

A Dual Route in Explaining Health Outcomes in Natural Disaster¹

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Human beings seem to be resilient and have a great capacity to overcome adverse circumstances. One apparent variable that may predict people's emotional and physical health after a trauma is their general level of psychological well-being (McMillen, Smith, & Fisher, 1997). The current study explores the role of subjective vitality and the perception of stress as mediators between general life satisfaction and post-trauma physiological and psychological health related to the Canadian 1998 Ice Storm. Results of this dual route indicate that satisfaction with life positively predicted subjective vitality and negatively predicted perceived stress. In turn, subjective vitality lead to lower levels of ill-health, whereas perception of stress lead to higher levels of physical symptoms and depression.

Disasters long have been defined in terms of physical agents and their consequences, and have been seen as situations causing threat to life, injury, sudden destruction, and loss of life and property (Bonnie, 1991). A disaster differs from a traumatic event in that it threatens or actually impacts an entire community. It may cover a wide area, disrupting communications, transportation, and the infrastructure of services that normally would respond to crises (Bissell, Becker, & Burkle, 1996), making it difficult for emergency agencies to determine what needs to be done, how to get there, and how to do it.

Although some disasters involve injury and loss of life, there can be disasters that involve neither. An incident that disrupts normal community life and that takes away essential services is a disaster, whether or not

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anyone is injured or anyone dies (Ottawa–Carleton, 1998). Disasters also have been described in terms of “massive collective stress” (Kinston & Rosser, 1974, p.) or “collective stress situations” (Barton, 1969, p.). Some of these conceptualizations of disasters emphasize the element of social disruption that often accompanies such stressful situations (Dynes, 1974; Fritz, 1961; Kinston & Rosser, 1974).

Since all disasters are, by definition, unexpected events and are unique in that they affect areas with distinct social, health, and economic conditions (Pan American Health Organization, 2000), no disaster plan—no matter how well conceived—can anticipate all that will occur (Ottawa–Carleton, 1998). Therefore, disaster response inevitably is decision making in the face of uncertainty.

Ice Storm 1998

Ice Storm 1998 struck regions of southeastern Canada and the northeastern United States from January 5 to 16, 1998. Over this period, continuous freezing rain left many areas without heat and electricity, and forced the closure of schools, businesses, and public institutions. More than 5 million people were affected by power outages that forced many to leave their homes for extended periods of time. In Québec and Ontario alone, 539 public shelters were established and 16,000 Army troops were called in to assist the populace. In the northeastern states, over 30 counties were declared disaster areas. Overall, 35 people died from storm-related afflictions, primarily hypothermia, carbon monoxide poisoning, and cardiac events (Abley, 1998).

Responses to natural disasters cover a wide range of psychological, behavioral, and physical disturbances; including phobias, anxieties, fears, depression, loss of affect, grief reactions, and guilt. Other responses include somatic symptoms, such as impaired concentration, anhedonia, sleep disturbances, and interpersonal problems (Bolin, 1988; Nolen-Hoeksema & Morrow, 1991).

In terms of diagnosis, significant increases in the post-disaster prevalence of depression, generalized anxiety, and post-traumatic stress disorder were observed in those who experienced the volcanic eruption of Mount St. Helens (Shore, Tatum, & Vollmer, 1986), the Mexico City earthquakes (Baum & Davidson, 1986), and the Missouri floods (Smith, Robins, Przubeck, Goldring, & Salomon, 1986). For some individuals, these symptoms may develop into serious psychological disorders (McFarlane & Papay, 1992). For others, they will be experienced to a much lesser degree. Thus, it is suggested that some individual differences and mediating mechanisms may underlie such a turn of events (Burnam et al., 1988).

Research provides evidence indicating that people exposed to uncontrollable events experience psychological distress (Nolen-Hoeksema & Morrow, 1991). Evidently, one of the leading sources of this psychological distress is the experience of stress itself (Bolin, 1988). *Stress* can be defined as a process by which an event subjects an individual (or group) to demands that exceed the person's capacity to respond (Bonnie, 1991). Stress is certainly a key concept in understanding the traumatic effect of such life events. However, a positive route describing the processes relevant to the question of how people are able to overcome traumatic experiences would shed some light on the factors to ensure recovery or to maintain well-being throughout and after the traumatic event.

