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MAINTAINING LIFE SATISFACTION: THE ROLE OF POSITIVE COGNITIVE BIAS

(Received 5 December, 2000; Accepted 18 August, 2001)

ABSTRACT. Recent research into population standards of life satisfaction has revealed a remarkable level of uniformity, with the mean values for Western populations clustering at around three-quarters of the measurement scale maximum. While this seems to suggest the presence of a homeostatic mechanism for life satisfaction, the character of such a hypothetical device is uncertain. This paper proposes that well-being homeostasis is controlled by positive cognitive biases pertaining to the self. Most particular in this regard are the positive biases in relation to self-esteem, control and optimism. Past controversies in relation to this proposition are reviewed and resolved in favour of the proposed mechanism. The empirical data to support this hypothesis are discussed in the context of perceived well-being as an adaptive human attribute.

KEY WORDS: life satisfaction, homeostasis, illusions, positive cognitive bias, self-esteem, control, optimism.

Over the past few decades, evidence has accumulated to support the idea that perceived well-being, in particular life satisfaction, does not freely vary over the range of values offered by measurement instruments, but exhibits a determined positivity. This non-random distribution of values gives rise to the possibility that life satisfaction is not simply under the influence of experience but is managed, by some form of psychological process, such that a positive view of life predominates. This paper proposes that such controlling processes can be conceptualised in terms of a homeostatic system based on the maintenance of positive cognitive biases (PCBs).

THE CASE FOR LIFE SATISFACTION HOMEOSTASIS

To a large extent this paper is concerned with life satisfaction but, other measures of subjective well-being are also relevant. Indeed, the earliest data consistent with homeostasis was Golding's (1954) observation that happiness data are naturally inclined to be positive. More recently, Headey and Wearing (1992) noted that people who experienced a major life event that disrupted their levels of life satisfaction had a strong tendency to return to their previous levels over time. They offered their

Journal of Happiness Studies **3:** 37–69, 2002.
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Dynamic Equilibrium Model by way of explanation and suggested that each person has a 'set-point' for subjective well-being to which they generally return.

These observations were reinforced by Cummins (1995) who combined 16 estimates of population life satisfaction, derived from six Western countries. As these studies employed different scales, the data were standardised to a statistic called percentage of scale maximum (%SM). This expresses any Likert scale value as though it had been scored on a scale measured over the range 0–100. Following the conversion, and using the 16 population mean scores as data, Cummins found a normative standard for life satisfaction which could be expressed as 75 ± 2.5%SM. Thus, using two standard deviations to describe the normative range, it was concluded that the population norms for life satisfaction lay in the very narrow range of 70–80%SM. However, this estimate was restricted to values derived from Western nations where the social and economic conditions are generally tolerable.

This analysis has subsequently been extended in two ways. First by the inclusion of non-Western countries. Cummins (1998) combined the population means on life satisfaction from 44 countries and calculated a value of 70 ± 5%SM. Thus, notwithstanding the huge diversity of life styles, standards and cultural norms between countries, their life satisfaction, expressed as a population mean score, was found to predictably lie within the two standard deviation range of 60–80%SM.

The second form of extension has involved examination of the distribution of life satisfaction scores *within* population samples. This has demonstrated a very consistent degree of variance. When the standard deviations from Western population samples are combined as data, they produce a mean of 18 ± 1%SM (Cummins, 2002a). Thus, using two standard deviations to describe a normal distribution around a mean of 75%SM, the normal range *within* general population samples is approximately 40–100%SM.

These normative values are depicted in Figure 1. The narrow range of 70–80%SM defines the normative range of life satisfaction population mean scores within Western nations. The larger range of 40–100%SM defines the normative range of life satisfaction for individuals within Western nations.

These findings are suggestive of two important and interesting aspects of life satisfaction. The first is that most human beings

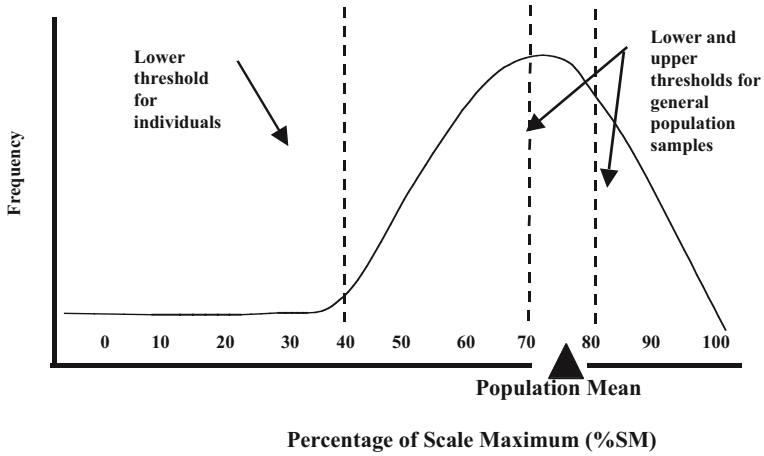

Figure 1. The normal distribution of subjective quality of life.

experience a level of satisfaction with their life that is moderately positive. Since such measures are almost inevitably made on bipolar Likert scale anchored by 'very dissatisfied' and 'very satisfied', the mean value of 75%SM can be seen to represent the half-way mark between ambivalent neutrality and complete satisfaction. Moreover, given the positioning of each sample distribution on the 0–100 scale, we find that using the seven domains of the Comprehensive Quality of Life Scale (Cummins, 1997a) only about 10% of people score below 50%SM and 30% score below 70%SM. So the considerable majority of people are quite satisfied with their lives (Cummins, 2002b).

What is the reason for this? This question can be answered on at least two levels. At a teleological level it is surely linked to the need for a generally positive disposition that also provides high levels of self-esteem and optimism. These, in turn, are presumably necessary to support an adequate level of motivation to achieve and maintain reasonable living conditions (Veenhoven, 2001) and to avoid the debilitating motivational consequences of depression. But the exploration of these matters is not the focus of this review. Here we seek an explanation for the generation and maintenance of life satisfaction through psychological processes and the authors are indebted to the Editor (Veenhoven) for suggesting the following two kinds of explanations: first, reasons why people may be less happy than the data suggest and, second, explanations as to why people are so positive about life. These may be referred to as 'false' and 'true' explanations.

