

A study of resiliency among Chinese health care workers: Capacity to cope with
workplace stress*

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Abstract

This paper reports a study of resiliency to cope with workplace stress among Chinese health care workers. We adopted a qualitative-quantitative-biomarker approach to conduct interviews, focus group discussions, and a 2-wave longitudinal survey. Wave 1 survey was conducted among health care workers in Hong Kong and Mainland China (N = 773). Amongst them, 287 took part in Wave 2 survey. A confirmatory factor analysis consistently supported a 9-item scale. A sub-sample's (N = 33) resiliency was positively related to salivary IgA levels (an immune marker). Results from hierarchical regressions demonstrated that resiliency measured in Wave 1 was positively related to job satisfaction, work-life balance, and quality of life; and negatively related to physical/psychological symptoms and injuries at work in Wave 2.

Keywords: resiliency, workplace stress, health care workers, Chinese, positive psychology

Introduction

Like in many Western societies, the economy in some key cities in Greater China such as Hong Kong and Beijing has in recent decades shifted from production-based to an emphasis on service and knowledge. This transition together with globalization of the economy has placed an increased demand on worker's competencies and capabilities to deal with change, challenges and conflicts, and to overcome stressful and adverse circumstances. Obviously, it is important to investigate a valuable personal asset in coping with workplace stress among Chinese employees.

Our focus in this study was on health care workers. Stress, burnout, and workplace violence remain top stressors in health care sectors (ILO, 2006). It is estimated that stress and violence together possibly account for 30% of the overall costs of ill-health and accidents, and may account for approximately 0.5-3.5% of the loss in GDP per year (Hoel, Sparks, & Cooper, 2002).

Recently, with the development of positive psychology (Peterson, 2006; Seligman, 2002), the concept of psychological capitals (PsyCaps) emerged, which refers to the competencies/capacities that enable employees to face challenges and adversity in the workplace (e.g., Luthans, 2002; Luthans & Youssef, 2007). Among the four PsyCaps that have been identified (self-efficacy, hope, optimism and resiliency), resiliency is particularly important to today's fast-paced, stressful, unpredictable work environment in China (Luthans, 2002; Luthans, Vogelgesang, &

Lester, 2006; Luthans & Youssef, 2007). Avolio and Luthans (2006) noted that “developing this PsyCap of resiliency and leveraging it in the turbulent times facing most organizations today would seem to be a very wise investment” (p.156).

While there is a growing research literature on children’s resiliency (e.g., Masten & Reed, 2002) and also resiliency in later life (e.g., Ryff & Singer, 2003), studies on resiliency in workers are relatively lacking. Even though discussion on resiliency has appeared in the organizational behavior literature in recent years (e.g., Harland, Harrison, Jones, & Reiter-Palmon, 2005; Luthans, Avey, et al. 2006; Luthans et al., 2005; Luthans, Vogelgesang, & Lester, 2006), the body of knowledge that applies resiliency to the workplace specifically coping with work stress is fragmented and generally inadequate (Sutcliffe & Vogus, 2003). In summarizing future directions for research on resiliency, Ryff and Singer (2003) also commented that literatures on resiliency are not linked to research on stress and coping. The purposes of the current study are: first, to develop and validate a measure of resiliency applicable to Chinese health care workers; and second, to examine its beneficial role in coping with workplace stress.

Resiliency: Conceptualization and Measurement Issues

The study for resiliency has deep roots in clinical and developmental psychology which one focused on the negative aspects such as risk factors (e.g., Block & Kremen, 1996). Recently, more positive psychologists offer more positive definition of

resiliency. For instance, Masten and Reed (2002) defined resiliency as “a class of phenomena characterized by patterns of positive adaptation in the context of significant adversity or risk“ (p. 75).

