

Failure of Homeostatic Subjective Well-being as a Model for Depression:  
An Empirical Study

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Introduction

The pervasiveness of depression and its impact upon people's lives is becoming increasingly recognised. Some researchers are now arguing that depression may be conceptualised as lack of subjective well-being (Cook, 2002; Cummins & Lau, 2003). This seems plausible given that a lack of life satisfaction, the core construct measured by subjective well-being scales, is a central and pervasive component of depression (Lewinsohn, Redner & Seeley, 1991).

There are a number of different types of depression and several taxonomies for distinguishing the various types. However, Clark and Watson (1989) found in their analysis that the majority of depression scales tend to measure core aspects of depression and ignore the symptoms of the possible variants. In order to avoid the debate over the difference between clinically diagnosable depression, the various types of depression, and subsyndromal depression, this report will be concerned with depressive symptomatology (DS).

Research evidence shows that reduced subjective well-being (SWB) and high depressive symptomatology are closely related. SWB is reduced for those currently experiencing high DS (Bonciatto *et al.*, 2001; Broe *et al.*, 1998; Heady, Kelley & Wearing, 1993; Lewinsohn, Hoberman & Rosenbaum, 1988; Lewinsohn *et al.*, 1991; Russo, *et al.*, 1997); SWB is a significant predictor of DS (DS (Abbey & Andrews, 1984; Hong & Giannakopoulos, 1994; Lewinsohn *et al.*, 1991); and SWB increases as DS decreases (Hansson, 2002; Lewinsohn *et al.*, 1991). Studies have also shown that SWB scores are lower for those with high DS than they are for people with other psychiatric illnesses (Hansson, 2002; Heady *et al.*, 1993; Russo, *et al.*, 1997) and those with other chronic medical illnesses (Bonciatto *et al.*, 2001; Broe *et al.*, 1998). Thus, it may be argued that high DS and low SWB appear to represent the same underlying psychological state.

Cummins has proposed that SWB is under homeostatic control, and he has outlined a model describing the psychological processes responsible for maintaining homeostatic SWB (Cummins & Lau, 2003). There is evidence to show that failure of these psychological mechanisms to maintain SWB results in both reduced SWB and high DS. Cummins' model will be described below and the evidence reviewed in support of the model. Evidence in support of the notion that DS relates to the model in the same way as SWB will also be reviewed.

The homeostatic model of SWB was proposed in response to the remarkable stability and homogeneity of SWB scores observed within and across populations (Cook, 2002; Cummins, 1995; Cummins, 1998; Cummins, 2003; Cummins *et al.*, 2002; Cummins & Lau, 2003; Cummins & Nistico, 2002). Cummins (1995) reports that the Western population mean SWB has consistently been found to average  $75.0 \pm 2.5$  percentage of scale maximum (SM) SWB with, remarkably, only two standard deviations of 5%SM SWB. Thus, Cummins proposed that 70%SM to 80%SM is the homeostatic range of SWB and any score outside this range is considered SWB failure. This range clearly reflects a strongly positive SWB.

According to Cummins' model, the set-point range of SWB is determined by personality, an unconscious first-order determinant of SWB. More specifically, the personality constructs of neuroticism (or its polar opposite, emotional stability) and extraversion, from Eysenck's Five Factor Model of personality, are thought to determine this set-point range (Cummins & Lau, 2003; Cummins, Gullone & Lau, 2002). Further, extraversion and neuroticism are so highly correlated with positive and negative affect, respectively, that they are considered synonymous with them for the purpose of this model (Cummins *et al.*, 2000; Depue & Monroe, 1986; Steel & Ones, 2000).

There is ample evidence in the literature to show that neuroticism and extraversion are intimately connected to SWB (Argyle & Lu, 1990; Costa & McCrae, 1980; Cummins *et al.*, 2002; Cummins & Nistico, 2002; DeNeve & Cooper, 1998; Diener, Sandvik, Pavot

& Fujita, 1992; Sandvik, Diener & Siedlitz, 1993; Vitterso, 2000). Steel and Ones (2000) conducted a meta-analysis using Veenhoven's World Database of Happiness (which includes more than two billion participants) and they found that extraversion and neuroticism accounted for 64 percent of the variance in SWB. Cummins argues that high extraversion results in resilience to SWB failure and high neuroticism results in susceptibility to SWB failure.

Similarly, there is evidence to demonstrate that those high on extraversion and positive affect are resilient to high DS (Barnett & Gotlib, 1988; Boyce, Parker, Barnett, Cooney & Smith, 1991; Clark, Watson & Mineka, 1994; Diener, Suh, Lucas, & Smith 1999; Rector, Hood, Richter & Bagby, 2002; Watson, Clark & Carey, 1988), and those high on N and negative affect are susceptible to high DS (Boyce *et al.*, 1991; Clark *et al.*, 1994; Roberts & Gotlib, 1997; Roberts & Kassel, 1996, Watson *et al.*, 1988). This is consistent with the proposition that DS relates to the homeostatic system in the same way as SWB.

A set of positive cognitive buffers are believed to be the conscious second-order determinants of SWB that strive to maintain SWB within the positive set-point range determined by personality. Accordingly, these cognitive buffers provide a strongly positive cognitive bias for perceiving the self, others and the world (Cummins, 2003; Cummins *et al.*, 2000; Cummins & Lau, 2002; Cummins & Nistico, 2002; Weinstein, 1980, 1989). When SWB is challenged by a negative event, people utilise these cognitive buffers to reinterpret the event, themselves, or the world positively, thereby maintaining positive SWB. Cummins' proposed a tripartite model for the cognitive buffers consisting of self-esteem, optimism and perceived control. These buffers have been found to co-vary (Enger, Howerton & Cobbs, 2000; Judge, Erez, Bono & Thoresen, 2002; Klein & Helweg-Larsen, 2002; Matikka, 1996; Ralph, Merralls, Hart, Porter & Sueno, 1995; Sanna, 1996; Scheier & Carver, 1985; Shepperd, Oulette & Fernandez, 1996). For example, Klein and Helweg-Larsen (2002) conducted a meta-analysis where they found that optimism and perceived control have an average correlation of .31 on average. Judge and colleagues (2002) found a correlation for self-esteem and optimism of .52.

