Happy Ever After? A Natural Experiment of the Set-Point Theory of Happiness with Survivors of Hurricanes Katrina and Rita.

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Abstract

The set-point theory suggests that we are genetically predisposed to experience a certain level of subjective well being (SWB) which remains stable throughout the course of our live. Major life events modify our SWB but these deviations are only transitory and eventually we return to our SWB baseline. To test this idea we use a longitudinal natural experiment with prospective data. We asked 438 women to assess their life in general 12 months before hurricanes Katrina and Rita struck, and again, 12 months and 48 months respectively after the onset of the natural disaster. Results support the set-point theory. Women's SWB decreased after the hurricanes but it recovered quickly. Four years after the hurricanes women's SWB was not different from their SWB 12 months before the disaster. Results held even after controlling for demographic and socio-economic variables, for indicators of social support and for hurricane-related stressors.

1. Introduction

The set point theory suggests that we are individually *wired* to experience a certain level of subjective well-being (SWB) which remains stable throughout the course of our lives. Deviations from our SWB set point caused by major life events certainly happen, but they are only transitory and eventually we return to our SWB baseline (Cummins et al. 2003; Headey and Wearing 1989; Lykken and Tellegen 1996; Stubbe et al. 2005).

Individuals with positive SWB manifest high levels of social trust and social support (Calvo et al. 2012; Biswas-Diener and Diener 2006), experience positive development (Park 2004), live healthier and longer lives (Diener and Chan 2011), adopt fewer risky health behaviors (Hoyt et al. 2012), and have more confidence in the government and stronger support for democracy (Diener and Tov 2007; Tov and Diener 2008). High levels of SWB are associated with many desirable outcomes and whether or not a person's SWB set point is modifiable has become the *quintessential question* in the field of well-being research.

The idea that we are genetically predisposed to experience a certain level of SWB and that despite life circumstances -good and bad- we eventually return to our SWB baseline, stems from the research of Brickman and colleagues (1971) who observed that over time lottery-winners and patients with spinal-cord injuries were not significantly happier or unhappier than people in their respective control groups (Brickman et al. 1978). The counterintuitive finding brought the attention of the scientific community and evidence testing the stability of SWB quickly began to accumulate.

Four decades of research latter we still do not have a definitive answer. It appears, for instance, that money does not buy happiness (Cummins 2000; Diener and Oishi 2000; Easterlin 1974, 2005; Howell and Howell 2008), that bachelors are less satisfied with their lives than

married counterparts (Glenn 1975; Lee et al. 1991) and that we are less satisfied with our lives after losing our jobs (Björklund, and Eriksson 1998; Blanchflower 2001; Di Tella et al. 2001).

Questions about SWB stability still remain in part because of the types of evidence that have been used to support the set point theory (Lucas 2007a). Much research that examines the stability of SWB has used single-occasion cross-sectional designs (see Frederick and Loewenstein 1999, for a review). These studies are very informative concerning the effect of a momentary event in our well-being at a specific point in our lives; but cannot answer to the *quid* aspect of the set point theory: to whether eventually we completely return to our SWB baseline. Other studies have followed individuals over time but have focused on group-level differences suggesting that SWB was stable if well-being averages did not change over time (Cummins 1995, 1998). An alternative explanation to this approach is that individual-level SWB did indeed change but the change was *hidden* in the group average. There are studies that have monitored individual-level SWB after the occurrence of a life event expecting a certain trajectory, –i.e. permanent low-levels of SWB after an accident that produced a spinal-cord injury- and after observing that SWB quickly increased after the event concluded that it was stable (Brickman et al. 1978). Yet, because respondents' pre-accident levels were not known, it is not possible to determine whether participants returned to their pre-accident well-being baseline.

Robust assessments of the set-point theory are very recent and coincide with the availability of long-term, individual-level panel data with pre-event levels of SWB. These prospective studies suggest that SWB is heritable, associated with personality characteristics but *not completely* stable over time. Actually, it seems that our SWB reacts differently to diverse life events. Money, for instance, seems to do very little for our life satisfaction in the long-run. A study followed a representative sample of the populations of Britain and Germany for over ten

years to test if changes in income influenced peoples' well-being. Results showed that the relationship between income and SWB was primarily driven by personality and that fluctuations in income had very little effect on individuals' life satisfaction (Luhmann et al. 2011). Getting married, having children or the death of our partner also leave negligible marks on our SWB (Lucas et al. 2003; Lucas and Clark 2006; Dyrdal and Lucas *in press*). However, we do not completely go back to our initial level of life satisfaction after getting a divorce (Lucas 2005), losing our job (Lucas et al. 2004; Yap et al. 2012) or after the onset of a disability (Lucas 2007b).