False happiness explanations (Veenhoven, 1997):

1. Biased appraisal of life: People *think* they are more happy than they really are, because they overestimate their success in life (contentment) and/or how well they feel usually (hedonic level). Possible reasons for this misperception are: unconscious ego-defence and half-conscious resignation. Veenhoven has argued that this distortion is at best modest (1996, 1997).
2. Biased reporting: People *say* that they are happier than they know they are. A possible reason is social desirability. There is some evidence for this distortion, for example, in the fact that responses in face-to-face interviews are more positive than in written questionnaires. The difference is small however (Veenhoven 1984).

Reality explanations

3. Liveability theory: In this explanation happiness depends on the degree to which basic human needs are gratified, which in its turn depends largely on the quality of the living environment. In this view all mobile animals feel reasonably well once need-gratification is satisfied. In this vein the pattern of high happiness may be explained by the fact that most humans live above the subsistence level (Veenhoven, 1997) and that modern individualistic society provides even more, in particular, freedom of choice, which effectively serves minority demand (Veenhoven, 1999). Heylighen and Bernheim (2000) also showed that happiness is systematically higher in the most modern societies.
4. Comparison theory: In this explanation happiness depends on the gap between reality and aspirations. Here the observed pattern can best be understood as a time-bound phenomenon. Because life improved so much over the last century we compare positively with the past. Because the difference between rich and poor nations is so great and salient, people in rich nations consider themselves fortunate. A more general explanation could be that over-report of misery in the media may also feed the idea that one is relatively well off.
5. Folklore theory: In this view happiness is part of a dominant outlook on life that roots in tradition and the Zeitgeist. In this vein one could explain the prevalence of happy responses to cultural tendencies such as Enlightenment optimism or Christian gratefulness. The pervasiveness of the pattern could then be attributed to cultural homogenisation, in particular to the increasing dominance of US happiness norms.

While support can be found for all of these hypotheses, we wish to suggest another possible explanation that links to the first hypothesis presented above. This is that life satisfaction is held under homeostatic control.

The *a priori* evidence for this idea has already been presented. It seems intuitive that, in evolutionary terms, the human organism would benefit from the maintenance of a fairly predictable and moderately high level of satisfaction. In empirical terms, Western populations evidence mean levels of life satisfaction that are predictable within a 10% range, while over 70% of individuals experience life satisfaction within a 30% range (70–100%SM). Moreover, in a further study of life satisfaction distributions, Cummins (2002a) has provided evidence that 70%SM appears to represent a 'line of resistance' acting to inhibit its free-fall below this point (see Figure 1). All of this is consistent with the idea that life satisfaction is not free to vary over its full range but is constrained through the operation of a homeostatic device.

The remainder of this paper will be concerned with a discussion of the psychological mechanisms that may be responsible for such homeostatic control of life satisfaction within a moderately positive bandwidth.

The Role of Comparative Devices

Perceived life satisfaction is clearly a product of cognition. It must involve some comparative process between current experience and internalised standards. However, the further specification of such processes remains uncertain, with authors offering a variety of opinions.

At the simplest level of conceptualisation, an analogy can be drawn with studies on performance. Locke et al. (1970) reported a series of studies demonstrating that satisfaction with task performance was a function of the degree to which such behaviour achieved desired goals or was discrepant from personal value standards. Consequently, by extension, life satisfaction has been proposed as the product of a cognitive, judgmental process (Lewinsohn et al., 1991) that reflects the degree to which needs are met (Parmenter, 1988), the gratification of an "appropriate portion" of major desires (Stones and Kozma, 1980), the congruence between desired and achieved goals (Neugarten et al., 1961), how well life's expectations have been met (Edgerton, 1990), a comparison of aspirations with achievements (George, 1979) and judgements of life in terms of personal norms derived from experience (McCauley and Bremer, 1991).

All of these vague notions imply an inverse relationship between life satisfaction and the magnitude of the discrepancy (or "gap," Calman, 1984) between experience and a personal reference point for the variable in question. Again, this idea has been described in various ways. For Runciman (1961) the discrepancy takes the form of "relative deprivation," where the reference point is determined through social comparison. This line of thinking has taken its most advanced form in Multiple Discrepancies Theory (Michalos, 1986) which integrates social comparison and personal experience. However, even though the application of measures based on such models can be used to explain substantial variance in life satisfaction (e.g. Michalos, 1985), when used as an explanation for life satisfaction the argument becomes tautological.

In these terms, discrepancy theories are stating the obvious. People who are dissatisfied with their lives see the quality of their lives as lying below some internalised reference mark, which may reflect themselves in the past, other people and so forth. In this sense, it serves as a descriptor of what life satisfaction means. A perceived negative discrepancy produces dissatisfaction, a perceived positive discrepancy produces satisfaction. So to measure discrepancy is, *de facto*, to measuring satisfaction.

A further problem concerns the difficulty of using such models to explain the population standard of 75%SM. This standard would imply some dispositional mechanism for the maintenance of a "gap" that produces 75%SM satisfaction. In other words, needs must be generated that cannot immediately be fulfilled. Given the fact that needs can be consciously identified and behaviour directed to their fulfilment, the "gap" would be difficult to maintain. Not only would this require the constant manipulation of needs as behaviour achieved its ends, but the meeting of such needs would cause marked fluctuations in the experience of life satisfaction.

Clearly, therefore, it would be non-parsimonious to base such a mechanism on needs that can be objectively met. But there is an alternative. If such needs are abstract, they can exist detached from reality and could serve the role of controlling perceived life satisfaction if two conditions are met. The first is that needs are perceived as about three-quarters fulfilled. For example, such needs may include the need for optimism regarding the expectancy of positive future events, and may be partially fulfilled by holding cognitions such as "I am lucky

most of the time." The second condition is that needs are maintained under homeostatic control such that the "gap" between needs and their fulfilment must be maintained within a narrow range. The remainder of this article concerns the hypothetical character of these perceived needs and the means by which they may be maintained.

SATISFACTION WITH THE SELF

In its most global form, the abstract need we propose can be described as "satisfaction with the self," that is, the need to perceive the self in ways such as being predominantly good, worthy and able. It is further proposed that such positive, cognitive reference to the self generates a feeling of satisfaction. Indeed, satisfaction with the self is the strongest predictor of subjective quality of life found to date. For example, Campbell (1981) reported this variable to correlate 0.55 with life satisfaction over and above other related correlates such as satisfaction with one's family life, income and friends. Others have reported satisfaction with the self to predict life satisfaction over and above personality variables such as extraversion (Argle and Lu, 1990), while Diener and Diener (1995b) reported the correlation between self-satisfaction and life satisfaction in 29 of 31 countries as ranging from 0.21 in Bahrain to 0.60 in the USA. It is worth noting, in passing, that the strength of the association between self-satisfaction and life satisfaction was found to be stronger in individualistic compared to collectivistic cultures. This implies that caution should be exercised in extending such Western measures to other cultures and also signifies the importance of investigating different means by which self-satisfaction is expressed.