Cummins et al. (2002) also demonstrated that these buffers interact with personality. Figure 1 shows the proposed relationship between personality, the cognitive buffers, life-events and both SWB and DS.

Insert Figure 1 here

Research is certainly consistent with the role of the positive cognitive buffers in maintaining SWB. A number of studies have found a positive relationship between self-esteem and SWB (Boschen, 1996; Hills & Argyle, 2001a, 2001b; Judge, Erez, Bono and Thoresen, 2002; Kwan, Bond, & Singelis, 1997; Marriage & Cummins, 2004; Matikka, 1996; Roy, Neale & Kendler, 1995), a negative relationship between self-esteem and neuroticism (Judge et al., 2002), and a negative relationship between self-esteem and DS (Brown et al., 1986; Lewinsohn et al., 1988; Lewinsohn, Mischel, Chaplin & Barton 1980).

Optimism has been implicated in the maintenance of SWB and in the maintenance of satisfaction with the self (Alloy and Ahrens, 1987; Cummins & Nistico, 2002; Fitzgerald, Tennen, Affleck & Pransky, 1993; Heady, Holmstrom & Wearing, 1984; Lucas, Diener & Suh, 1996; Peterson, 2000; Weinstein, 1989; Wrosch & Scheier, 2003). Further, optimism has been found to correlate negatively with DS (Alloy & Ahrens, 1987; Aluoja et al. 2004; Peterson, 2000; Weinstein, 1989; Wrosch & Scheier, 2003). For example, Weinstein (1989) and Peterson (2000) in their literature reviews both report that lack of optimism is associated with depression, and Alloy and Ahrens (1987) found that depressed people are pessimistic relative to non-depressed people.

Perceived control over one's world is positively correlated with SWB and perceived lack of control is negatively correlated with SWB (Boschen, 1996; Enger et al., 2000; Fuhrer et al. 1992; Grobb, Little, Wanner & Wearing, 1996; Klein and Helweg-Larsen, 2002; Klonowicz, 2001; Kopp & Ruzcika, 1993; Marriage & Cummins, 2004; Raphael et al. 1996; Schulz & Decker, 1985). It has additionally been found that compared with those low on DS, those high on DS exhibit low perceived control (Aluoja et al., 2004;

Lewinsohn *et al.*, 1991; Wardle *et al.*, 2004) and do not exhibit an illusion of control (Alloy, Abramson & Viscusi, 1981).

Thus, there is evidence in the literature in support of the notion of a tripartite cognitive buffering system for both SWB and DS. For a more comprehensive review of the positive cognitive buffers see Cummins and Nistico (2002).

The close relationship of SWB to internal constructs such as personality and cognition, and the remarkable stability and homogeneity of SWB compared with the huge variability in the extrinsic conditions of individuals, suggest that SWB is largely independent of life circumstances (Costa & McCrae, 1980; Cummins & Lau, 2002; Diener, Suh, Lucas & Smith, 1999; Heady & Wearing, 1992, in Cummins & Nistico, 2002). Consistent with this argument, research shows that major life events usually impact upon SWB for a short period only, estimated to be anywhere up to a maximum of six months (Brickman, Coates & Janoff-Bulman, 1978; Cummins *et al.*, 2000; Eronen & Nurmi, 1999; Schulz & Decker, 1985; Suh *et al.*, 1996). Following this time, SWB returns to one's normal set-point range as described above (Cummins *et al.*, 2000). Thus, when under maintenance conditions (that is, homeostasis), SWB is independent of extrinsic conditions.

However, all homeostatic systems have their limits. SWB failure is proposed to occur when the impact of an extrinsic condition is sufficiently severe or chronic, or one reports a sufficient level of perceived stress in response to daily microstressors to overcome the homeostatic system. For example, while research has found that people who become paraplegic return to homeostatic SWB before long, if the injury is sufficiently debilitating (e.g., the injury results in the need for ventilatory assistance) chronic SWB failure is likely to occur (Bach & Tilton, 1994).

Similarly, life-events can trigger an increase in DS. Research has largely supported the notion of a 'diathesis-stress' model of depression where those vulnerable to depression require a life-event (Brown *et al.*, 1986; Eronen & Nurmi, 1999; Lewinsohn *et*

al., 1991), or the perception of daily microstressors or stress, to trigger the depression (Depue & Monroe, 1986; Lewinsohn *et al.*, 1988; Lewinsohn *et al.*, 1991; Roberts & Monroe, 1992). The relationship between extrinsic conditions and the SWB system and DS can be seen in Figure 2.

Insert Figure 2 here

Thus, a homeostatic model of SWB and the mechanisms by which it operates has been presented. Evidence has been presented in support of this model, and it can be seen that SWB and DS relate to the model similarly. Three main predictions can be made in relation to SWB from Cummins' model. It is argued here that these predictions can be similarly applied to DS.

First, under maintenance conditions the SWB system (that is, personality and the positive cognitive buffers) should predict SWB and DS. Emotional stability and extraversion should predict SWB and DS the most strongly (as they are the first order-determinants of SWB), followed by the positive cognitive buffers. This should be evident in a positive relationship with SWB, and a negative relationship with DS.

Second, under maintenance conditions there should be no relationship between SWB or DS and extrinsic conditions (as SWB and DS should be independent of extrinsic conditions when under SWB maintenance).