Positive Psychology

Some interesting research results, emerging from the movement of positive psychology, can provide insights into some of these inquiries. The general aim of positive psychology is to begin to catalyze a change in the focus of psychology, from preoccupation only with repairing the worst things in life, to also building positive qualities (Seligman & Csikzentmihalyi, 2000). In fact, much more is known about how negative emotions promote illness than is known about how positive emotions can lead to health.

A main postulate underlying this movement is that human beings are resilient and have a great capacity to overcome adverse circumstances by displaying a notable capacity to adapt, when given time (Canino, Bravo, Rubio-Stipec, & Woodbury, 1990; De la Fuente, 1990; Diener, Suh, Lucas, & Smith, 1999). What, then, would allow us to predict adjustment to a traumatic life event? Accordingly, it is now believed that it is paramount to study well-being and ill-being using a dual-route approach. In other words, it is crucial to understand the role of both the positive and the negative aspects leading to the result.

Moreover, researchers must strive to understand further the processes underlying adaptation. Considerable adaptation to both good and bad circumstances often occurs, yet the processes responsible for these effects are documented poorly. People react differently to the same situations and evaluate conditions based on their unique dispositions, expectations, values, and previous experiences (Diener et al., 1999). For instance, research clearly has shown that individuals are able to overcome life-threatening illnesses through their positive beliefs. The role of self in adapting to negative experiences has been demonstrated in different contexts; specifically, breast cancer (Carver et al., 1993) and AIDS (Taylor et al., 1992).

Steffen (1999) examined the effects of optimism on physiological and psychological well-being at four time points following Hurricane Andrew. The results revealed that optimism was related positively to both psychological and physiological functioning after the hurricane. People high in optimism—or in subjective well-being, for that matter—thus tend to have better moods, to be more preserving and successful, and to experience better physical health (Seligman & Csikzentmihalyi, 2000).

The field of positive psychology at the subjective level is about valued subjective experiences: well-being, contentment, and satisfaction (in the past); flow and happiness (in the present); and hope and optimism (for the future). In the current study, two subjective well-being variables appear to be relevant to study psychological and physical adjustment; notably, general life satisfaction and subjective vitality.

Satisfaction with life refers to a judgmental process in which individuals assess the quality of their lives on the basis of their own unique set of criteria (Shin & Johnson, 1978). Life satisfaction represents the cognitive aspect of the more global measure of subjective well-being, which also includes an affective component (Pavot & Diener, 1995). It assesses the positive side of an individual's experience, rather than focusing on unpleasant emotions.

Two basic theoretical accounts have been put forward to explain individual differences in well-being. However, because of a series of studies that reported disappointing results for objective or bottom-up factors, subjective well-being research recently has shifted toward a top-down approach (Heller, Watson, & Hies, 2004).

The top-down approach is mainly a dispositional perspective emphasizing the role of broad individual differences in satisfaction. According to this perspective, individuals are somewhat predisposed to experience and react to events and circumstances in positive or negative ways. This view also holds that there is a general propensity to experience situations in a positive way such that, despite circumstances, some individuals seem to be and remain happy people (Brief, Butcher, George, & Link, 1993). In other words, if individuals can generate positive thoughts and not dwell excessively on negative aspects when evaluating their lives as a whole, it can most likely rekindle their level of energy to keep on fighting during a difficult episode.

Life satisfaction is a well-known construct to measure subjective well-being and has been used with different populations: students (Blais, Vallerand, Pelletier, & Brière, 1989), adults (Pavot, Diener, Colvin, & Sandvik, 1991), and elderly caregivers (Vitaliano, Russo, Young, Becker, & Maiuro, 1991). To our knowledge, its role in understanding recovery of a post-traumatic event has yet to be examined. Thus, we included a measure of life satisfaction and asked participants to indicate how satisfied, in general, they were with their lives.

Subjective vitality is the second concept that we believe deserves attention in terms of its potential to understand better how individuals surmount traumatic life events. Ryan and Frederick (1997) defined *subjective vitality* as one's conscious experience of possessing energy and aliveness. This positive feeling is known to be a phenomenologically salient, yet dynamic state, but also entails a special sense of being restorative or regenerative (Nix, Ryan, Manly, & Deci, 1999; Ryan & Frederick, 1997).