Satisfaction with the self can be measured as a global concept by simply asking subjects how satisfied they are with themselves on a 7 point scale (Diener and Diener, 1995b). However, such measures do not specify the aspects of the self for which satisfaction is important. Thus, breaking down self-satisfaction into its constituent parts is likely to be heuristically useful, and this has been supported by literature which has identified three aspects of the self to have a predictive relationship with life satisfaction. These are a sense of worth or value, namely self-esteem, a sense that one can change the environment in accordance with one's wishes, namely control and, finally, a sense of optimism for the future.

SELF-ESTEEM, CONTROL AND OPTIMISM AS REGULATORS OF LIFE SATISFACTION

Table I presents zero-order correlations between life satisfaction and self-esteem, control, and optimism. It is not intended to represent an exhaustive list of studies containing relevant data but does contain all such studies known to the authors. As such it represents a semi-random sample of studies drawn from the quality of life literature.

It can be seen that the six studies concerning self-esteem record a high and consistent correlation with life satisfaction, ranging from 0.54 to 0.77. However, despite these very high values, Diener and Diener (1995a) have determined that both variables are discriminable constructs.

The nine studies on control record more varied correlations. The reason probably lies with the greater variation in instrumentation. However, with two exceptions, the correlations range from 0.35 to

TABLE I

Zero-order correlations between life satisfaction and self-esteem, control, and optimism

Study	Sample	*r*
Self-esteem		
Boschen (1996)	Spinal injury	0.77
King et al. (1998)	College students	0.66
Kwan et al. (1997)	College students	0.54
Lucas et al. (1996)	College students	0.56
Raphael et al. (1996)	Adolescents	0.56
Van Nieuwenhuizen et al. (1997)	Severe mental illness	0.58
Control		
Boschen (1996)	Spinal injury	0.35
Christensen et al. (1998)	Daughter caregivers	0.35
Decker and Schulz (1985)	Spinal injury	0.52
Fuhrer et al. (1992)	Spinal injury	0.50
Morris and Jones (1989)	Renal transplant	0.18
Nieves et al. (1991)	Spinal injury	0.57
Palmore and Luikert (1972)	General population	0.16
Raphael et al. (1996)	Adolescents	0.53
Schulz and Decker (1985)	Spinal injury	0.52
Optimism		
Christensen et al. (1998)	Daughter caregivers	0.49
Lucas et al. (1996)	College students	0.54
Headey et al. (1984)	General population	0.23

0.53 indicating a moderate degree of covariation. In addition, Abbey and Andrews (1985) reported a correlation of 0.29 between these variables, and further support for this relationship is offered by Larson (1989) who examined the correlation between control and happiness across age groups. Every 2 h for one week, subjects were required to note their level of happiness and how much control they felt they had over their current actions and over present situations. While no significant correlations were reported between happiness and control in the adolescent group, correlations of 0.27 and 0.41 were found in the adult and retired adult groups respectively. These findings suggest that, with age, the need for control may increase in its contribution to happiness.

While, self-esteem and control are clearly linked to life satisfaction, a third relevant variable is a sense of optimism. In addition to the studies reported in Table I, Dember and Brooks (1989) report an even stronger relationship between optimism, measured by items such as "I generally look at the brighter side of life" and happiness, with a correlation of 0.61. These findings suggest that the need for optimism regarding oneself is also intimately linked to life satisfaction. Overall, these findings highlight a considerable degree of covariation between self-esteem, control, optimism, and the maintenance of satisfaction with life.

POSITIVELY BIASED SELF-COGNITIONS

It can be assumed that fulfilment of the need for self-esteem, control and optimism is dependent upon the presence of positive cognitions regarding these aspects of the self. In relation to this assumption, research into what has been termed cognitive illusions has much to offer. Specifically, Taylor and Brown (1988, 1994) describe a set of beliefs or cognitions regarding one's sense of worth, control and optimism that are held at positive levels in general populations. Due to the almost ubiquitous positivity of such self-beliefs, they are referred to by these authors as positive illusions. It is therefore possible that such positive views of the self represent the psychological experience of high self-esteem, control and optimism. It is further possible that such positively biased cognitions constitute an adaptive mechanism which creates and maintains mean population life satisfaction in the range of 70–80%SM through partial fulfilment of these abstract needs. However,

to date, the definitional properties and characteristics of such PCB has been largely unexplored. Some have even questioned its existence, so evidence of cognitive biases from other areas of study would reinforce the case.

DO PCBs EXIST?

At the simple level of judgement regarding probability and frequency, Tversky and Kahnemon (1974) adopt a 'Heuristics and Biases' approach to the processing of information. This suggests that intuitive predictions and judgements are often mediated by a small number of distinctive mental operations, which they call judgement heuristics. Examples of outcome include an insensitivity to prior probability of outcome, overconfidence in subjective probability distributions, illusory correlation, misconceptions of randomness, etc. They suggest that such heuristics are fundamental to our processing of information about the world, and while they are more often useful than not, can also lead to characteristic errors or biases when measured against an objective reality.

Against this view Gigerenzer has mounted several assaults (e.g. 1996) based largely on a concern that such explanatory notions for perceptual biases "remain vague, undefined, and unspecified with respect to both the antecedent conditions that elicit (or suppress) them and also to the cognitive processes that underlie them." (p. 592). However, to this Kahneman and Tversky (1996) have offered an impressive defense. Two empirical matters of dispute convey the general tone. First, Gigerenzer claims that the use of frequencies reliably makes such cognitive biases 'disappear'. This, however, overstates the case. While the use of frequencies may improve the accuracy of judgements, substantial biases in the judgements of frequency can readily be demonstrated (e.g. Slovic et al., 1982; Tversky and Kahneman, 1983). Second, he claims that errors in estimates of subjective probabilities have been learned, rather than representing innate bias. There are data, however, that clearly counter this view, such as the compulsion people (e.g. gamblers) feel to forming illusory correlations, even when repeated exposure to the actual frequencies does not support the belief (e.g. Chapman and Chapman, 1969; Gilovich et al., 1985). Kahneman and Tversky (1996) conclude "These findings do not imply that people are incapable of learning the correct contingencies; they

only show, contrary to a naïve frequentist position, that some significant judgmental biases are not readily corrected by the observation of natural frequencies." (p. 589).