The concept of resiliency has recently been applied to the workplace through the work of Masten and Reed (2002) and Coutu (2002). Coutu (2002) described resilient individuals at the workplace as likely to be those who have a strong awareness and acceptance of reality and an ability to be flexible, to improvise, and to adapt to change. In organizational behavior research, Luthans (2002) defined resiliency as “the positive psychological capacity to rebound, to ‘bounce back’ from adversity, uncertainty, conflict, failure or even positive change, progress and increased responsibility” (p.702).

Jackson and Watkin (2004) used the Resilience Factor Inventory (comprised of seven skills of emotion regulation, impulse control, causal analysis, self-efficacy, realistic optimism, empathy, and reaching out) and provided evidence that boosting such resilience skills would improve the capacity of employees in clinical and corporate settings in Western societies. Yet their work did not apply to coping with workplace stressors.

Luthans, Avolio, Walumbwa, and Li (2005) adopted work of Block and Kremen (1996) and Klohnen (1996) to measure resiliency in their study. Luthans and coworkers have recently developed and validated a 24-item reliable and valid measure

of PsyCap, with six items measuring resiliency (Luthans, et al, 2006; Luthans, Youssef, & Avolio, 2007). However, longitudinal validity evidence of such measure has not been reported, and again their measure was not targeted on tapping capacity to rebound when facing workplace stress. To bridge this gap, we conducted a longitudinal study to examine the role of a locally developed measure of resiliency to cope with workplace stress in several cities of China.

Previous work on the benefits of resiliency in the workplace stress in China has been cross-sectional (Luthans et al., 2005). Another limitation of earlier research on measure of resiliency is a lack of objective indicators. To date, we found that few if any study that validates resiliency measures with any objective criterion. We therefore proposed the use of a biomarker namely salivary immunoglobulin A (IgA). Salivary IgA is an indicator of stress level and physiological immunity against diseases in the upper respiratory tract. Recently, the assessment of salivary IgA has proven to be a valid and reliable reflection of the respective unbound hormone in blood (Kirschbaum & Hellhammer, 1994), and a biomarker of work stress (an immune marker) among nurses (Ng et al., 1999; Yang et al., 2002). This physiological test was used in this study to serve as a converging measure of work stress.

Summarizing future directions for research on resiliency, Luthans, et al. (2007) noted it is imperative that a longitudinal approach be employed; a triangular strategy or multi-methods be used in data collection to avoid bias; and that the impact on other

positive outcomes such as employee wellness be empirically assessed. This study attempts to meet all these prescriptions by using a longitudinal design to develop a measure of resiliency (capacity to cope with or “bounce back” in the wake of high-stress situations or after setbacks) applicable to the health care workplace in Chinese societies. We also aimed to demonstrate the beneficial role of resiliency in the workplace by demonstrating its relationship with positive outcomes (including job satisfaction, work-life balance, quality of life) and negative outcomes (including psychological or physical dysfunction and injuries at work).

Based on previous research findings, we hypothesized that resiliency would be positively related to job satisfaction, work-life balance, and quality of life; and negatively related to physical and psychological symptoms, and injuries at work. We also hypothesized that the level of salivary IgA would be positively related to resiliency.

Overview of Current Study

In this study, we attempted to develop a resiliency measure which is satisfactory both in terms of internal consistency (Cronbach’s alpha) and construct validity (Campbell & Fiske, 1959; de Groot, 1969). Establishing a scale’s construct validity is neither a one-time task nor a single-approach procedure (Schwab, 1980). The following steps were involved in the research: item generation with focus groups, scale construction, concurrent validity testing using saliva IgA, and prospective

validation with a two-wave longitudinal study, showing impact of resiliency on workplace outcomes.

Method

Step 1: Item Generation with Focus Groups

Following Kinicki and Latack's (1990) procedure, we worked as a multidisciplinary research team covering the fields of industrial/organizational psychology, social psychology, as well as community and family medicine. Drawing upon our experience with health care workers, we developed an initial pool of items which was made up of 15 items from the Resiliency Self-test: Self Confidence During Stress (<http://www.hooah4health.com>), as well as some items used in Siu, Chow, Phillips, and Lin (2006) and Jackson et al.'s (2004) studies. Items were also generated in two focus group discussions (FGDs) on protective factors and outcomes of resiliency.