People regularly speak of being particularly alive or invigorated in certain circumstances, whereas in other contexts—for instance, a stressful event—they can feel drained (Patry, Pelletier, & Blanchard, 2002; Ryan & Frederick, 1997). Vitality also is viewed as being more than just a physical energy; rather, involving a psychological component referred to as *spirit* and *enthusiasm* (i.e., for the present and future). Vitality, therefore, can be influenced by physical factors such as illness and fatigue or by psychological factors (Ryan & Frederick, 1997); for instance, the feelings experienced when one is generally satisfied with life.

As such, since some positive affect (i.e., sharing, mutual aid, feelings of accomplishment, survival) sometimes is able to pierce the cloud of negative affect weighing on individuals being subjected to various degrees of stress, this line of research (i.e., positive psychology) is a key to better understanding psychological health during and after a traumatic event. That being said, if one is generally satisfied with his or her life, it should provide the individual with both the energy and the motivation to overcome adverse circumstances and thus maintain or regain this overall feeling of life satisfaction. Headey and Wearing (1989) found that people eventually return to a baseline of positive and negative affect after the occurrence of good or bad events, moving people above or below this baseline, but returning, in time, to this stable set point.

The Present Study

The present study explores the role of a dual route in predicting post-trauma physical and emotional ill health. More specifically, it examines the role of positive psychological health variables; namely, general life satisfaction and subjective vitality, and their effect on ill-being following a natural disaster. In addition, the current study takes into account the negative route to physical and psychological ill-being by measuring participants' perception of stress.

Research, wherein the positive and negative routes are measured jointly, is needed because it is strongly believed that health outcomes are predicted best by such dual routes (Aspinwall & Staudinger, 2003; Magnusson & Mahoney, 2003). As well, while understanding the role of the positive route with respect to a negative event, we must not examine it to the detriment of

the role of the negative route, primarily because these elements appear to be interrelated.

Therefore, it is hypothesized that higher levels of general life satisfaction will lead to higher levels of subjective vitality, which, in turn, will be related to less ill health; notably, post-trauma physiological and psychological functioning. Conversely, higher levels of general life satisfaction will lead to lower levels of perceived stress. Finally, perceived stress will be associated with higher levels of psychological distress and somatic symptoms.

Method

Participants and Procedure

Three weeks after the ice storm of 1998, 148 French students (110 women, 32 men, 6 did not provide their gender; M age = 25.43 years) who were enrolled at the University of Québec at Montréal, completed measures of life satisfaction, vitality, perceived stress, depression, and physical symptoms as part of a larger questionnaire package. Five participants omitted their age.

It is important to note that the ice storm began on January 5, 1998, and lasted until January 16, 1998. Thus, the questionnaires were completed by participants 3 weeks after the beginning of the natural disaster. Therefore, when participants were asked to report their positive and negative experiences associated with the ice storm—namely, “over the past 2 weeks”—they actually had to refer to the last week of the disaster and the week following its end. More importantly, participants were living in the city of Montréal at the time of the ice storm. Since Montréal was one of the most affected cities, it was assumed that the participants all had experienced the natural disaster at least to some degree.

Participants received the research package along with an introductory letter explaining the purpose of the study and containing instructions for questionnaire completion. In this letter, participants were informed that there were no right or wrong answers, were asked to be open and honest in their responses, and were told that their collaboration would be greatly appreciated. Furthermore, participants were told not to write their names on any questionnaire and were informed that data collected from the study would serve only scientific purposes and likewise would remain strictly confidential.

Instrument Measures

Life satisfaction. The Satisfaction With Life Scale (SWLS; Diener, Emmons, Larson, & Griffin, 1985) is a five-item scale ($\alpha = .87$) that is used

to measure participants' level of satisfaction with their own life. A sample item is "In most ways, my life is close to my ideal."

More specifically, participants were invited to respond in terms of their life in general, referring essentially to the period before the ice storm. They were asked to indicate to which point they were in agreement with the statements on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Subjective vitality. The Subjective Vitality Scale (SVS; Ryan & Frederick, 1997) was used to evaluate participants' perceptions of having energy, zeal, interests, and feelings of aliveness. Participants were asked to rank the items "over the past 2 weeks" on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*). The subscale used in this study contains seven energy-related items ($\alpha = .84$). According to Ryan and Frederick, these items reflect an adequate definition of a phenomenological sense of aliveness and energy and were labeled *subjective vitality*.