Although large-scale, nationally representative panel studies are fundamental to advance our understanding of SWB adaptation, one caveat of this approach is that the data is still correlational and we cannot be sure of the direction of the relationship between different life events and SWB change (Diener et al. 1999). In other words, life events do not happen randomly; we know, for instance, that people with high levels of SWB earn more money and are healthier than people with lower levels of SWB (Graham et al. 2004; De Neve and Oswald 2012). Happy people are also more likely to get married, have children and get a job, and less likely to divorce and to experience unemployment (Lucas et al. 2003; Luhmann et al. 2013; Lyubomisky et al. 2005).

A strategy to test the stability of SWB while dealing with issues of endogeneity associated to personality traits is to examine the effect of naturally exogenous occurring events on peoples' SWB. Gardner and Oswald (2007) followed this tactic by monitoring the well-being of Britons two years before and after winning the lottery. Lottery winners experienced a significant increase in their mental well-being during the two years after getting the prize. Yet we do not knowif participants returned to their SWB baseline after a longer period of time. In addition, it could be argued that although winning the lottery is a random occurrence playing the

lottery is not and data limitations of this study made it impossible to adjust for the number of times respondents played.

This study adopts a similar strategy to test the stability of SWB. We follow survivors of Hurricanes Katrina and Rita to monitor if their SWB returned to baseline four years after the onset of the natural disaster. According to the classical set-point theory respondents' well-being should diminish right after being impacted by the hurricanes and then go back to its baseline level quickly afterwards.

Few studies have examined well-being adaptation to extreme life events with prospective data. By monitoring individuals' well-being before and after the occurrence of a natural disaster our study goes beyond previous research on SWB adaptation concerning issues of causality. In addition, it adds to the literature by investigating the impact of an extreme negative life event on life satisfaction, which according to some authors would have a stronger effect on SWB than positive events such as getting married or childbirth (Frederick and Loewenstein 1999; Luhmann 2009; Taylor 1991).

2. Methods

2.1. Sample

Participants were initially part of the New Orleans arm of the Opening Doors Study, a program restricted to low-income parents aimed to increase academic persistence in community colleges. The recruitment strategy comprised a general marketing and outreach campaign, which included flyers, newspaper and radio announcements; and oral presentations in mandatory orientation and testing sessions for incoming freshman. To be eligible for the study, participants had to be between the ages of 18 and 34; be parents of at least one dependent child under the age of 19; have a household income under 200 percent of the federal poverty level; and have a high

school diploma or equivalent (see Brock and LeBlanc 2005 and Richburg-Hayes et al. 2009, for further details).

By the time Hurricanes Katrina and Rita made landfall, on August 29, 2005 and September 24, 2005, respectively, 492 participants had completed a baseline survey (Baseline; T0). Trained interviewers conducted the survey over the phone and compensated participants with $20 gift cards. About a year after Hurricanes Katrina and Rita, between May 2006 and March 2007, 402 of these 492 participants (81.7%) were successfully located and surveyed. Trained interviewers administered the post-disaster survey (Time 1; T1), which included the same questions as the baseline survey, as well as a module of hurricane experiences, and sent participants $50 gift cards. Approximately 3.5 years after the hurricanes, between April 2009 and March 2010, 409 of the 492 participants from baseline (83.1%) were located and surveyed. Trained researchers administered the additional follow-up survey (Time 2; T2) over the phone and compensated participants with $50 gift cards for their participation. The T2 survey included the same measures as the previous surveys. All participants provided written consent to be part of the original study, and verbal consent to participate in the post-disaster surveys.

Evidence suggests that there are consistent gender differences in psychological distress following natural disasters (Norris et al. 2002), and that the effect of environmental factors on SWB is different for men and women (Roysamb et al. 2002). There were too few male respondents in our sample (n = 23; 4.6%) to explore these differences and we excluded them from the analyses to avoid statistical noise. We also excluded from the models 31 participants who completed the baseline survey only. The analyses therefore drew on a sample of 438 women who completed the baseline survey (T0) and at least one of the post-disaster surveys (T1 or T2). All of them lived in an area affected by hurricane Katrina, and 40.6% lived in areas affected by

hurricane Rita when it struck less than a month later. Independent-samples *t*-tests and chi-square tests with Bonferroni corrections for multiple tests found no differences between the women included in the final sample and the excluded participants.