Third, the model proposes that under non-maintenance conditions the ability of the SWB system to predict SWB and DS will be reduced, and, instead, extrinsic conditions should predict SWB and DS. Thus, extrinsic conditions should predict SWB and DS better than the SWB system for non-maintenance conditions. Further, the ability of the SWB system to predict SWB and DS should be poorer for non-maintenance conditions than maintenance conditions.

These are the predictions that will be tested here. Consistent with other studies it is

expected that those high on DS will be low on SWB. Extrinsic conditions will be operationalised as negative life-events (NLE) and stress, where stress represents the subjective response to the minor daily hassles that challenge SWB and have been shown to trigger high DS.



## Method

### *Participants*

Participants were randomly drawn from a database of previous Australian adult participants at the Australian Unity Wellbeing project who had indicated that they were willing to participate in further projects. 1620 participants were sent the questionnaire and 562 returned it completed, giving a response rate of 34.69 percent. The gender of some participants was unknown from the database, but of those that were known there were 331 females ( $M = 57.00$  years old,  $SD = 13.23$ ) and 218 males ( $M = 50.68$  years old,  $SD = 16.47$ ). The age of participants ranged from 18 years old to above 76 years old.

Returning the completed questionnaire was considered consent to participate. No inducements were given for participation.

### *Measures*

As this study was run in conjunction with other studies there were a number of scales included in the questionnaire that were not relevant to this study. These are presented in Appendix A. The remaining scales relevant to this study will be outlined below. All scales used an 11-point Likert scale (ranging from 0 to 10) which was unconventional for most of the scales. This was done to ensure that all items used the same scale as the Personal Well-Being scale in order to avoid confusion to the respondent, and to allow easy comparison of responses on different variables.

Subjective well-being was measured using one global life-satisfaction item (“How satisfied are you with your life as a whole?”), and using a 7-item Personal Well-being scale developed as part of the Australian Unity Wellbeing project (Cummins *et al.*, 2001). The scale asks participants “How satisfied” they are with their standard of living, health, life achievements, personal relationships, safety, security and community connectedness. The scale was developed using an 11-point Likert response scale. The reliability coefficient reported by Cummins was .82 and Cronbach’s coefficient alpha with this sample was .87.

Depression and stress were measured using questions from the short version of the Depression, Anxiety and Stress Scale (DASS) (Lovibond & Lovibond, 1995). The anxiety scale was included in the questionnaire but is not relevant to this study. There are 21 items altogether in the short version of the DASS, with 7 items each for depression, anxiety and stress. The participant is asked to indicate on a scale if the statement applies to them “not at all” or “a lot.” The scale is usually anchored on a four-point scale, though, as already mentioned, an eleven-point scale was used here. The DASS reports good reliability of .91 for depression, .84 for anxiety and .90 for stress (Lovibond & Lovibond, 1995). The coefficient alpha for the depression sub-scale for this sample was .90, and for the stress sub-scale it was .87.

Personality based on extraversion and emotional stability was measured using the four relevant questions from the Ten Item Personality Inventory (TIPI), a short inventory for measuring the Big Five personality dimensions (Gosling, Rentflow & Swann, 2003). It is normally a seven-point scale. Gosling and colleagues (2003) found a coefficient alpha of .68 for extraversion and .73 for emotional stability. In this sample the Cronbach coefficient alphas were .68 for extraversion and .67 for emotional stability.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1979). This is a brief ten-item scale designed to measure global self-esteem (e.g. “On the whole I am satisfied with myself”). The participant is asked to indicate how much they agree with each statement, where the scales are anchored by “strongly disagree” to “strongly agree”. It is normally a five-point scale. Previous studies have found reliabilities that range from .72 to .90 (Gary-Little, Williams & Hancock, 1997; Robins, Henden & Trzesniewski, 2001). In the current sample the coefficient alpha for this scale was .88.

Perceived Control was measured using a nine-item scale developed for the Australian Unity Wellbeing project (Chambers, Hollway, Parsons & Wallage, 2003). Three-items each measured primary control, secondary control and relinquished control. All items begin with the statement “When something bad happens to me I...” An example of a primary control question is “I ask others for help or advice,” an example of a secondary

control question is “I remind myself something good may come of it,” and an example of a relinquished control question is “I spend time by myself.” While it was intended that primary control, secondary control and relinquished control would be analysed separately, the cases to IV ratio did not permit it. Thus, perceived control was collapsed into a composite variable by reverse scaling the relinquished control items, and adding the scale together, to reach a final perceived control score. The coefficient alpha for the collapsed scale with this sample was .60.

Optimism was measured using the Life Orientation Test-Revised (Carver & Scheier, 2003). The scale measures generalised optimism versus pessimism (eg. “Overall, I expect more good things to happen to me than bad”). The participant is asked to indicate how much they agree with each statement, where the scales are anchored by “strongly disagree” to “strongly agree”. It is normally a five-point scale. The reliability of the scale has been found to range from .75 to .85 and is stable over time. The coefficient alpha with this sample was .79.

Negative life-events (NLE) were measured using one item that asked participants, “Has anything happened to you recently causing you to feel happier or sadder than normal?” to which participants answered, “Yes, happier,” “Yes, sadder” or “No.” Participants were then asked to rate the influence of this event on the 11-point Likert scale, and to indicate out of seven choices which major life areas were most strongly influenced. No correlation was found between SWB and the perceived influence of the event so only the answer to the first question was used in this study.

### *Procedure*

Questionnaires were posted to participants with a brief introductory letter explaining the project to them and outlining their rights and their confidentiality (a copy of the letter can be seen in Appendix B). Participants returned the completed questionnaires by mail within a few weeks of receipt.

