patterns and this will be updated by personal experience in the environment in which they develop and operate. This therefore starts with a relatively simple set of core needs but that can with time develop in multiple directions and give the wonderful complexity and variations of all human beings.

Furthermore, we can see that these core-needs and needs are present across cultures and contexts. They are present in all groups of people from sports clubs, religious movements, nations, races, tribes, and any sort of unifying movement.

When used as model for motives we can see that the SCOAp model explicitly states that there will be individual variation through natural evolutionary variation which in itself has been

important for the evolution of the human species and the niche it occupies. Within motives that are universal there will also be some natural genetic variation. This will also apply to models of approach and avoidance motivation with individuals predisposed to one side or the other side but on average over the human population this will be balanced (we predict a slight preference for approach motivation across all human beings). Similarly, the topic not discussed would also be intensity of motivation which will also be subject to individuality with some people deeply and passionately driven and others less so. These individual variations are normally expressed as personality.

When used as a model for requirements or subjective well-being the SCOAp model states that subjective well-being is, well, subjective. Specifically, that when needs are fulfilled to the level of one's expectations, then one experiences well-being, or coherence, subjective current happiness. If one can control this over time then we label this meta-coherence, the happy life. This has far reaching implications, for example in measuring and predicting stress and burnout in the workplace and happiness research.

Figure 2

Outline SCOAp Framework

When used as model for optimal states we enter into trickier territory. The intuitive assumption would be that optimal states of needs fulfilment will lead to optimal states for performance much like the flow concept proposed by Csikszentmihalyi (Csikszentmihalyi, 1991). However, research here is conflicting and this makes evolutionary sense. One would be motivated when one has failed to meet one's goals, therefore a certain amount of incongruence can be beneficial and lead to growth – this is well-known in physiological fields such as sports performance whereby subjecting the body to stress improves performance – the tricky question in sports performance as well as in psychological and cognitive performance is what is the optimal amount of stress? Not too much and to too little – a zone of optimal stress - which is however individualistic and out of the scope of this paper. What is clear is that not achieving goals is just as important as achieving goals for models of motivation.

The SCOAp model therefore enables us not only to describe a “generalised elephant” that neatly aligns needs proposals by researchers over the last century but enables the description of “different elephants” and where they may be different.

Summary

The SCOAp model human needs can therefore be considered a comprehensive model of human needs, it covers almost all needs that are presented by 54 other models analysed. It can be considered an overriding framework and draws strongly on empirical work of Grawe and his Consistency Theory Model, and Auger and Curtis' BPU model. It includes major schools of thought on human nature, motives, and psychological needs, and can clearly explain how needs are updated personally but are also universal.

- Giving a simplified but accurate view of human nature
- Giving key psychological drives and motivations
- Giving requirements for healthy (optimal) psychological well-being

- Informing others how to increase human well-being be that in organisational contexts, education, or public policy

Discussion

The SCOAp Model therefore serves as a simplified and refined model of human nature. We have explicitly called it a model for there are still too many unanswered questions to justify calling it a theory. Therefore, we foresee that this can and most likely will be updated in the future. Indeed, our view is that it should be continually updated, static models and theories may not stand the changes in knowledge and within research across multiple disciplines.

Some of these unanswered questions include:

- A coherent and detailed mapping of interplay with physiological and psychological factors such as movement, exercise, nutrition, microbiome, sleep, and stress.
- Matching to cultural universals: one cultural universal model has been included in this analysis (Schwartz), but cultural universals provide detailed list of constructs and behaviours that can be considered consistently human. Detailed mapping will lend strength to the SCOAp model or highlight potential discrepancies.
- Have we accurately captured all needs? For example, the concept of emotional expression has been proposed by some but is not present in the model as it stands. The same goes for privacy which is a cultural universal. This may go hand in hand with categorisation of cultural universals, or could be classed as mixed needs, e.g. privacy could be seen as an evolutionary development of theory of mind: with the ability to be aware that other people may be judging oneself, that privacy is the only place one can be truly oneself and therefore serves to protect self-esteem but also gives a sense of freedom and control.
- Similarly, the concept of language and communication seems to fulfil multiple needs but not be explicitly mentioned. Considering that language is one of the defining features of