Perceived stress. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) was used as an intervening variable, measuring participants' experienced levels of stress as a function of objective stressful events and coping resources. The PSS has adequate internal ($\alpha = .85$) and test-retest reliability ($\alpha = .85$). In the present study, the scale was used to ask participants about their feelings and thoughts "over the past 2 weeks" on a 4-point scale ranging from 1 (*never or almost never*) to 4 (*very often*; e.g., "How often were you unable to control the important things in your life?" and "How often have you felt difficulties were piling up so high that you could not overcome them?"). A technicality especially important when using a dual-route approach is that measures of the respective routes should be somewhat opposite. For that matter, the perception-of-stress items, which are opposite to the vitality ones, were also not directly related to the ice storm. By doing so, perception of stress measures participants' thoughts and feelings as representative of a more general state of mind, just as the vitality variable does.

Depressed mood. The Center for Epidemiologic Studies—Depressed Mood Scale (CES-D) (Radloff, 1977) is a 20-item scale that was used to measure participants' current level of depressive symptomatology, with an emphasis on the affective component (i.e., depressed mood). According to Radloff, the CES-D items were selected from a pool of previously validated depression scale items. The CES-D has very good internal consistency ($\alpha = .85$), fair stability, and excellent concurrent validity, correlating significantly with a number of other depression and mood scales. More specifically, participants were asked to indicate the number that best describes how often they felt or behaved a certain way, again "over the past 2 weeks" on a 4-point scale ranging from 1 (*rarely or none of the time*) to 4 (*most or all of the time*).

Physical symptoms. The Symptoms Checklist (Emmons, 1992) lists symptoms, including headaches, stomachache/pain, chest pain, runny/congested nose, coughing/sore throat, faintness/dizziness, shortness of breath, acne/pimples, and stiff/sore muscles. Participants were asked to indicate which sensations they had experienced “over the past 2 weeks” on a 7-point scale ranging from 1 (*never*) to 7 (*frequently*). In line with Emmons’ (1992) findings, these categories were combined to create a total symptom index ($\alpha = .78$).

Results

Table 1 presents descriptive statistics of all of the study variables. In fact, Table 1 presents values of central tendency (means), as well as measures of dispersion (standard deviations) and distribution (skewness) for each of the following variables: life satisfaction, subjective vitality, perceived stress, depressed mood, and physical symptoms.

Correlational Analysis Among Variables

Pearson correlations were computed among all variables and are presented above the diagonal in Table 1. First, we expected to find a positive correlation between life satisfaction and subjective vitality. Second, positive correlations were predicted among all variables of ill-being (i.e., perception of stress, depressed mood, physical symptoms). Third, a negative correlation was expected between variables of well-being and variables of ill-being. As hypothesized, the correlation between life satisfaction and subjective vitality was positive and significant ($r = .51, p < .01$). Also, correlations between variables of well-being and perceived stress, depressed mood, and physical symptoms were all negative and significant ($-.25 \leq r \leq -.56, p < .01$). Finally, all variables of ill-being were positively correlated among themselves (variations from $r = .36$ to $r = .78, p < .01$).

Path Analyses: Dual Route Explaining the Health Outcomes

It was hypothesized that life satisfaction would lead to higher levels of subjective vitality and, in turn, to lower levels of ill health; notably, less physical symptoms and feelings of depression. It also was hypothesized that life satisfaction would lead to lower levels of stress perceptions. Stress, in turn, should be related to higher levels of physical symptoms and higher levels of depression.

Table 2 displays correlations between the relevant variables to this study (life satisfaction, subjective vitality, perceived stress, depressed mood, and physical symptoms), unstandardized and standardized regression

Table 1

Descriptive Statistics, Cronbach's Alphas (Diagonal), and Pearson Correlations Among Well-Being and Ill-Being Variables

	Descriptive statistics			Correlations				
	<i>M</i>	<i>SD</i>	Skewness	1	2	3	4	5
1. Life satisfaction	5.08	1.15	-0.60	(.86)	.51	-.52	-.56	-.25
2. Subjective vitality	4.85	1.02	-0.72		(.86)	-.48	-.50	-.33
3. Perceived stress	1.88	0.65	0.46			(.83)	.78	.39
4. Depressed mood	1.74	0.56	0.93				(.92)	.36
5. Physical symptoms	20.17	8.65	1.02					(.44)

Note. $N \geq 144$. Satisfaction, vitality, and physical symptoms were rated on a 7-point scale. Stress and depression levels were rated on a 4-point scale. All correlations were significant at $p < .001$.

coefficients (B and β), semi-partial correlations (SR^2), and explained variance (adjusted R^2) for each of the three regressions performed within this path analysis.