## Results

None of the independent variables (extraversion, emotional stability, self-esteem, optimism, perceived control, NLE and stress) or the dependent variables (SWB and DS) were normally distributed, and all were strongly positively skewed, except for NLE and also DS and stress, which were strongly negatively skewed. However, as these distributions were as expected according to theory and past research, transformation of the variables was not undertaken, as transformation would distort the nature of the data. Additionally, and more importantly, the residuals of prediction for each group for both dependent variables were normally distributed.

Each question on the scale was examined for outliers and missing data (outliers were any response outside of zero to ten, as these were the response choices on the 11-point Likert scale that was used for all questions except for NLE). Outlying values were deleted, resulting in a total of less than 2 percent missing data on each item. Missing data were analysed through SPSS 11.5 MISSING VALUES ANALYSIS (see Appendix C for an example of this analysis). There appeared to be no pattern to the missing data. Expectation maximization was conducted to impute the missing data for all items except for NLE, which was a dichotomous categorical variable and therefore could not be imputed. Thus, the cases with missing data on NLE ( $N = 11$ ) were not used in the regressions, though they were used for finding correlations with the full sample ( $N = 562$ ) for all variables except NLE ( $N = 551$ ). The means and standard deviations for items on each scale were unaltered by expectation maximisation (see Appendix C for an example of the output from the expectation maximisation).

Table 1.

Correlation Matrix for All Predictors, Life Satisfaction, Personal Well-Being and Depressive Symptomatology

	1	2	3	4	5	6	7	8	9	10
1. Life Satisfaction	1									
2. Personal Wellbeing	.74**	1								
3. Depression	-.57**	-.57**	1							
4. Emotional Stability	.06	.07	.05	1						
5. Extraversion	.18**	.13**	-.05	.19**	1					
6. Self-esteem	.52**	.63**	-.61**	-.03	.12**	1				
7. Optimism	.52**	.58**	-.53**	-.05	.14**	.67**	1			
8. Perceived Control	.40**	.45**	-.38**	.03	.12**	.52**	.53**	1		
9. Negative Life Event	-.25**	.26**	.30**	-.05	-.07	-.18**	-.14**	-.16**	1	
10. Stress	-.38**	-.39**	.66**	.06	-.0	-.44**	-.39**	-.26**	.19**	1

Note:  $\underline{N}$  = 562 for all predictors except NLE, where  $\underline{N}$  = 551; \*\* $p$  < .001

The correlation matrix shown in Table 1, is based on the full sample ( $\underline{N}$  = 562, except for NLE where  $\underline{N}$  = 551). The results show that all correlations between all variables (both independent variables and dependent variables) were significant and in the expected direction, except for a large portion of the correlations with the personality variables. No correlations with emotional stability were significant, except extraversion. SWB, life-satisfaction and the positive cognitive buffers correlated significantly with extraversion but DS, NLE and stress did not. The correlations with extraversion were lower than the correlations between any other variables, other than those with NLE, which was a dichotomous variable for which the size of the correlations would be mathematically restricted. This is not consistent with Cummins' model where the personality variables are the first-order determinants of SWB and are therefore hypothesised to correlate the most strongly with SWB.

All correlations with SWB and DS, other than the personality variables and NLE, were moderate to high. For SWB, correlations with the remaining independent variables (other

than personality and NLE) ranged from  $-.39$ , for stress, to  $.63$ , for self-esteem, and for DS they ranged from  $-.37$ , for perceived control, to  $.66$ , for stress.

For the main analysis of the predictions participants were split into three groups by their score on the life-satisfaction item. Participants who scored less than 70%SM on life-satisfaction were placed in the Failure Group ( $N = 108$ ), and those who scored between 70%SM and 80%SM were placed in the Maintenance Group ( $N = 272$ ). Those who scored above 80%SM were not used in the analysis ( $N = 171$ ).

Four hierarchical multiple linear regressions were conducted, one for each group with SWB as the dependent variable (as measured by the PWB scale), and one for each group with DS as the dependent variable (as measured by the depression subscale on the DASS). The predictors were the same for both groups, but they were entered into the regression in a different order, according to theory. The predictors were emotional stability, extraversion, self-esteem, optimism, perceived control, stress and NLE. For the Maintenance Group, the personality variables were entered at the first step, and then the remaining predictors were entered altogether at the second step. For the Failure Group, NLE and stress were entered at the first step, and then the remaining predictors were entered altogether at the second step. Analysis was performed using SPSS 11.5 REGRESSION.

To reduce the influence of outliers in the solution outliers were replaced with the value for that dependent variable that was three standard deviations from the mean for that group. An outlier was defined as any predicted value that was more than three standard deviations from its actual value. Three outliers were replaced in the Maintenance Group for DS, and one was replaced in the Failure Group for DS.

Multicollinearity was assessed by checking tolerance and by using a conditioning index in SPSS collinearity diagnostics. No multicollinearity was found.

An  $F$ -test of all four of the final models found that they were all significant at the  $p <$

.001 level. However, most of the predictors in the model were not significant. The results of the regression for both SWB and DS can be seen in Table 2 for the Maintenance Group and Table 3 for the Failure Group. The variance accounted for (using adjusted  $R^2$ ) by the final model in SWB was 24 percent for the Maintenance Group and 21 percent for the Failure Group, and for DS it was 49 percent for the Failure Group and 43 percent for the Maintenance Group. Thus, the model was able to account for greater variance in DS than in SWB.

Table 2.