Jopling (1996) has also challenged the validity of self-reported biases as evidence of some naturally occurring cognitive distortion. He claims that the available supporting data lack "ecological and phenomenological validity" because "The specialised experimental tasks or questions that elicit self-reports are specifically designed to shed light on the experimenter's hypothesis, or to decide among competing theories. The drawback, however, is that they are not representative of what people do under natural circumstances when they describe themselves and evaluate their abilities and plan for the future". (p. 532)

This criticism could be answered by two kinds of data. One would be the detection of positive illusions in qualitative data, and the second would be their demonstration in relation to matters that are so commonplace that they could be regarded as being experienced by most people. Well, both kinds of data are very easy to find. Take the issue of luck. Pick-up almost any autobiography and the author is almost sure, at some point in the narrative, to describe themselves as a lucky person. That is, a luckier person than most other people. Of course they feel this way, most people do. It is why most nations run lotteries with such success for the funding agency. Most people feel they have a better chance of winning than the average person.

But Jopling (1996) continues: "It would indeed be remarkable if what was elicited in a decontextualized experimental context on such morally important issues as a person's happiness . . . proved to be significantly congruent with what would be elicited . . . in a frank and caring face-to-face dialogue with another person that is directed to working to the question 'Are you really happy?' " (p. 533). A recent study conducted in our laboratory (Mellor et al., 1999) provides data on this issue. University students were individually interviewed by a trained counsellor. They were asked to imagine a 'worst life', and subsequently a 'best life' for themselves, and to discuss at length what they imagined would constitute such circumstances for themselves. They were then asked to imagine a 'feeling thermometer' stretching between the two poles they had created and to report on their current state of life satisfaction. The resultant data yielded a mean life satisfaction of 76%SM, and the values so obtained correlated 0.79 with values obtained from the subjective component of the Comprehensive Quality of Life Scale (Cummins, 1997a). Moreover, the volunteered bases for making the life

satisfaction judgements confirmed the types of comparison predicted by Multiple Discrepancies Theory (Michalos, 1985).

Finally, for the case against the natural presence of positively biased self-cognitions, Krueger (1998) suggests that self-enhancement (regarding oneself as above average) is a controllable bias rather than a fixed cognitive bias. He argues this in relation to the following three paradigmatic models.

Common-Rater Paradigm: He credits the philosopher Adolf Horwicz with having first expressed the spirit of Common-Rater Paradigm when he asked "How much more intelligent, soulful, better, is everything about us than about anyone else?" (Krueger, 1998, p. 505). The paradigm requires participants to rate themselves and another person, or to rate themselves relative to the average person. When people make such comparisons they almost invariably rate themselves as higher. However, he states that such data cannot be interpreted as indicators of a fixed cognitive bias for the three reasons as follows:

1. It is possible that most people are better than average. He argues this in relation to the perceived problem solving ability of college students and states "Unless distributional biases are controlled, the interpretation of self-other differences remains ambiguous . . . the Common-Rater Paradigm does not provide a mechanism that would discriminate between the self-enhancers and the actual elite". (p. 506) This argument cannot, however, be sustained in the face of some 90% of the population considering they experience above-average levels of life quality (Cummins, 2002a).
2. "The investigators typically do not know, let alone control, whom the rater imagines the average other to be". (p. 506) This is inaccurate. Many studies report guidance in this process, such as the 'average in your class'.
3. He is concerned that the measures do not distinguish between self-enhancement and other diminishment. But this concern is irrelevant in the light of the life satisfaction data previously cited. While people may, and generally do, regard others as being less satisfied than themselves, their own PCB is very evident.

The Common-Target Paradigm: This requires participants to rate themselves and also be rated by observers. Once again, people rate themselves more positively than others. In relation to this Krueger (1998) states: "Self-enhancement, when it occurs, is not likely to result

from observer harshness. The small size of the self-enhancement effects in the Common-Target Paradigm suggests that the Common-Target Paradigm confounds the enhancement of the self with the diminishment of the average other." (p. 506). However, this paradigm is fatally flawed since proxy responses in relation to subjective states are highly unreliable (see Cummins, 2002c, for a review). The reduced level of enhancement in the Common-Target Paradigm is almost certainly due to the specification of the proxy response to an individual. Under such conditions, the anonymity of the 'average' is removed, meaning people would rate the specified individual's life satisfaction as higher than average, hence reducing the discrepancy. It is analogous to using specific tasks for skill judgements, in that it objectifies the nature of the comparison.

Social-Normative Paradigm: The idea here is that people see as more 'desirable' those traits in which they are strong. Then "enhancement bias [self-enhancement bias relative to average] may be independent of the normative positivity of the self-description. A person who describes herself as lazy may self-enhance by overrating the desirability of being lazy. If this is so, the self-enhancement effects observed in the socio-normative paradigm will be independent of the traditional measures of bias" (p. 510). While this is indeed likely, it applies only in relation to specific attributes. It cannot be used as an explanation for the global biases that are of concern in this paper.

From all of the above we conclude that none of these arguments have been successful in discounting the idea that the brain generates positively biased cognitions. But Taylor and Brown (1988) have added heat to the debate by renaming these biases 'positive cognitive illusions' in a move that has been most controversial.

PCBs OR ILLUSIONS?

Two major articles have argued that renaming cognitive biases as illusions is unwarranted. Both Colvin and Block (1994) and Krueger (1998) have presented arguments to support this case. The details of their arguments, which we find compelling, will not be reproduced here, but they have influenced the reasons we consider the term 'illusion' to be ill-advised as follows:

(1) On a point of semantics, Taylor and Brown (1988) state their reason for substituting the word 'illusion' for 'bias' as being that

the latter implies "short term distortions that might be caused by careless oversight or other temporary negligences" (p. 194). But this temporal connotation seems to be of the authors' manufacture. It does not accord with the dictionary definitions of bias which, indeed, emphasise quite the opposite view, of a permanent form of distortion.