Participants in the FGDs were 15 health care employees who worked in infectious disease wards of several public hospitals in Hong Kong. These individuals did not experience (as many others did) much psychological symptoms during the SARS outbreak in 2003, despite their working in a high-risk environment. They constituted a resilient group of individuals who seem to possess the protective factors to withstand stress.

After several iterations of FGDs and discussion within the research team (in which items and definitions of resiliency were presented and debated), we selected two items from Siu et al. (2006); adapted seven items from the *Resiliency Self-test: Self Confidence During Stress*, and composed one new item. This formed a 10-item resiliency instrument.

Step 2: Scale Construction

Participants and procedures. To examine the psychometric properties of the 10-item resiliency scale, data were collected from health care workers in several hospitals in Hong Kong and three cities in Mainland China (Total N = 773, N = 211 in Hong Kong, N = 297 in Beijing, N = 70 in Hunan, N = 195 in Tibet). Of this sample (hereafter called the “Wave 1 sample”), 614 were females and 153 were males (six did not indicate their gender). Their ages ranged from 18 to 65 years ($M = 34.66$, $SD = 10.20$), and their job tenure varied from less than a year to 40 years ($M = 10.85$, $SD = 9.13$). In addition, 59.9% of the respondents were front-line health care workers, and 56.7% were shift workers. The demographic information is presented in Table 1.

Each participant in Hong Kong received a questionnaire shortly before a training seminar. They completed the questionnaires and returned them to the researchers in the seminar room on the same day. For the sample recruited in Beijing, the completed questionnaires were returned in sealed envelopes within a week. All

participants were informed that participation was voluntary, and that non-participation would not have any repercussion on their jobs. The survey was anonymous.

Measures. The 10 resiliency items were presented on a six-point Likert scale (1=*very inaccurate*; 6=*very accurate*). The use of an even-point scale is to reduce central tendency bias, which is prevalent among Chinese respondents who, subscribing to the Confucian “doctrine of moderation” (Fu & Tsui, 2002; Hui, Lee, & Rousseau, 2004), often tend to check the midpoint of a rating scale.

Step 3: Concurrent Validity Testing Using Saliva IgA

Measure. As mentioned earlier, salivary IgA is an immune marker. We therefore expected those who reported higher levels of resiliency to show higher levels of salivary IgA.

Participants and procedures. Of the 211 participants in Hong Kong, 33 (5 males, 28 females) volunteered to provide saliva samples for titration for IgA levels (Because of budgetary constraint we did not assess all participants on this). Compared to the full sample, these 33 participants were slightly older, averaging 44.56 years old ($SD = 8.52$ years). They had an average of 15.39 years of full-time working experience ($SD = 9.87$ years). Two-thirds of the participants were front-line health care workers, and 42.4% were shift workers. The demographic information of the full sample and the IgA subsample can be found in Table 1.

Step 4: Prospective Validation with a Two-wave Longitudinal Study

This aspect of the study had two purposes. First, we evaluated the validity of the instrument. Second, we examined the stability and invariance of the factor structure.

For these, we compared two sets of data collected from the separated by five months.

Participants and procedures. Of the 773 participants who took part in Wave 1, 441 expressed interest in participating in Wave 2. Specifically, among the samples in Mainland China, only participants from one hospital in Beijing (N = 200 in Wave 1) agreed to participate. These individuals received the Wave 2 questionnaire five months after Wave 1. A total of 287 (88 from Hong Kong, 199 from Beijing) returned the completed questionnaires, making an overall response rate of 37%. However, the response rate for the Hong Kong sample was 41.7% and that for the participant hospital in Beijing was 99.5%. Respondents in this second wave were aged from 20 to 59 years (M = 36.99, SD = 9.78). Of these, 253 were women (88.2%) and 34 were men (11.8%). Their job tenures varied from less than a year to 42 years (M = 12.94, SD = 9.70). Here we call this sample the “Wave 2 sample”. (Table 1 also shows the demographic information of the respondents of Wave 2). The dependent measures used are listed in the following paragraphs.