We also tested for differences between the 125 participants for whom we had complete data and those who were missing data on any of the variables included in the current study (n = 313), and found only one significant difference: participants with complete data had significantly greater T1 religious attendance than those with missing data.

The overall missing rate of the sample was 8.0%. We conducted multiple imputation using the Amelia II software (Honaker et al. 1999) in R to handle missing data, and five complete datasets were then used for statistical analysis. Results represent an average of the five separate analyses with Rubin's (1987) correction of standard errors. Notably, we replicate our analyses using only the 125 complete cases and results did not change.

2.2. Measures and Definitions

Participants were asked to rate their own well-being with answers to the question *if you were to consider your life in general these days, how happy or unhappy would you say you are?* Responses ranged from *not at all happy* (1) to *very happy* (4) in four-point scale.

We adjusted in the models for demographic and socioeconomic variables as well as for indicators of health and social support which have been shown to correlate with SWB. In addition, we included a series of control variables that captured hurricane exposure.

Evidence suggests that age, race and ethnicity and number of children are associated with SWB variability (Angeles 2010; Krause and Broderick 2004; Siedlecki et al. 2008) and these also influence post-disaster psychological outcomes (Brewin et al. 2000; Gibbs 1989). Women in our study self-reported their age and the number of children they had. They also self-reported

their ethnicity and race with answers to the questions *are you Hispanic/Latina/Spanish?* and *what is your race*? white, black, Asian or Pacific Islander, American Indian or Alaskan Native and other.

Income correlates with well-being especially in low-income populations (Diener et al 1999; Diener and Lucas 2000; Diener and Biswas-Diener 2002). Participants were asked to report their total household income from all sources including earnings from jobs and all benefits from social programs. We also asked women to rate their general health on a five-point scale from *poor* (1) to *excellent* (5) to adjust for individual variability concerning the SWB-health relationship (Diener and Chan 2011; Cummins 2013).

Three indicators of social support: marital status, perceived social support and religious attendance corrected for the association between social support and SWB in the models (Lu et al. 1997; Lucas 2005; Lucas and Clark 2006; Taylor et al. 2001).

Women specified whether they were married and living with their spouse, divorced or never married and did not share dwellings with a partner or if, in contrast, they cohabitated with a partner. Preliminary analyses showed no significant differences on happiness between women who cohabitated with a partner and married counterparts and we merged both categories in the models.

We employed a short version of the Social Provisions Scale to measure respondents' perceived social support (Cutrona and Russell 1987),. The scale included two items from four of the six original subscales: *Social Integration* (e.g., "I am with a group of people who think the same way I do about things"), *Reassurance of Worth* (e.g., "There are people who value my skills and abilities"), *Guidance* (e.g., "I have a trustworthy person to turn to if I have problems"), and *Reliable Alliance* (e.g., "There are people I know will help me if I really need it"). The

retained items were selected a priori because they aligned with the goals of the Opening Doors program, which were to increase community college students' sense of social integration, connection, and guidance from their community colleges. Items were rated using a 4-point Likert-type scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), and half of the items were reverse scored. Evidence of the validity and reliability of the full scale is provided elsewhere (Cutrona 1989, Cutrona et al. 1986). In the current study the reliability of the short version of the scale was Cronbach's alpha of .83 at Time 0, .81 at Time 1, and .78 at Time 2.

Religious attendance was assessed by a question concerning how often participants attended church, synagogue or any other religious service. At each time point, participants rated their attendance on a five-point scale from *never* (1) to *several times per week* (5)

We also included in the models three indicators of hurricane exposure. First, a *Hurricane-Related Stressors* scale comprised of eight questions drawn from a larger survey of the demographic and health characteristics, evacuation and hurricane experiences, and future plans of Hurricane Katrina evacuees (Brodie et al. 2006). Participants expressed whether they had experienced the following as a result of the hurricanes: 1) lacked enough fresh water to drink, 2) lacked enough food to eat, 3) felt their life was in danger, 4) lacked necessary medicine, 5) lacked necessary medical care, 6) had a family member who lacked necessary medical care, 7) lacked knowledge of safety of children, and 8) lacked knowledge of safety of other family members. We asked the questions for both Hurricane Katrina and Hurricane Rita, yielding 16 items in total and created a composite score with the count of affirmative responses to these items.. The second indicator of hurricane exposure captures whether participants had lost a family member or close friend due to the hurricanes and their aftermath (*bereavement)* as previous research has shown this is a stressor that increases survivors' post-disaster mental

health (e.g., Gibbs, 1989). The last indicator rated the extent of damage of participant's pre-hurricane home on a five-point scale from *none* (1) to *enormous* (5).