(2) Their second form of justification involves normative comparisons. They state that people "consistently regard themselves more positively and less negatively than they regard others. Insofar as it is logically impossible for most people to be better than others, we label this tendency as illusion." (Taylor and Brown, 1994, p. 22). They even regard happiness as an illusion. "... if most people believe that they are happier. . .than most other people, such perceptions provide evidence suggestive of illusion." (Taylor and Brown, 1988, p. 194).

This rationale seriously confuses the objective and subjective dimensions of well-being. It is based on a notion of objective reality, where only half of the population can be above average. However, the phenomenon under consideration lies purely within the subjective realm. In making personal judgments of 'self-values', people do not normally reference themselves against objective standards, but against internal standards. And, in this context, the resultant self-evaluations are non-zero-sum. That is, there is no logical impediment to everyone feeling themselves to be above average.

In terms of happiness, people's beliefs that they are happier than other people represents a recognition of their own high levels of happiness and the (false) assumption that happiness is normally distributed in the population around a mean of 50%. It is this assumption that is wrong, and which creates the sense of being happier than most other people. But this sense of happiness–superiority is not illusory, in the sense of being a 'false mental image' (see Taylor and Brown, 1988, p. 194). It is a normal and accurate mental image based on an in-built false assumption. That is, it is a PCB.

We therefore propose that the term 'illusion' is an unnecessarily evocative and confusing label. Positive biases of self-evaluation are not illusory in the sense that there is some standard against which they can be deemed inaccurate, and much of the arguments levied by Colvin and Block (1994) and Krueger (1998) have been directed to make this point. We therefore propose that the term 'cognitive illusion' be abandoned in favour of the more neutral and accurate term 'positive

cognitive bias' (PCB). The degree of this bias can then be represented on the 0–100%SM scale mentioned earlier.

DEFINING PROPERTIES OF PCBs

It is proposed here that PCBs have two distinctive properties: they are non-specific and they are empirically unfalsifiable. Each property will be addressed in turn.

The non-specific property of PCBs is that they do not relate to specific skills or qualities on which one could objectively evaluate oneself, such as the ability to sing well or cook a soufflé. Rather they relate to nebulous ideas that cannot readily be discerned from reality such as, "I am luckier than most other people." There is some evidence in the literature that PCBs, if specified to particular attributes of the person, break down. For example, individuals do not exhibit a PCB of control in a skill task (Alloy and Abramson, 1979; Benassi and Mahler, 1985). Further, when subjects were asked to carefully consider the attributes of specific people, Weinstein (1980) found that PCBs of personal invulnerability significantly reduced. While Weinstein does not offer an explanation for this finding, it may be that in considering the specific attributes of another person, respondents may have been forced to consider their own objective standing as well. If the resulting appraisal was that they were similar or worse on these attributes than others, respondents may have concluded that they were in fact as vulnerable as others. Thus, in relation to the maintenance of life satisfaction, a key aspect of PCBs is their non-specific nature. This leads to their second important property, that they are empirically untestable and therefore unfalsifiable.

PCBs of self-enhancement are difficult to test or verify due to a lack of objective referents with which to compare nebulous personal qualities. As noted by Brown (1986), people are free to assume they are more friendly or interesting than others as there are no objective reference points by which to measure such a claim. Indeed, people typically select a comparison other who is "worse off' as a point of reference, allowing self-enhancing beliefs to be maintained (Wood et al., 1985). PCBs of control are also difficult to verify, as when success is experienced, the contribution of one's own efforts versus the influence of external factors to the success is not readily discernible. Similarly, optimistic views that one's future will be rosier than that of others are difficult to disconfirm because the future has not yet arrived.

PCBs are also made less falsifiable due to other information processing biases. One such bias is that people more readily attend to self-information that is congruent with their prior self-perception (Moreland and Sweeney, 1984) and actively resist incongruent self-information (Tesser and Campbell, 1983). Bias is also evident in that information selected for processing, and the recall of information about oneself, tends to be consistent with previous self-expectations (Mischel et al., 1973, 1976). These information processing biases may preserve the self-beliefs that already exist and may represent another mechanism by which PCBs relating to self-perceptions defy refutation.

It is thus likely that the non-specific and unfalsifiable properties of PCBs makes them a robust and reliable mechanism by which people maintain positive self-cognitions resulting in self-satisfaction and hence, life satisfaction. While the adaptive value of such positive cognitions seems clear, such devices need to be carefully maintained. As has been noted by a number of authors (e.g. Weinstein, 1989), propensities such as optimistic bias fail to be adaptive if they cause the person to seriously underestimate significant danger. Such extension of cognitions beyond the normal, adaptive range may be labelled delusional.

Delusions

Delusions are traditionally associated with mental ill-being and have been occasionally confused with PCBs (Baumeister, 1989). The principle distinction seems to be in the extent to which they confront reality. Delusional beliefs are incongruent with reality. For example, a belief that one is of another identity such as "I am Jesus Christ," is contrary to reality and thereby delusional. Cognitive biases, on the other hand, are beliefs based in reality but with a positive bias in favour of the individual. For example, people living in bush-fire prone areas may hold the belief that a fire is more likely to occur in a neighbouring area rather than their own. PCBs of control (Golin et al., 1979) may allow one to believe that if a fire occurs, they will be successful in fighting the fire thus preventing damage to their property. PCBs of invulnerability (Weinstein, 1980) may induce a belief that in the event of a fire, they will not be harmed. Finally, self-enhancing PCBs (Wood et al., 1985) may confirm such beliefs, as it is always possible to appear better off than one's neighbours by choosing the most self-enhancing dimension for comparison. Thus it is argued, provided that

PCBs are maintained within some homeostatic range which prohibits the emergence of delusions, they constitute an adaptive mechanism for the maintenance of subjective quality of life.

Further support for the idea that self-PCBs may be instrumental in generating life satisfaction is that positively biased self-perceptions are found in normal populations. Three types of PCB are consistently reported in such populations, conforming to the aspects of the self discussed previously, and have been used by Taylor and Brown (1988) as the basis for their claim that positive illusions underlie mental health. These are; self-enhancing PCBs, PCBs of control and PCBs of optimism.