Quality of life. Six items developed by Siu and Phillips (2005) were used to measure satisfaction level in six domains of life (health status, quality of life, life satisfaction, family relation, friendship, and financial management). A six-point Likert-type response scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*)

was adopted. The Cronbach's alpha for this scale was 0.82 and 0.84 for Wave 1 and Wave 2 respectively.

Work-life balance. Six items developed by Siu and Phillips (2005) were used to measure perceived control over work and life interface (e.g., "Your work and life is balanced"). A six-point Likert-type response scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*) was adopted.

Job satisfaction. Two items from Cammann, Fichman, Jenkins, and Klesh (1979) were used (e.g., "All in all, I am satisfied with my job"). They have been used in many cross-cultural studies and have demonstrated high internal consistency (e.g., Siu, Spector, Cooper, & Lu, 2005; Spector et al., 2004). In addition, two items were constructed to measure participants' satisfaction about the hospital they were working in and the Hong Kong Hospital Authority (or The Health Bureau when used in China): "In general, I am satisfied with the operation of the hospital I work in", "In general, I am satisfied with the operation of The Hong Kong Hospital Authority (or The Health Bureau when used in China)". Each item was scored on a six-point scale with a higher score denoting higher job satisfaction.

Injuries at work. Five items were used to measure whether the participants had recently suffered from contusion, scratches, sprains/strains, cuts/punctures, and infectious disease. This scale has been found to be reliable among Hong Kong employees such as construction workers and geriatric nurses (e.g., Siu, Phillips, &

Leung, 2004). Each item was rated on a six-point scale with a high score denoting more injuries.

Physical and psychological symptoms. Six items were taken from the Psychological Well-being Scale of An Organizational Stress Screening Tool (ASSET) (Cartwright & Cooper, 2002) measuring physical symptoms (3 items, such as insomnia) and psychological symptoms (3 items, such as depressive mood). The construct validity of the Psychological Well-being Scale of ASSET has been demonstrated (Johnson & Cooper, 2003). The short version comprising these 6 items was reliable among Hong Kong employees (e.g., Siu et al., 2006). Each item was rated on a six-point scale with higher values indicating poorer well-being.

Results

Scale Construction

A series of analysis of variance revealed no difference in resiliency among the various subsamples from different locations. We examined the item-total correlations and coefficient alphas (Devellis, 2003; Spector, 1991). With the exception of one item, all had an item-total correlation of .40 or above, thus showing strong relationships among items. With the problematic item (Item 10) dropped, the revised 9-item scale (see Appendix 1) is internally consistent ($\alpha = .88$, see Table 2).

As resiliency was conceptualized as a unidimensional construct representing capacity to cope with workplace stress in the present study, and the present scale was

developed to reflect this, we expected to confirm a one-factor structure underlying the construct. An exploratory factor analysis (EFA) on the nine items yielded one factor which explained 51.19% of the total variance (Table 3). In addition, a confirmatory factor analysis on the 9 items confirmed a one-factor structure (see Table 4). With this information we used the 9-item model for analyses of the Wave 2 data.

Concurrent Validity

As hypothesized, participants' salivary IgA level was positively related to resiliency level, quality of life and job satisfaction; and negatively related to injuries at work (see Table 5). As shown in Table 5, resiliency was positively related to job satisfaction, quality of life, and work-life balance; and negatively related to injuries at work and physical/psychological symptoms. The results are consistent with our hypothesis that resiliency would be positively related to job satisfaction, work-life balance and quality of life; and negatively related to physical and psychological symptoms, and injuries at work.