3. Data Analysis Strategy

We first conducted descriptive analyses of all the variables included in the study. In a second step we assessed the stability of women' SWB by conducting a series of paired-samples t-tests between T0 and T1, T1 and T2, and T0 and T2 concerning women overall happiness. The last step of our data analyses strategy involved running a series of multilevel models (individuals nested within time: T0, T1 and T2) where we examined the effect of the different set of variables on SWB..

4. Results

Table 1 shows the results from the descriptive analyses. At baseline most women self-identified as non-Hispanic black and, on average, were 25 years of age, in good health, had two dependent children and a monthly household income of 1,500 dollars. Concerning indicators of social support, over half of the sample was single at baseline, 23 percent of women were married, almost 12 percent lived with a partner, around 10 percent of the sample was divorced, and less than 1 percent of participants were widows. Most women perceived strong social support from the community and, on average, attended religious services regularly.

Twelve months after the hurricanes women's average self-reported happiness and health were lower than at baseline. They also experienced less support from the community and attended religious services less frequently than before the disaster. The majority of the sample suffered substantial property damage and 30 percent of the sample had lost a loved one as a consequence of the hurricanes.

Forty eight months after the onset of the natural disaster women's happiness was close to baseline levels. They also had experienced a substantial increase in income, perceived greater support from the community and attended religious services more often than twelve months after the hurricanes.

Table 2 shows the results of the paired-samples *t*-test we conducted to assess whether differences in happiness before and after the hurricanes were significantly different from zero. Women general happiness significantly decreased from T0 to T1 (*Mean Difference* = -.17, *S.E.* = .04, $t(437) = -4.36$, $p < .001$), and significantly increased from T1 to T2 (*Mean Difference* = .15, *S.E.* = .04, $t(437) = 3.96$, $p < .001$). However, there was not a significant difference between T0 and T2 general happiness among the women in our sample (*Mean Difference* = -.02, *S.E.* = .04, $t(437) = .47$, $p = .64$).

Next, we conducted a series of regression analyses to examine what factors accounted for changes in general happiness over time (Table 3). We conducted two different models, one for each time data point (12 and 48 months after hurricanes Katrina and Rita). The first model assesses the effect of baseline indicators (T0) on women's happiness 12 months (T1) and 48 months (T2) after the hurricanes. The second model predicts women's happiness 48 months (T2) after the hurricanes using the indicators we collected 12 months (T1) after the natural disaster.

Baseline general happiness contributed positively to women's general happiness one year and four years after the hurricanes. Widows at baseline, however, were significantly less happy than married counterparts 48 months later. Women's general happiness level a year after the hurricanes was the only significant predictor of their happiness 4 years later.

5. Discussion and Conclusions

This paper investigated the stability of SWB with a natural experiment. We followed a

group of women survivors of hurricanes Katrina and Rita and monitored whether their SWB levels returned to baseline levels three years after the onset of the natural disaster. Results showed that women's SWB declined right after the hurricanes but returned to baseline quickly. Women's SWB three years after the hurricanes was not significantly different from their SWB at baseline (12 months before the hurricanes).

Our study is the first to systematically examine the effect of a natural disaster on SWB. It is also the first one that addresses issues of causality on SWB research. However, the findings are constrained by some limitations that need to be resolved in future studies. First, we have a non random sample drawn from among community college students for a different purpose for our analyses and we do not know if we would find the same pattern with a representative sample of the population. Second, we could not include males in our sample although research shows that men and women react differently to different life events. Finally, we could not adjust for the personality variables we know influence SWB like extroversion or neuroticism.