Regression Analyses for Subjective Well-Being and Depressive Symptomatology Under Maintenance Conditions

Predictor	Subjective Well-Being						Depressive Symptomatology					
	r	$\beta$	t	sr <sup>2</sup>	R <sup>2</sup>	$\Delta R^2$	r	$\beta$	t	sr <sup>2</sup>	R <sup>2</sup>	$\Delta R^2$
<u>Step 1</u>												
ES	.08	.14	2.55	.14	.00	.01	.15	.02	0.50	.02	.02	.02
Extraversion	.05	-.04	-0.62	-.03			.05	.09	1.78	.08		
<u>Step 2</u>												
NLE	-.21*	-.11	-1.91	-.10	.24	.26**	.56**	.14	2.99*	.14	.43	.43**
Stress	-.14**	-.09	-1.63	-.09			.22**	.45	9.19**	.42		
Self-esteem	.45**	.28	4.12**	.22			-.47**	-.29	-4.87*	-.22		
Optimism	.37**	.15	2.26	.12			-.32**	-.06	-0.94	-.04		
Perceived Control	.33**	.11	1.87	.10			-.24**	-.03	-0.65	-.03		

Note:  $N = 272$ ; \* $p < .01$ ; \*\* $p < .001$ ; ES = emotional stability;  $\Delta R^2 = R^2$ -change

The personality variables (entered at the first step) did not result in a significant  $R^2$ -change for either SWB or DS for the Maintenance Group. Analysis of the Maintenance Group revealed that extraversion did not correlate significantly for either SWB or DS, and extraversion did not result in any significant semi-partial correlations or  $\beta$ -weights for SWB or DS. Emotional stability did not correlate significantly with SWB but it did

correlate significantly with DS ( $r = .15$ ,  $p < .01$ ). However, emotional stability did not result in a significant semi-partial correlation or  $\beta$ -weight for either SWB or DS. Thus, results were inconsistent with the hypothesis that personality would be able to predict SWB and DS.

Table 3.

Regression Analyses Subjective Well-Being and Depressive Symptomatology Under Non-Maintenance Conditions

Predictor	Subjective Well-Being						Depressive Symptomatology					
	r	$\beta$	t	$sr^2$	$R^2$	$\Delta R^2$	r	$\beta$	t	$sr^2$	$R^2$	$\Delta R^2$
<u>Step 1</u>												
NLE	-.21	-.22	-2.40	-.21	.03	.05	.29**	.50	2.26	.16	.44	.45**
Stress	-.12	.16	1.59	.14			.66*	.16	6.34**	.44		
<u>Step 2</u>												
ES	.01	-.01	-0.06	-.01	.21	.22**	.01	.02	.33	.02	.49	.08**
Extraversion	-.14	-.14	-1.56	-.13			.06	-.03	-.49	-.03		
Self-esteem	.43	.39	3.62**	.31			-.48**	-.26	-3.01*	-.21		
Optimism	.30**	-.15	1.37	.12			-.38**	-.11	-1.25	-.09		
Perceived Control	.20*	-.02	0.19	.02			-.15	.10	1.28	.09		

Note:  $N = 108$ ; \* $p < .01$ ; \*\* $p < .001$ ; ES = emotional stability;  $\Delta R^2 = R^2$ -change

The remaining predictors resulted in a significant  $R^2$ -change for both SWB and DS for the Maintenance Group ( $R^2$ -change = .26,  $p < .001$ ). All of the positive cognitive buffers correlated positively with SWB and DS. However, only self-esteem resulted in a significant semi-partial correlation and  $\beta$ -weight, for both SWB ( $sr^2 = .22$ ,  $\beta = .28$ ,  $p < .001$ ) and DS ( $sr^2 = -.22$ ,  $\beta = -.29$ ,  $p < .001$ ). The remaining semi-partial correlations and  $\beta$ -weights of the positive cognitive buffers were not significant. Thus, the data was consistent with the hypothesis that the positive cognitive buffers could predict DS and SWB under maintenance conditions for self-esteem, but not for optimism or perceived



control.

It was predicted that NLE and stress would have no relationship with SWB and DS under maintenance conditions. Both NLE and stress correlated significantly with SWB and DS under maintenance conditions. However, neither NLE or stress resulted in a significant semi-partial correlation or  $\beta$ -weight for SWB, though they both resulted in significant semi-partial correlations and  $\beta$ -weights for DS (for NLE,  $\underline{sr}^2 = .14$ ,  $\underline{\beta} = .14$ ,  $\underline{p} < .01$  and for stress,  $\underline{sr}^2 = .42$ ,  $\underline{\beta} = .44$ ,  $\underline{p} < .001$ ). Thus, once shared variance for the independent variables was accounted for, the data was consistent with the prediction that SWB would be independent of extrinsic conditions under maintenance conditions. This prediction was not upheld for DS. Further, these results are not consistent with the prediction that DS and SWB relate to the psychological constructs of the SWB system in the same way.

For the Failure Group, NLE and stress did not result in a significant  $R^2$ -change for SWB, though they did for DS ( $\underline{R}^2$ -change = .45,  $\underline{p} < .001$ ). However, only stress resulted in a significant semi-partial correlation and  $\beta$ -weight for DS ( $\underline{sr}^2 = .44$ ,  $\underline{\beta} = .50$ ,  $\underline{p} < .001$ ). This relationship was not stronger than the relationship between DS and extrinsic conditions for the Maintenance Group. Thus, for both SWB and DS the data were not consistent with the hypothesis that extrinsic conditions are more strongly related to SWB under non-maintenance conditions than under maintenance conditions.

The remaining predictors for the Failure Group (personality and the positive cognitive buffers) resulted in a significant  $R^2$ -change for both SWB ( $\underline{R}^2$ -change = .22,  $\underline{p} < .001$ ) and DS ( $\underline{R}^2$ -change = .08,  $\underline{p} < .001$ ). However, only self-esteem resulted in a significant semi-partial correlation and  $\beta$ -weight for both SWB ( $\underline{sr}^2 = .31$ ,  $\underline{\beta} = .39$ ,  $\underline{p} < .001$ ) and DS ( $\underline{sr}^2 = -.21$ ,  $\underline{\beta} = -.26$ ,  $\underline{p} < .001$ ). The remaining predictors were not statistically significant.