Self-Enhancing PCBs

Self-enhancing PCBs have received much empirical attention. For example, Lewinsohn et al. (1980) found students to rate themselves as being more socially desirable than did observer ratings. But against the simple interpretation of self-enhancement, Ackerman and DeRubeis (1991) suggested that the observers may have been particularly critical. This suggestion, however, does not account for the authors' finding of a discrepancy between the ratings of observers and non-depressed subjects, but no discrepancy between ratings of observers and depressed subjects. Thus, these results can be taken as evidence that non-depressed subjects regard themselves as more friendly, popular, warm and humorous compared with self-ratings by depressed subjects and observer judgements.

As further normative evidence of self-enhancing PCBs, Tabachnik et al. (1983) found that non-depressed college students described a set of positive, self-attributes as more true of themselves than the 'average' college student. Thus, these students viewed themselves as more cheerful, enthusiastic and confident compared with their college peers. Again, Brown (1986) found that students rated positive personality adjectives as more true of themselves compared with non-descript "others" and negative personality adjectives as less true of themselves compared with "others."

The basis of such self-enhancing PCBs probably lies in the use of social comparisons. Festinger (1954), the originator of social comparison theory, proposed that individuals seek self-evaluation and do so by selecting someone close in ability or opinion as a comparison target. Thus, cognitive activity can be used for self-enhancement, by

either upward or downward comparison. Upward comparisons are used predominantly by high self-esteem subjects following failure (Wood et al., 1994). By believing that the upward comparison person would also have failed under similar circumstances, they are able to attribute failure to an unavoidable situation. Downward comparisons, against people who are worse off, tend to be employed in situations of threat (Wood et al., 1985) or in the presence of low self-esteem (Aspinwall and Taylor, 1993). For example, Wood et al. (1985), in an investigation of women with breast cancer, found that 80% reported coping at least somewhat better than other women with cancer.

Such examples concern people in overt situations of threat to self-esteem. In fact, however, self-enhancing PCBs are likely to occur whenever people perceive themselves in relation to the performance of others. As such, self-enhancing PCBs constitute one device for the maintenance of life satisfaction in general populations. PCBs of control represent another set of normative self-cognitions which may contribute to life satisfaction.

PCBs of Control

Perceived control is highly susceptible to the influence of PCB. A widely reported example is that people attribute success to internal, stable and global causes, and failure to external, unstable and specific causes (Abramson and Alloy, 1981). For example, Harvey et al. (1974) studied attribution when participants performed therapy on a study accomplice. The "therapist" accepted more personal responsibility for positive therapy outcomes than when the outcome of therapy was negative. As a consequence of such processes, successful outcomes are owned and unsuccessful outcomes disowned. PCBs of control are also evident in the findings that, in a chance task but not a skill task, people believe they can control outcomes more than objective probability would suggest (Langer, 1975). In a non-contingent task, in which the participant's response does not influence the task outcome, Alloy and Abramson (1979) found that people overestimate the degree to which their response influences outcomes.

PCBs of control are also readily demonstrated in people experiencing threat or adversity. Silver and Wortman (1980) found a tendency among people with major spinal injury to hold unrealistic beliefs about the effect of their own efforts on improvement. Their participants made comments such as, "I'll work so hard I'll walk again." A similar report

by Helgeson (1992) involved cardiac patients. When asked how much control they believed they had over their heart problem, 46% responded "somewhat" and 46% replied "a lot." It seems possible that such PCBs of control act as a buffer against the potentially adverse psychological effects of threatening events. PCBs of control are therefore proposed as another mechanism by which life satisfaction is maintained in general populations, as well as those experiencing adversity. This also applies to the third type of bias that is commonly reported, that of unrealistic optimism.

PCBs of Optimism

PCBs of optimism refers to a set of unrealistic, positive beliefs regarding oneself in the future. It involves a world where good things are more likely to happen to oneself than to hypothetical others. So, for example, students rate themselves as more likely to succeed academically compared to students in general (Alloy and Athrens, 1987). A related optimistic PCB is that people believe more good things will happen to them than bad. Markus and Nurius (1986) found that college students predicted four times more good things than bad happening to them in the future. An extension of these PCBs to include the likelihood of negative events yields the notion of perceived invulnerability. Weinstein (1980) reported that college students regarded themselves as more likely to enjoy their post-graduation job, live past 80 years of age and less likely to have a drinking problem or a heart attack before 40 years of age, compared with the average, same-sex student at their college.

In conditions of adversity, people may re-frame a bad situation into one of optimism for the future. Taylor (1983) reports that cancer patients describe a sense of discontinuity between one's life prior to the adverse event and the present, allowing the optimistic belief that the future will be better for oneself because things are now different. Thus, PCBs of optimism have been reported for both normal populations and those experiencing adversity, and it seems rather intuitive that a belief that one's future will hold good things is important to a sense of life satisfaction.

In summary, the existence of PCBs of self-enhancement, control and optimism is empirically well established. This suggests that such positively biased self-cognitions are a pervasive phenomenon in many different populations. As such it seems likely that they are serving some

fundamental purpose. We suggest that this purpose is the maintenance of self-satisfaction and hence, life satisfaction. But before going on with this idea, the issue of the link between PCBs and mental health needs to be addressed.

PCB AND MENTAL HEALTH

In large part, the critique provided by Colvin and Block (1994) targets the claim by Taylor and Brown (1988) that 'illusions' are tied to mental health. As before, we will not reproduce the detail of this argument, but simply state that we find their case against to be substantial and add the following observations of our own.

In defending their position on this issue, Taylor and Brown (1994) state "... most people do not hold entirely accurate and unbiased perceptions of themselves and the world in which they function. It follows, then, that accuracy is not essential for mental health." (p. 21). So they are stating that the absence of PCB (accuracy) is not essential for mental health. But later in their paper they state that the *presence* of PCBs is not essential for mental health either. "An argument that illusions promote mental health does not imply that they are a necessary condition for mental health. That is a point that has yet to be proven or refuted." (p. 25). So if mental health can exist coincident with either the absence or presence of 'cognitive illusions', the relationship of 'illusions' to mental health would seem tenuous.

They then identify multiple indicators of mental health as "the ability to be happy or contented, the ability to feel good about oneself, the ability to care for and about others, the capacity for creative and productive work, and the ability to grow and develop, especially in response to stressful events." (p. 25).