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Table1. Means, Standard Deviations and Frequencies for Variables Included in the Study (N=438)

Variables	Time Points				Range
	T0 (12 months before hurricanes)	Hurricanes struck	T1 (12 months after hurricanes)	T2 (48 months after hurricanes)	
Happiness	2.31 (0.67)	--	2.13 (0.74)	2.27 (0.70)	1= *not at all happy* to 4= *very happy*
Age	25.43 (4.39)	--	--	--	18 to 34 years of age
Number of children	1.96 (1.13)	--	2.00 (1.07)	2.18 (1.22)	0 to 11 children
Ethnicity and race					
Non-Hispanic black	85.1%	--	--	--	--
Non-Hispanic white	10.0%	--	--	--	--
Hispanic (any race)	2.9%	--	--	--	--
Other	2.0%	--	--	--	--
Household Income	$1536.04 ($1038.49)	--	$1901.55 ($1532.52)	$2736.24 ($2062.59)	
Health	3.77 (1.01)	--	3.49 (1.03)	3.41 (1.04)	1= *poor* to 5= *excellent*
Marital Status					
Married	23.0%	--	31.2%	32.1%	--
Cohabiting	11.8%	--	18.7%	15.3%	--
Widowed	0.7%	--	0.6%	0.8%	--
Divorced	9.6%	--	10.2%	12.6%	--
Single	54.9%	--	39.2%	39.3%	--
Perceived social support	3.30 (0.47)	--	3.19 (0.47)	3.22 (0.46)	1= strongly disagree to 4= strongly agree
Religious attendance	2.33 (1.26)	--	2.08 (1.34)	2.71 (0.94)	1= *never* to 5= *several times per week*
Hurricane-related stressors	--	3.81 (3.30)		--	0 to 16
Bereavement	--	29.5%		--	0 = *no*, 1 = *yes*
Property damage	--	2.91 (1.17)		--	1= *none* to 5 = *enormous*

Table 2. Results of Paired-Sampled Assessing Changes in General Happiness Over Time (N = 438)

Comparison	*Mean Difference*	*S.E.*	*d.f.*	*t*	*p*
T0 – T1	-.18	.04	437	-4.73	< .001
T1 - T2	.14	.04	437	3.66	< .001
T0 - T2	-.04	.04	437	1.01	.32

Note. Time 0 (T0) was approximately 12 months before the hurricanes; Time 1 (T1) was approximately 12 months after the hurricanes, and Time 2 (T2) was approximately 48 months after the hurricanes.

Table 3. Coefficients for Multi-level Regression Analysis Predicting Time 1 and Time 2 General Happiness (N = 438)

		T1 (12 months after hurricanes)				T2 (48 months after hurricanes)			
		B	SE	R^2 ($R^2\Delta$)	FΔ	b	SE	R^2 ($R^2\Delta$)	FΔ
Demographic Variables				.01 (-)	.66			.01 (-)	.83
	T0 Age	.01	.01			-.01	.01		
	Ethnicity and race								
	T0 Non-Hispanic black	-.02	.12			-.10	.11		
	T0 Hispanic (any race)	-.12	.24			-.09	.22		
	T0 Other race	.23	.28			-.27	.26		
Time 0 Socio-Economic and Social Support Variables				.15 (.14)	6.98***			.13 (.12)	5.79***
	T0 General happiness	.32***	.05			.20***	.05		
	T0 Income (ln)	< - .01	.02			.03	.02		
	T0 General Health	.04	.04			.05	.03		
	Marital Status								
	T0 Cohabiting	-.01	.12			.10	.12		
	T0 Widowed	.14	.39			-1.26***	.38		
	T0 Divorced	-.06	.13			.19	.12		
	T0 Single	-.12	.09			.03	.09		
	T0 Number of children	.06	.03			-.05	.03		
	T0 Perceived social support	.08	.07			.12	.07		
	T0 Religious attendance	.04	.03			.04	.03		
Hurricane-Related Variables				.16 (.01)	2.05			.14 (.01)	2.49
	Hurricane-related stressors	-.01	.01			-.01	.01		
	Bereavement	.11	.08			-.01	.08		
	Property damage	-.01	.03			-.05	.03		
Time 1 Socio-Economic and Social Support Variables				--	--			.24 (.10)	5.95***
	T1 General happiness	--	--			.32***	.05		
	T1 Income (ln)	--	--			< -.01	.02		
	T1 General health	--	--			-.04	.04		
	Marital Status	--	--						
	T1 Cohabiting	--	--			-.12	.11		
	T1 Widowed	--	--			< -.01	.77		

	T1 Divorced	--	--			.07	.13		
	T1 Single	--	--			< .01	.10		
	T1 Number of children					-.02	.05		
	T1 Perceived social support	--	--			-.01	.08		
	T1 Religious attendance	--	--			-.05	.03		