Analysis of the semi-partial correlations revealed that the extrinsic conditions related more strongly than the SWB system to DS under non-maintenance conditions. This is consistent with the prediction. However, this was not the case for SWB where the

extrinsic conditions did not predict SWB under non-maintenance conditions but the SWB system did (though, only self-esteem did).

A one-way ANOVA was conducted for each of the dependent variables and each of the independent variables to see if the Maintenance and Failure Groups differed significantly on them. They did so for all variables except for emotional stability ( $p < .001$  for each ANOVA other than emotional stability). Again, this is inconsistent with Cummins' prediction that the personality variables determine SWB.

When the semi-partial correlations are assessed it appears that self-esteem correlates the most highly with SWB for both the Maintenance and the Failure Groups, and stress correlates the most highly with DS for both groups, though self-esteem still accounts for a large proportion of unique variance in DS. It seems that the strong relationship between stress and DS results in the greater amount of variance accounted for in DS by the models, for both groups, compared with SWB.

The prediction that those high on DS (defined as anyone who scored outside of normal on the depression sub-scale of the DASS) will have reduced SWB was also tested. A one-way ANOVA was conducted to see if those high on DS ( $N = 27$ ) differed significantly on SWB from those with low DS. This was found to be the case ( $p < .001$ ). The 95% confidence interval for SWB for those with low DS was 73.79%SM to 75.85%SM, whereas for those high on DS it was 45.96%SM to 56.90%SM ( $p < .001$ ). A one-way ANOVA was conducted for high versus low DS groups for each predictor individually, and all predictors were found to be significant ( $p < .001$  for each ANOVA) except the personality variables.

Thus, overall the data was not consistent with predictions drawn from Cummins' model of homeostatic SWB, even though the univariate relationships between the independent variables and the dependent variables were strong and significant. Further, the data were not significant with the hypothesis that SWB and DS would relate to Cummins' homeostatic model similarly.

## Discussion

Overall, the results were not consistent with Cummins' homeostatic model of SWB for either the maintenance conditions, or the non-maintenance conditions. For maintenance conditions, the personality factors did not significantly predict SWB or DS, which is fundamental to Cummins' model. Of the positive cognitive buffers, self-esteem was the only statistically significant predictor for both SWB and DS. Thus, while the data were consistent with a cognitive-buffering system for self-esteem, the data was inconsistent with the notion of a tripartite cognitive buffering system as proposed in Cummins' model.

Second, the hypothesis that extrinsic conditions (NLE and stress) would not significantly predict SWB or DS under maintenance conditions was upheld for SWB, but not for DS. This observation also contradicts the prediction, at least for maintenance conditions, that DS and SWB would relate to the SWB system in the same way.

Third, it was hypothesised that extrinsic conditions would predict SWB and DS more strongly than the SWB system under non-maintenance conditions, which was found for DS, but not for SWB. It was also predicted that the SWB system would have a reduced relationship with DS and SWB under non-maintenance conditions. Self-esteem correlated and predicted SWB more strongly for the Failure Group than for the Maintenance Group and self-esteem correlated and predicted DS about equally for both groups. These findings are inconsistent with the prediction.

It must be noted however, that the individual correlations for the full sample between the predictors and SWB and DS were all significant, except the correlations between emotional stability and SWB, emotional stability and DS, and extraversion and DS (though emotional stability did correlate significantly with DS for the Maintenance Group). Further, the Maintenance Group and the Failure Group differed significantly on all predictors except emotional stability, as revealed by one-way ANOVAs. Thus, the independent variables did show significant univariate relationships with the dependent variables, but they were unable to significantly predict the dependent variables according to the multivariate model proposed here.

The lack of relationship between the personality variables and the dependent variables was unexpected. Not only was personality unable to predict the dependent variables for the multivariate model, emotional stability did not correlate with any variables other than extraversion when the full sample was assessed. Extraversion did not correlate significantly with DS for the full sample and the correlation between extraversion and SWB was lower than the correlations between SWB and each of the other predictors (other than NLE). As aforementioned, these results do not support Cummins' theory that personality is the first-order determinant of SWB. Possible reasons for these outcomes will be discussed.

First, it must be noted that much of the research that has found a relationship between personality and SWB or DS has resulted from the observation of univariate relationships. The univariate relationship between extraversion and SWB for the full sample was also significant here, as was the univariate relationship between emotional stability and DS for the Maintenance Group. These relationships may be due to shared variance with other predictors. Thus, once the shared variance was accounted for, there may have remained little unique variance to contribute to the multivariate model. Hence, for the overall multivariate model the personality variables were not significant predictors.

However, this does not explain the lack of significant univariate correlations found for emotional stability, nor for extraversion and DS. It may be that there is no relationship between extraversion and DS, as some studies have found (Cox, McWilliams, Enns & Clara, 2004; Jorm *et al.*, 2000). However, it is difficult to find studies that have not found a significant relationship between emotional stability and SWB or DS.

One possibility is that while research has shown that emotional stability and extraversion are strongly related to SWB and DS, it may actually be specific facets of the personality dimensions that relate to SWB and DS. There is some evidence to support this notion. For example, Schimmack, Oishi, Furr and Funer (2004) found that the depression subscale on the Neuroticism scale of the NEO-PI-R related the most strongly

to SWB, and so too for the positive emotions subscale on the Extraversion scale of the NEO-PI-R. Schimmack and colleagues (2004) found that when they entered these two subscales before neuroticism and extraversion on a stepwise regression, with SWB as the dependent variable, the subsequent addition of neuroticism and extraversion did not result in a significant  $R^2$ -change. This was not the case when the order of entry of the items was reversed. That is, the addition of the subscales to the regression after neuroticism and extraversion did result in a significant  $R^2$ -change. Thus, Schimmack and colleagues believe that neuroticism and extraversion relate to SWB due to the relationship between SWB and the depression and positive emotions subscales, respectively. Given that the personality scales used in this research were abbreviated beyond the inclusion of the subscales of neuroticism and extraversion, relationships between the subscales and SWB or DS would most likely not have been captured. Thus, this may provide an explanation for the lack of relationship between the personality variables and SWB or DS in this study.