It is not clear, however, why this list is considered sufficient to define mental health; a fact not lost on Colvin and Block (1994) who also claim it is not a "conceptually acceptable and empirically substantial operationalization of the construct of mental health." (p. 16). The problems with the definition, apart from the lack of empirical justification, are as follows: (1) It mixes global concepts (to be happy) with specific aspects of well-being (e.g. productive work). (2) It omits some aspects of experience that are known to be essential for mental health for most people (e.g. to be cared about by others). (3) It includes

statements that are essentially unoperationalizable ('the ability to grow and develop; the capacity for creative and productive work'). (4) Any demand for 'creative and productive work' would deny mental health to a large proportion of the population. (5) As noted by Taylor and Brown (1994, p. 25), most of the indicators seem to have little in common with the PCBs for self, control and optimism. This makes the proposed linkage between positive 'illusions' and mental health even harder to understand.

Taylor and Brown (1994) also state "Our concern is with mental health, not depression. The crucial issue is not whether depressed people are accurate or negatively biased; it is whether normal, healthy adults are accurate or positively biased." (p. 22). Yet this constitutes a distinct change of heart from Taylor and Brown (1988) where the reduced form of illusions in people with depression was used as the pre-eminent exemplar for all three forms of illusion (see pp. 196–197) and also from Taylor (1989) who stated:

> The discovery of depressive realism and the fact that depressed people do not hold or are unable to use the positive illusions that are so advantageous to normal people suggests that positive illusions – more particularly, their absence – may figure into the onset and progression of at least some forms of depression. (p. 219)

Finally, as noted by Colvin and Block (1994, p. 8), one can hardly consider people with psychiatric disorders to be 'mentally healthy', and yet Taylor and Brown (1988) provide no evidence that their three 'illusions' are necessarily absent for such people. Indeed, there is evidence that people with psychiatric disorders other than depression do retain such PCBs. While this literature cannot be reviewed here, the data provided by Bowins and Shugar (1998) are instructive. They measured self-esteem in people with schizophrenia and found that, while the mean was lower than normal (52 vs. 70), the range of values (0–96) indicated that some people had normal, or even abnormally high, levels of self-esteem.

In summary, it is evident that the link between PCBs and mental health cannot be sustained. What can be sustained, however, is the link between PCBs and subjective well-being as defined earlier in this paper. There is abundant evidence for a generally high correlation between subjective well-being and self-esteem, perceived control and optimism. This link, indeed, was recognized by Taylor and Brown (1988, p. 198).

THE CLINICAL SIGNIFICANCE OF PCBs

As long ago as 1931, Dodge and Kahn argued that an "insatiable" craving for superiority led to psychopathology. Since then many prominent theorists in the field of psychology have argued that an accurate perception of reality and oneself are the crucial components of psychological health (Allport, 1943; Maslow, 1950; Erikson, 1950). Within such "reality based" approaches, psychological health would include; an accurate knowledge of one's abilities and limitations, a true estimation of one's degree of control, and a realistic consideration of the negative events that may eventuate. It is reasoned that without such knowledge, one may undertake projects outside of one's ability and control, leading to failure. Neglecting to take adequate precautions against the consequences of a failure may further endanger the individual. Thus, the ability to accept reality without distortion has been aligned with the psychologically healthy person, a view that is seriously challenged by the link between subjective well-being and PCBs.

A reconciliation of these two contrary views is thus required. Baumeister (1989) provides such a notion in proposing that optimal psychological functioning is associated with a "slight to moderate" degree of distortion in one's perception of the self and the world. In stating his Optimal Margin Hypothesis, he makes it clear that there exists an optimal bandwidth for PCBs, and that moving outside this range in either direction has negative consequences for psychological functioning.

Depression: The Diminution of PCB

As has already been mentioned, there exists substantial evidence of a relationship between reduced PCBs and dysthymic or depressed populations. For example, Lewinsohn et al. (1980) used the Minnesota Multiphasic Personality Inventory to demonstrate that depressed subjects perceived themselves as having less socially desirable attributes compared to self-ratings of psychiatric and normal control groups on this same measure. This suggests that the depressed group did not demonstrate the self-enhancing biases reported in non-depressed subjects. Tabachnik et al. (1983) also demonstrated an absence of positive self-bias in students rated as dysthymic on the Beck Depression Inventory (Beck, 1967). These participants rated themselves as similar to non-specific college students on a set of positive self-attributes

while non-depressed subjects rated themselves as having more positive self-attributes than non-specific college students. The association between depression and reduced PCBs was also demonstrated by Lewinsohn et al. (1981) with the finding that depressed subjects had less expectancies for positive outcomes and greater expectancies for negative outcomes compared with non-depressed subjects.

On the basis of such studies, Ackerman and DeRubeis (1991) have postulated that, "depression is a breakdown in this motivation to maintain self-esteem, resulting in the absence of optimistic biases" (p. 581). Implicit in this statement is the idea that the maintenance of positive cognitions requires energy or motivation. Thus, a loss of such motivation may be described as a deficit that is associated with depression (Abramson et al., 1978). It follows that a loss of positively biased beliefs in depressed people may be responsible for the decrease in motivation. A cerebrum that is too astute in perceiving a threatening world may become immobilised by negative effect. Thus, PCBs may supply a counterbalancing force, ensuring the maintenance of motivation for action and a positive sense of well-being. In the absence of such positive bias, optimal psychological functioning would be compromised.

Exceptionally High Levels of Bias

At the opposite end of the spectrum, very high levels of bias may also be maladaptive (Baumeister, 1989). For example, overestimating personal competence may generate increased dangers of failure. Indeed, encountering failure may be central to the maintenance of an optimal upper boundary. When failure is not encountered, such as may happen when people in positions of power are not provided with disconfirming negative feedback, they may become delusional, thereby constituting a danger to themselves and others. McFarlin et al. (1985) offer support for this argument, finding that high self-esteem subjects tend to persist at impossible tasks even in the light of advice to the contrary. Further, excessive PCBs of optimism can lead to an overestimation of one's ability to cope with difficult situations (Haaga and Stewart, 1992), such as the overconfident person believing they can perform well on an exam without much preparatory work. Moreover, if the biased belief is that failure is due to external events, such students may not attribute their low mark to a lack of preparatory work. Instead they may attribute it to being a particularly difficult exam and consequently, fail to use this

experience as a guide for future behaviour. High levels of PCB may thus have maladaptive consequences for the individual.