A series of standard multiple regression analyses were conducted in order to test these links. First, all three independent variables were included in the analysis in order to predict physical symptoms. The adjusted " R^2 " was equal to .17 and was significantly different from 0, $F(2, 143) = 16.06$, $p < .001$. The results show that stress was the most important predictor of physical symptoms ($\beta = .32$, $p < .01$). As well, results indicate that subjective vitality was a good predictor of somatic functioning ($\beta = -.17$, $p < .05$).

A second regression was conducted using psychological ill-being as the criterion variable and subjective vitality, perception of stress, and life satisfaction as predictors. The explained variance (adjusted R^2) was equal to .63 and was also significantly different from 0, $F(3, 143) = 82.43$, $p < .001$. The results show that perception of stress was the best predictor of psychological ill-being ($\beta = .64$, $p < .001$). The link between subjective vitality and psychological ill-being also was significant ($\beta = -.12$, $p < .05$). In addition, life satisfaction was related negatively to depressed mood ($\beta = -.12$, $p < .05$).

A third regression was conducted to predict subjective vitality ($R^2 = .26$), $F(1, 143) = 49.00$, $p < .001$). This analysis yielded a positive relationship between life satisfaction and subjective vitality ($\beta = .51$, $p < .001$). Finally, a regression was conducted in order to test the association between life

Table 2

Path Analyses: Dual Route Explaining Health Outcomes

	Coefficients		Correlations		Adjusted R^2
	B	β	Zero-order	SR^2 (unique)	
Physical symptoms					.165
Stress	4.21***	.317	.400	.085	
Vitality	-1.56*	-.173	-.332	.031	
Depressed mood					.627
Stress	0.54**	.644	.773	.419	
Vitality	-0.07*	-.116	-.505	.026	
Satisfaction	-0.08*	-.118	-.549	.047	
Subjective vitality					.257
Satisfaction	0.45***	.507	.507	.257	
Perceived stress					.279
Satisfaction	-0.29***	-.529	-.529	.280	

* $p < .05$. ** $p < .01$. *** $p < .001$.

satisfaction and the perception of stress ($R^2 = .28$), $F(1, 144) = 54.15$, $p < .001$. The results reveal a significant negative relationship ($\beta = -.53$, $p < .001$).

According to structural equation modeling (SEM) performed with EQS, all of the estimated parameters were significant. Also, the model presented an adequate fit to the data (i.e., goodness of fit), $\chi^2(10, N = 146) = 282.12$, $p < .001$ (CFI = .945, SRMR = .077, RMSEA (.110, .274) = .188). None of the modification indexes obtained (i.e., Lagrange multiplier, Wald test) provided statistically or conceptually significant suggestions for improving the model. Thus, no change was brought to the hypothesized model. Overall, results obtained from the path analyses support our hypotheses. Figure 1 presents the path analyses resulting from the four regressions in support of the dual route explaining both psychological and physical health after a traumatic event.

Mediation Test

To test the statistical significance of the intervening effect of both positive and negative variables, MacKinnon and Lockwood's (2001)

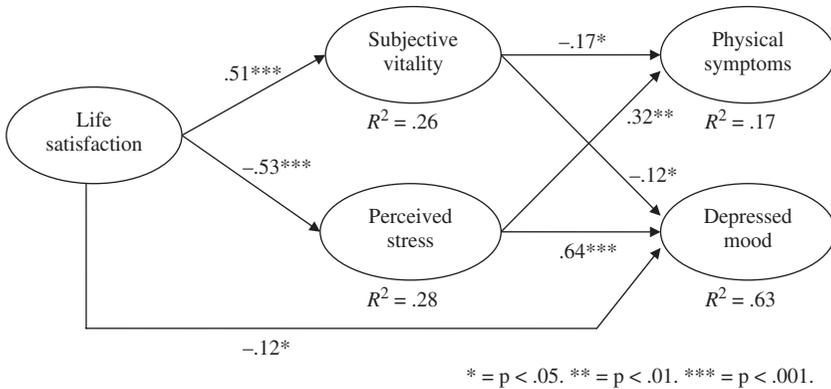


Figure 1. Positive and negative routes explaining health outcomes after a natural disaster.

asymmetric distribution of products method was used:

$$\left[\alpha\beta \pm CL\sqrt{\alpha^2\sigma_\beta^2 + \beta^2\sigma_\alpha^2} \right]$$