Although there has been much research showing strong univariate relationships between the individual positive cognitive buffers with both SWB and DS (which were also found here), there has been a lack of research regarding the multivariate relationship between the positive cognitive buffers and SWB or DS. The lack of significance found for optimism and perceived control, when their multivariate relationship with SWB and DS was assessed, may be due to lack of unique variance associated with SWB and DS. The significant relationship found between self-esteem and both SWB and DS in the multivariate analysis reflects the higher level of unique variance in self-esteem compared with the other positive cognitive buffers that can account for variance in SWB and DS. Optimism and perceived control may correlate with SWB and DS due to the variance they share with self-esteem, while contributing little unique variance of their own. This seems a plausible explanation when one compares the size of the zero-order correlations with the semi-partial correlations for both SWB and DS with each of the positive cognitive buffers. For example, the correlation between optimism and DS for the Maintenance Group was  $-.32$ , whereas the semi-partial correlation was  $.04$ , which is markedly reduced. Compare this with self-esteem for DS in the Maintenance Group

where the zero-order correlation was  $-.47$  and the semi-partial correlation was  $-.29$ . Clearly, self-esteem can still account for a large amount of variance in DS even when shared variance has been accounted for. Thus, when the shared variance in optimism and perceived control was not used in assessing their relationship with SWB or DS in the multivariate model, their relationship did not reach significance.

Further, the relationship between self-esteem and both SWB and DS may be exaggerated due to the lack of relationship found between personality and SWB and DS. If the personality scales used in this study failed to capture an actual relationship between personality and SWB and DS, the variance that self-esteem normally shares with personality may have been allocated to self-esteem alone, thereby boosting its association with the dependent variables. If so, then the relationship between self-esteem and the dependent variables within this model can not be reliably assessed from this study.

The main difference between DS and SWB in the outcome of this study was with the strong relationship found between extrinsic conditions and DS for both groups, where there was no relationship found between extrinsic conditions and SWB for either group. Thus, the results of this study suggest that SWB and DS are different psychological constructs, where extrinsic conditions are strongly associated with DS but not with SWB, regardless of the level of SWB.

It must be noted however that the item regarding NLEs on the questionnaire used in this study was not well formulated. The question relies only on the participants' subjective perception of an event that has influenced their happiness. There is no objective assessment of NLEs. Thus, the way a participant responds is likely to be influenced by their mood and personality (Heady & Wearing, 1989; Magnus *et al.* 1993; Seidlitz & Diener, 1993). Further, the question asks about events that have occurred 'recently.' The perception of 'recent' is open to interpretation and may elicit different responses from different people. Additionally, the question does not establish whether the event is still influencing the participant's happiness or not, and therefore whether it is interacting with the SWB system. Thus, the question does not elicit information that is

useful for testing this model. Therefore, the relationship between extrinsic conditions and the model being tested in this study can not be reliably deduced from this study.

The lack of significance of the positive cognitive buffers other than self-esteem may be due to lack of power. Although the ratio of cases to the independent variables was acceptable for normally distributed data for a medium effect size (though this ratio was only just within acceptable limits for the Failure Group), a greater number of cases may have been required due to the non-normal nature of the data. Further, given that a multivariate analysis is concerned only with unique variance in assessing whether a variable makes a significant contribution to the regression, most of the effect sizes of the variables were small. For example, the correlation between optimism and DS for the Failure Group was  $-.38$ , which is between a small and medium effect size by Cohen and Cohen's (1983, in Tabachnik & Fidell, 2001) rough estimates (where small is  $.20$ , and medium is  $.50$ ). However, the semi-partial correlation (which is what is being tested in a multivariate analysis) was only  $-.09$ , which is smaller than Cohen's definition of a small effect size. Thus, if the study was repeated with a larger sample size, significant multivariate relationships may be found where they were not found here.

The results of the study were consistent with the prediction that those high on DS were low on SWB. It may be that high DS results in reduced SWB, but reduced SWB does not necessarily result in high DS. This may explain the strong association between SWB and DS, despite their different relationships to the SWB system. This is supported by the observation that for the 27 participants who scored outside the normal range on the depression sub-scale of the DASS, all of them had reduced SWB (the 95% confidence interval of this group ranged from  $45.96\%SM$  to  $56.90\%SM$  on SWB), and this is both clinically and statistically significantly lower than that for the non-depressed participants (for whom the 95% confidence interval for SWB was  $73.79\%SM$  to  $75.85\%SM$ ). Conversely, very few of the participants in the Failure Group scored outside the normal range on the depression subscale of the DASS. Thus, while participants high on DS were low on SWB, those who were low on SWB were not necessarily high on DS.

Thus, overall Cummins' model was not supported by this study, and neither was the hypothesis that SWB and DS represent the same underlying psychological construct. However, it is plausible that high DS results in SWB failure. Additionally, the univariate relationships observed in the literature that led to the formulation of Cummins' model were found in this study, other than those with personality. It is difficult to draw conclusions regarding Cummins' model from this study as there are a number of criticisms to be made of the study. Therefore, further research is required before conclusions can be drawn regarding the multivariate relationships between the psychological mechanisms of Cummins' model, and regarding the relationship between SWB and DS.



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Appendix A: Scales in the questionnaire not relevant to this study

The other scales that were included on the questionnaire that were not relevant to this project were Neighbourhood and National Wellbeing scales developed for the Australian Unity Wellbeing project, developed by Chambers, Hollway, Parsons and Wallage (2003), some questions about volunteering, some questions about pain, and the Social Value Orientation scale developed by Van Lang, Otten, DeBruin and Joireman (1997).