human beings this seems to be an omission. We do have some personal opinions such as the fact that language can match multiple levels of the framework e.g. expressions such as pain, reflecting reflexes, cooing sounds reflecting nurturing instincts, orientation mechanisms, but also social mechanisms. Nevertheless, this would need to be carefully laid out and backed up by the research in the respective fields.

- Other aspects could be included for example the concept of gravity – this may at first glance seem a bit outrageous, but this is precisely one of the obvious facts that becomes overlooked in evolutionary theories. We develop in an environment with gravity – bone density, blood circulation (e.g. valves on veins) are designed because of this not to mention obvious cognitive concepts such as up and down. This in the age of space exploration is essential not also least because of the proposed long-term space travel to planets such as Mars.
- We have alluded to how needs change over development and time but have not fully listed and formulated how this takes place. There are some predictable patterns in developmental phases such as changes on focus on how we process self-esteem. However, this must be matched in detail and with accuracy to the model we propose. Similarly, how this can change in cultures and contexts.

We have already pointed to potential other avenues of research that would help in identifying and evaluating needs such as big data, social media behaviour, corpus analytics, and market analysis which are underrepresented in the scientific literature. Our preliminary observations seem to confirm that these would neatly support the SCOAp model, but this could also give more quantifiable data to back this up and how they interact but also in how they, for example, develop over lifespans.

A final point is that as model of human drives, motives, and needs this should be corroborated across disciplines and in different fields of research. What is noticeable on reviewing these

models is that some models have made honourable attempts at describing human nature, specifically Grawe's consistency theory model but also Dweck's BEATS theory, PSI, Aunger and Curtis' BPU theory, and Talevich et al.'s Hierarchical Taxonomy of Human Motives. Ironically these particular models, that our analysis shows have best been able to describe the nature of human nature, have also been underrepresented in the literature, for numerous reasons. For example, Grawe was well-known in the German-speaking world but not in the USA despite his previous role as Chairman of the International Society for Psychotherapy Research. Seemingly cognitive scientists also do not give evolutionary models the credit or attention they deserve with the two evolutionary models, and specifically Aunger and Curtis' model, being academically impressive but barely cited in the literature. This may be through lack of exposure, awareness, or lack of interest by motivational researchers in evolutionary theories.

But the importance of this evolutionary perspective points to the importance of multi-disciplinary research but also to the masses of research and evidence that has been built and amassed by thousands of other researchers. Similarly, the danger of theory-induced blindness – i.e. constantly referring to Maslow – and trends in research that follow a given path or theory such as SDT, as good as SDT explains many things, it fails to encapsulate the majority of human experiences and therefore is only a partial view of human motivation despite it being labelled a macro-model of human motivation. To describe the elephant in detail we need masses of research from multiple fields – our argument has been that at the current stage of development in 2020, as we write this, we have enough information and data to give a fairly refined view of the elephant. We hope that further research will help to refine this and build an ever more accurate picture.

Our analogy of the six blind scientists and the elephant is in no way designed to be derogatory. Rather closer Plato's analogy of the cave – in science we are attempting to describe nature with only the data and observations we can make – to interpret what is representing the shadow is fiendishly difficult as is trying to describe an elephant through touching it. Our simple claim is

that the current state of science, and cognitive, motivational, and behavioural research is able to make clear model of human drives, motives, needs and therefore give a model of human behaviour that can lead to individual and collective well-being and guide those in different fields to make better decisions for the betterment of society.

Conflict of Interest Statement

The authors are owners and shareholders in a for-profit legal entity that aims to sell assessments based on the SCOAP Theory.

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