First, the correlations between the dependent variables and the independent variable were established (life satisfaction, physical symptoms, $r = -.25, p < .01$; life satisfaction, depressed mood, $r = -.56, p < .001$). Second, the simple mediation effect of subjective vitality and perceived stress on the relationship between life satisfaction and depressed mood was calculated through their respective confidence intervals: vitality = -0.0576, -0.0005; stress = -0.2084, -0.1120. Because these confidence intervals do not include 0, the intervening variable effects are both significant (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Moreover, the total mediation effect of the combination of both vitality and stress was also significant (-0.2452, -0.1332). These results indicate that, taken together (i.e., interdependent variables) or as independent processes, both the positive and negative routes explaining the depression level based on general life satisfaction are to be considered significant intervening variables in this particular turn of events. Third, the simple mediation effect of subjective vitality and perceived stress on the relationship between life satisfaction and physical symptoms was calculated: vitality = -1.4325, 0.0289; stress = -2.0157, -0.4794. The intervening effect of vitality was not significant, including 0 between its lower and upper confidence limits. However, the perceived stress mediating effect was found to be significant.

Finally, the total mediation effect of the combination of these two variables yielded significance (-3.0009, -0.8892). This supports the negative

route as a good mediator between satisfaction with life and physical symptoms in the occurrence of such a stressful event, whereas the positive route seems not to be strong enough to account for it. Nonetheless, the dual route taken as a whole (i.e., interdependent variables) must be considered a good mediating process.

Discussion

The present study investigated a dual route to health outcomes after a stressful life event; namely, a natural disaster. The results show that satisfaction with life (i.e., before the ice storm) was a good indicator of health outcomes measured after the traumatic event. More precisely, the results indicate that general life satisfaction predicted higher levels of subjective vitality and lower levels of stress during the ice storm. In turn, subjective vitality negatively predicted physical symptoms and psychological ill-being (i.e., positive route), whereas the perception of stress positively predicted ill-health outcome variables (i.e., negative route).

For the reason that researchers recently have been emphasizing the need to examine the dual route when studying ill health (Aspinwall & Staudinger, 2003; Magnusson & Mahoney, 2003), this study is a significant contribution to current literature in the field of positive psychology. The present findings are in line with this recent position. Results obtained herein reveal that the positive variables, in combination with the negative ones, play a role in predicting ill health. It appears that the role of the positive route is one that attenuates the negative effects, thus acting as a buffer. Future research should integrate both routes in order to better understand health processes and to further test the role of the positive route.

Moreover, future research should investigate further the nature of the relationship among the dual-route variables. For instance, some have suggested that the negative and positive routes are interdependent, whereas some have suggested that the routes are independent.

Our goal in examining both positive and negative psychological processes was not truly reflected in our outcome measures, but rather in our intervening variables. For example, in addition to assessing a positive mediating variable, we also included stress perception. Our choice of mediators includes one that is likely to result in positive adjustment (i.e., subjective vitality) and one in negative functioning (i.e., perceived stress).

Even with such a small range of variables included, one can begin to address questions regarding the relationship between positive and negative functioning. If the dual route were flip sides of the same coin, then, one would expect that the general life satisfaction and mediators that influence

one route would influence the other route as well, in the opposite fashion (Kling, Ryff, Love, & Essex, 2003). If positive and negative functioning were simply reflections of each other, the resulting pattern would necessarily involve a positive influence by one mediator on the outcomes and a negative influence by the other.

This pattern was not tested entirely in the present study because positive-functioning consequences were not measured. For example, vitality was associated with decreases in physiological and psychological adjustment, whereas stress was associated with increases in both of these health functioning variables. However, in order to demonstrate the dependency or independency of health functioning, we would have had to measure both positive and negative predictors and outcomes. One would need to measure all of these variables in order to test if positive and negative psychological functioning are independent processes associated with distinct predictors or psychological processes. Therefore, future research including positive outcome variables should be conducted.

As well, among the positive consequences, future research should examine the perceived benefit or strength phenomenon; that is, the process by which those who have experienced traumatic events report benefit and growth as a result of their experience (Magnusson & Mahoney, 2003; McMillen, Smith, & Fisher, 1997; Thoits, 1995). Because one may experience positive affect while experiencing a negative event (e.g., being surrounded and supported by family members), a natural disaster can be interpreted in a slightly positive light, and it can provide an opportunity for positive growth to occur in the midst of the event.