Appendix B: Letter to participants

1<sup>st</sup> July, 2004

Dear Friend of The Australian Centre on Quality of Life

Some time ago now, you were kind enough to complete a telephone interview in respect of the research being conducted as a joint venture by our Centre and our industry partner, Australian Unity. Your interview data contributed to one of the quarterly surveys we conduct across the Australian population, which measure how good we feel about ourselves as Australians, and how good we feel about Australia. These data are used to create Reports, one for each survey, and these Reports are available from our web-site [acqol.deakin.edu.au](http://acqol.deakin.edu.au). Enclosed with this letter you will find a copy of the Executive Summary from our last report.

At the end of your telephone interview you indicated that you would be willing for us to contact you again with a view to completing another survey. This is the purpose of our renewed contact. The new questionnaire and other documents are enclosed.

The purpose of this continuing research is to track the wellbeing of Australians across time. If you are willing to join us in this venture, you can expect to receive one survey from us each year. I wish we could offer you some form of tangible reward for your continuing involvement, but we are struggling to financially support the project at a very basic level. Consequently, we have to call once again on your good will, and hope that you will be able to find the time to remain as an active voluntary contributor to this remarkable project.

Please feel free to contact me with any queries concerning this project.

Kind regards

Robert A. Cummins  
Professor of Psychology.

1<sup>st</sup> July, 2004

Dear Friend of The Australian Centre on Quality of Life

Some time ago now, you were kind enough to complete a written questionnaire in respect of the research being conducted as a joint venture by our Centre and our industry partner, Australian Unity. Your data contributed to our monitoring of the Australian population, in respect of how good we feel about ourselves as Australians, and how good we feel about Australia. These data are used to create Reports, and the quarterly Reports are available from our web-site [acqol.deakin.edu.au](http://acqol.deakin.edu.au). Enclosed with this letter you will find a copy of the Executive Summary from our last report.

The purpose of this continuing research is to track the wellbeing of Australians across time. I wish we could offer you some form of tangible reward for your continuing involvement, but we are struggling to financially support the project at a very basic level. Consequently, we have to call once again on your good will, and hope that you will be able to find the time to remain as an active voluntary contributor to this remarkable project.

Please feel free to contact me with any queries concerning this project.

Kind regards

Robert A. Cummins  
Professor of Psychology.

Appendix C: Evidence of analysis of assumptions, missing values and outliers.



Table5.

Missing Values Pattern Analysis for Life-Satisfaction and the Personal Well-Being Items using SPSS MVA.

Case	%	Missing and Extreme Value Patterns								
		Q5	Q8	Q4	Q2	Q1	Q7	Q6	Q3	Q9
22	11.1									S
337	11.1									S
412	11.1									S
448	11.1									S
259	22.2							S		S
356	11.1							S		
45	22.2							S	S	
343	11.1								S	
350	11.1								S	
89	11.1	-					-		S	
492	11.1				-	-			S	
202	11.1						S			
238	11.1						S			
34	11.1			S						
430	11.1					S				
23	11.1					S				
41	22.2				S					S

% = percent of missing values for Q 1 - 9 for each case; - = an extreme low value; + = an extreme high value.



Table 6.

*Means Before and After Expectation Maximisation for Life-Satisfaction and the Personal Well-Being Scale using SPSS Missing Values Analysis.*

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
All Values	7.59	7.65	7.09	7.28	7.44	7.81	7.14	7.02	7.32
EM	7.59	7.65	7.09	7.28	7.44	7.81	7.14	7.02	7.33

EM = expectation maximisation.

Table 7.

*Standard Deviations Before and After Expectation Maximisation for Life-Satisfaction and the Personal Well-Being Scale using SPSS Missing Values Analysis.*

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
All Values	1.896	1.796	2.178	1.940	2.258	1.782	1.939	2.126	2.082
EM	1.894	1.795	2.175	1.939	2.258	1.781	1.938	2.126	2.078

EM = expectation maximisation.

Table 8.

*Casewise Diagnostics using SPSS REGRESSION for the Outliers of the Regression for Depressive Symptomatology in the Maintenance Group.*

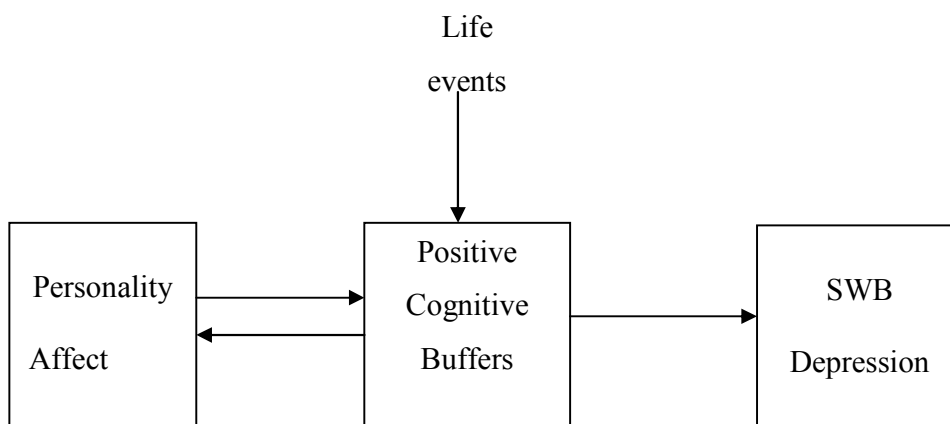
#	Std Res	DS
77	3.067	64.00
280	3.066	74.00
300	3.389	74.00

# = case number; Std Res = standard residual; DS = depressive symptomatology.

Appendix D: The questionnaire.

Appendix E: Ethics approval.

Appendix F: Figures.



**Figure 1.** The relationship between personality, the positive cognitive buffers, SWB and depression, and life-events