Although very high levels of cognitive bias may be generally regarded as maladaptive, there may also be life circumstances when, in order to restore or maintain life satisfaction within the homeostatic range, it is adaptive to move outside the optimal margin for PCBs. One such circumstance is following major disability or disease diagnosis. Taylor (1983) proposes that the involvement of PCBs under such circumstances is central to the process of psychological recovery. She posits the onset of cognitive adaptation to such conditions as through the use of such devices as a search for meaning in an attempt to regain mastery over the event (PCB of control), self-enhancing evaluations which usually involve downward comparisons (PCB of self-enhancement), and unrealistic views of future health status (PCB of optimism). Support for these processes is readily available. For example, Ireys et al. (1994) found that, among young adults with severe disabilities, having a negative self-perceived prognosis (low PCB for optimism) was the variable most strongly associated with low self-esteem.

In summary, although high levels of PCBs may have adaptive advantage in these specific life circumstances, it appears that this is exceptional. More generally, moderately high levels of PCBs fall within the optimal margin posited by Baumeister (1989), while low or absent levels of PCB, and extremely high levels of PCB, fall outside of the margin and have maladaptive consequences. The fact that cognitive biases are found to exist at moderately high levels in normal populations also suggests that they are mechanisms under homeostatic regulation.

HOMEOSTATIC REGULATION OF PCBS

A description of the factors which maintain PCBs at moderately high levels is at this stage theoretical, but it is possible they are related to assumptive schemata. These have been characterised by Janoff-Bulman (1989) as abstracted knowledge structures which serve as pre-existing theories for anticipating the future and interpreting new information. It is suggested that assumptive schemata are also biased towards the positive. As evidence for this, Janoff-Bulman (1989) provided data from her World Assumptions Scale. This evidences positive bias in relation to the assumptive schemata categories, such that the world is seen as benevolent, positive meaning is attributed to events,

and the self is perceived as worthy. Clearly, therefore, such positively biased assumptive schemata would produce a systematic source of PCB.

While the nature of the overlap between PCBs and assumptive schemata is uncertain at this stage, several processes that may act to maintain bias in either system are becoming clearer. One mechanism may be information processing biases, such that people tend to select information congruent with prior perceptions and neglect information incongruent with their assumptive schemata (Mishel et al., 1973, 1976; Tesser and Campbell, 1983; Moreland and Sweeney, 1984). This tendency reduces the likelihood that incongruent information is able to influence PCBs or schemata in a negative direction. A second factor in the maintenance of such positivity has been stated earlier, as the non-specific and unfalsifiable properties of both PCBs and schemata. Clearly if they cannot be easily negated they will tend to be robust, even in a negative environment.

However, major negative life events may provide a challenge to either system. If such events are unable to be assimilated within the positively biased framework, such events may cause the assumptive schemata to undergo accommodation and become more negative. As a result, life satisfaction will decrease due to the increased negativity of PCBs or schemas. This "bottom-up" casual influence has been confirmed by Feist et al. (1995) using structural equation modeling.

Following such change, it is proposed that the system has the potential to recover its normal level of positive status. The mechanism is likely to involve adaptation (e.g. Adaptation Level Theory, Helson, 1964) whereby, due to a combination of contrast and habituation, minor daily events are perceived as more positive than they were before the change, thus gradually returning the PCBs and schemata to their former positive status. Together, these processes offer an explanation of the way in which the lower margin for both is maintained at a moderately high level of positive bias.

These processes may further explain how the upper margin for an optimal positive level of bias is maintained. For an individual with extreme positive bias, experience with reality may produce new information regarding the self that is markedly incongruent with expectation. As a consequence, the new information may fail to assimilate resulting in the accommodation or moderation of PCBs and schemata to a lower level of bias. For example, an athlete who continues to believe they are especially superior to others may neglect to follow training guidelines

stringently, resulting in continual surprising losses. Such experience with reality may reach a threshold where it is no longer susceptible to information processing biases and is too incongruent with expectations to be assimilated. In other words, reality itself may be responsible for the maintenance of an upper boundary for positive bias.

We propose that the processes that have been described contribute to the homeostatic regulation of PCB. Such homeostatic maintenance of PCBs and schemata in a moderately high bandwidth would explain why the standard for life satisfaction is also maintained at such levels, and also accounts for the low levels of variation in the average life satisfaction data of normative samples drawn from Western populations.

CONCLUSION

Through some mechanism, the mean life satisfaction of Western populations is maintained at $75 \pm 2.5\%$ of the measurement scale maximum score. In considering how such levels of satisfaction might be maintained, attention has been drawn to the fact that the variable most strongly associated with life satisfaction is satisfaction with the self. Indeed, it seems intuitive that, in order to feel satisfied and happy with life, satisfaction with the self would be prerequisite. It has further been proposed that such self-satisfaction rests on three related beliefs of self-worth, perceived control and optimism. Together, therefore, these three beliefs are proposed to be responsible for the generation of life satisfaction.

It is also proposed that a generally positive outlook on life is necessary to normal functioning. Therefore, not only must some mechanism, like self-satisfaction, be able to generate life satisfaction, but must also be robust enough to withstand challenge from the objective realities of life, which often have the potential to create self-dissatisfaction. Thus, the self-beliefs must also act as buffers to reality. In this, their role to maintain a sense of positive well-being is paramount and, in so doing, these self-beliefs bias cognitions pertaining to the probabilities and likelihood of the empirical world. This process is referred to as positive cognitive bias (PCB).

Previous reviews of this literature have been marked by controversy over the claim that ‘cognitive illusions’ are associated with ‘mental health’. This paper has resolved these difficulties by adopting the

position that 'illusions' are a misnomer for what are more accurately described as PCBs and that 'mental health' in this context is more appropriately considered as subjective well-being. With these reconceptualizations in place, it is then argued that the empirical literature supports the concept that the PCBs for self-worth, control and optimism are essential to the homeostatic maintenance of subjective well-being within an optimal bandwidth. If their activity falls below this optimum level they become associated with depression, and above the optimal bandwidth they become associated with delusional thoughts.

Finally it has been argued that PCBs may have a close relationship with what have previously been termed cognitive schemata. The latter are also held at a positive level, and consequently would yield PCB of the kinds that have been described. Thus, in total, the model describes a package in which cognitive schemata create a PCB in self-perceptions of personal worth, control and optimism. These devices are quite robust and resist a literal cognitive link with objective reality in order to serve their primary purpose. This is to homeostatically maintain life satisfaction within the moderately high bandwidth associated with optimal psychological functioning.

ACKNOWLEDGEMENT

We thank Betina Gardner and Pamela de Kort for their assistance in the preparation of this manuscript.

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