Indeed, such results would be consistent with current conceptions of the self as a psychological activist for well-being during stressful circumstances (Thoits, 1994). In other words, rather than reacting passively to negative events, individuals sometimes behave in ways that increase their well-being in times of challenge. Further work on "construing benefits from adversity" (Affleck & Tennen, 1996, p. 903) is needed, therefore, because if victims of a stressful event are able to overcome the incident and, in the end, feel positive about themselves, the event would then lead individuals to experience growth. Since the present research did not measure positive consequences following the event, future research should measure the degree to which people feel stronger afterward and the factors promoting such positive results.

With respect to the role of subjective vitality, the results indicate that it predicted lower levels of depression and lower levels of physical symptoms. Given that subjective vitality acts as a generative mechanism to feelings of depression and physical symptoms, it is reasonable, then, to conclude, as hypothesized by Ryan and Frederick (1997), that by enhancing levels of

vitality, we can have a positive impact on well-being after such a stressful event. Our study thus provides more evidence for the mediating role played by subjective vitality (Patry, Blanchard, & Landry, 2003).

With regard to the mediational effects of subjective vitality, Patry et al. (2002) recently proposed a model linking self-determined forms of motivation, vitality, and their impact on self-regulation success. Their findings suggested that vitality appears to play an important mediating role in predicting successful self-regulation, especially self-regulation of the behaviors in the mood category (i.e., emotions).

The present paper offers a general framework to study further assessments of factors that facilitate versus forestall subjective vitality. In this case, life satisfaction, taken as a general tendency, appeared to enhance levels of vitality. Grow and Ryan (1995) studied elderly persons in a nursing facility and found that subjective vitality was also positively related to life satisfaction, psychological well-being, and physical health; and negatively related to depression and anxiety.

In addition, our results lend further support to Ryan and Frederick's (1997) conceptualization of subjective vitality as a feeling of personal energy associated with agency, which can be diminished by factors that block or hinder this particular feeling. Such factors can be illness or, according to the present findings, stress related to a traumatic event.

The study of the relationship between subjective vitality and neuropsychological systems is also potentially fruitful, especially given the associations found in Watson and Clark (1993) between subjective energy and variables associated with positive mood, a dimension that is increasingly linked to neuroanatomically specific behavioral activation systems (Gray, 1990). As a complementary note, the present findings somewhat clarify the opposite relationship, linking subjective vitality to negative mood. The relations between subjective vitality and organismic processes related to health and disease remain largely unexplored. Future studies using objective indicators of physical or mental status, rather than self-reports, would help to clarify these relations.

Limitations

Several limitations of the present study should be underscored. Because most traumas cannot be anticipated, our knowledge of vulnerability factors comes largely from retrospective studies. One of the disadvantages of the current research (post-only design) is the difficulty of disentangling true increases in psychopathology from the apparent increases that can result from the tendency of those exposed to blame the disaster for problems that

actually predated it, or the difficulty in participants' recalling and dating symptoms (Canino et al., 1990).

Moreover, since the mental and physical health status of the disaster's victims were not assessed previously, it is difficult to determine the extent to which the disaster had affected the health outcomes of these victims, especially when there was no specific question designed to ask participants the degree to which they were affected by the ice storm. If the study had evaluated participants at both pre- and post-storm times, then any effects would be considered more likely because of the deleterious consequences of the stressor itself inasmuch as previous symptoms would be taken into account.

Optimally, the buffering effect of vitality on the effects of incoming stressors (e.g., natural disasters) on changes in health outcomes would have to be determined by some longitudinal work, controlling for baseline stress, symptoms, and general health. The present study does not fall into this category but presents, in our view, some promising findings supporting the relevance of using a dual-route approach in examining adjustment and well-being.

A second limitation of this study is its reliance on self-report measures. It certainly would have been advantageous to obtain objective assessments, particularly of students' emotional reactions to the ice storm. Nonetheless, the instruments used to assess life satisfaction and the other study variables show evidence of good validity and reliability (Cohen et al., 1983; Diener et al., 1985; Emmons, 1992; Radloff, 1977; Ryan & Frederick, 1997). Therefore, although we did not have clinical assessments of the respondents in this study, we believe the symptomatology assessments to be informative.

Another potential problem is that the subjective vitality measure was obtained as part of the same questionnaire packet as the various symptom measures. Thus, the presence of the depression items, for example, may have biased responses to the vitality measure. Unfortunately, this is characteristic of designs in the area of natural disasters. Ozer, Best, Lipsey, and Weiss (2003) suggested that the naturalistic, retrospective emphasis is certainly understandable, given the unpredictability of traumatic exposure in many of the civilian populations studied (e.g., the unexpected nature of most natural and human disasters) and the obvious ethical prohibitions of inflicting exposure to highly stressful events on populations in an experimental or quasi-experimental design.

Another related limitation concerns our sample. Participants were all university students whose responses may not be generalizable to other age or cultural subgroups. For instance, although the elderly may endure more severe exposure to disasters, may have poorer health, and may have fewer social and economic resources, they also possess two advantages lacking in younger adult populations that promote the process of adaptation to

disasters: a higher incidence of past resolved stressful experiences (Norris & Murrell, 1988), and a lower incidence of current unresolved stressful experiences (Hughes, Blazer, & George, 1988). It could then be proposed that experienced victims already possess the repertoire of coping responses required to adapt successfully to such crises. The second advantage reflects the tendency for older adults to experience fewer life changes within a given interval of time than younger adults. Caplan's (1964) theory implies that individuals in the midst of a life transition (e.g., university years) are in the process of developing new coping strategies and, consequently, may experience a concurrent accidental crisis as overwhelmingly stressful. Taking these age differences into account, the present findings must be interpreted with respect to generalization to youth-related populations.

Finally, because this is a correlational study, our results can only suggest which factors predicted participants' somatic and psychological health. The causal relationship between variables cannot be established. Furthermore, would our results apply to victims of different kinds of traumas?

One important characteristic of a natural disaster is that nearly everyone in a community experiences the event, at least to some degree. This allows people to share their experiences and reactions with others who may have been affected similarly. In contrast, traumas such as rape or the violent death of a loved one happen to individuals or to families. Sharing such an experience with others may be difficult because people may have difficulty understanding the victims' feelings or because victims fear ostracism for revealing their traumas. There also would seem to be more opportunity for self-blame in traumas such as these than in natural disasters (Nolen-Hoeksema & Morrow, 1991). Would victims of these types of traumas experience the same kinds of somatic and psychological responses as would the victims of a natural disaster? And if so, could vitality possibly mediate the consequences?

In addition, a ruminative response style may be especially pernicious for victims of traumas who feel that they cannot reveal anything to others. Confiding in others may reduce a person's tendency to ruminate, thereby helping him or her to recover from a trauma (Pennebaker, 1989). A *ruminative response style* is conceived as the tendency to focus purposely on one's moods and the implications of these moods (Nolen-Hoeksema & Morrow, 1991). This response style theoretically should predict the duration of negative feelings. When a person is prone to rumination and cannot confide in others about a particular trauma, he or she may be at particularly high risk for long-term negative reactions to traumas. The relationships between the ruminative response styles, subjective vitality, and health outcomes following a variety of traumas remain to be tested.

The present findings suggest that individuals exposed to a stressful environmental event can experience less physiological and psychological

damage if they express general life satisfaction and vitality. This emphasizes that enabling an individual to feel generally satisfied and vital in the long run can be beneficial to his or her health conditions, especially in a situation involving fairly high levels of stress.

This generalization reintroduces the concepts of energy and vitality as they once were considered by applied health professionals. For instance, Selye (1956), in his well-known theory of stress, proposed that individuals possess a limited reservoir of adaptation energy that is critical in the maintenance of health. Selye suggested that people use this energy when facing environmental and disease stressors, representing a principal factor in resilience. Empirical work, therefore, should focus more on actually establishing ways to improve one's levels of vitality, rather than only associating subjective vitality to several indexes of psychological well-being, basic personality traits, and affective dispositions.

In conclusion, although some issues remain to be examined, our data indicate that disasters are important stressors that affect victims' physical and mental functioning and morbidity. The need for primary, secondary, and tertiary intervention strategies is thus apparent. This suggests, in line with Canino et al.'s (1990) general discussion, the need for training mental health workers, crisis-intervention counselors, and general health practitioners in identifying the population at risk (e.g., the poor, the uneducated, those with a previous psychiatric history) and undertaking specific interventions for the treatment of the most common stress-induced disorders and symptoms; that is, post-traumatic stress as well as somatic and depressive symptomatology.

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