Temporal Stability

We used the longitudinal factor analysis model (Feldt, et al., 2000; Feldt, Leskinen, Kinnunen, & Ruoppila, 2003; Tisak & Meredith, 1990) to assess stability of the factor structure of resiliency. Equality constraints were imposed on the corresponding factor loadings and error terms across resiliency data collected in the

two waves. A non-significant chi-square would provide justification for this constrained model.

Three models were estimated: (1) a baseline model without any invariance assumption ($\chi^2(48) = 211.72$), (2) a model where the factor loadings were constrained to be equal across time ($\chi^2(56) = 218.61$), and (3) a model where both the factor loadings and error terms were constrained to be equal across time ($\chi^2(69) = 235.20$). Comparing the second model with the baseline model, $\chi^2_{\text{diff}}(8) = 6.89$, ns. Comparing the third (most constrained) model compared with the second model, $\chi^2_{\text{diff}}(13) = 16.59$, ns. The goodness-of-fit statistics for the stability model are shown in Table 4. The stability coefficient for the structure of resiliency was moderately high (0.68) over the 5-month follow-up period. The squared multiple correlation (R^2) for the structural equation was .46, which indicated that the proportion of variance in the factor at the second time point, as predicted by that factor at the first time point was 46%. In short, the structure for resiliency remained invariant over time.

Cronbach's alpha for the resiliency scale was 0.90 (see Table 2). Resiliency scored at Wave 1 ($M = 3.99$, $SD = 0.78$) and Wave 2 ($M = 3.99$, $SD = 0.82$) demonstrated a high level of agreement, with a test-retest reliability of 0.68.

Prospective Validity

We used hierarchical regression to examine the impact of resiliency on outcomes measured in Wave 2. We first entered, as control variables, the corresponding

outcome variables measured in Wave 1 into the regression equation followed by resiliency measured in Wave 1. F tests show that resiliency significantly improved the prediction of quality of life, work-life balance, physical/psychological symptoms, job satisfaction and injuries at work. Details can be found in Table 6. In sum, the hypothesis that resiliency would be positively related to job satisfaction, work-life balance, and quality of life; and negatively related to physical and psychological symptoms, and injuries at work was again supported.

Discussion

This paper reported the development and validation of a Chinese measure of resiliency. The study was conducted among health care employees in Hong Kong and the PRC, where only very limited studies could be found.

Based on qualitative data obtained from interviews, focus group discussions, a 10-item scale was drafted. Subsequent factor analyses consistently supported a 9-item resiliency scale. We found resiliency positively related to salivary IgA level among 33 Hong Kong participants. Hierarchical regressions on various stress and work outcomes showed that participants at a high level of resiliency reported less stress symptoms and injuries at work several months later. They also reported higher job satisfaction, more work-life balance and better quality of life. These results corroborate a previous study in Hong Kong (Siu et al., 2006), and, to a certain extent, some studies in Western societies (Jackson & Watkin, 2004; Luthans, Avolio, et al.,

2005; Luthans, Youssef, et al., 2007). Using a multi-method and longitudinal design (Luthans, Youssef, et al., 2007), we advanced theory-building in positive psychology, identifying resiliency as a psychological capital in the workplace.

One practical implication of our findings is economic. Boosting health care workers' PsyCap of resiliency and selecting job candidates who are resilient will in the long term reduce cost due to absenteeism, illnesses, and loss of human lives. This is because resilient employees can rebound from their adversity to their premorbid level of functioning (see, e.g., Carver, 1998). This is particularly true of people who themselves work in the health care sector. Improving resiliency in the workplace would add to the promotion of mental health among employees in other occupational sectors as well. This, in turn, can add economic and social value to societies.

Another contribution of the present investigation is that it provides the research and professional communities an instrument to evaluate effectiveness of programs designed to improve employee well-being in general and resiliency in particular. Because seven items of this 9-item scale were adapted from Western measures, and the scale is now demonstrated to be valid in several Chinese cities, we are fairly confident that this new instrument can also be used cross-culturally and in other professions.

One limitation of the study is the small sample available for the objective physiological test. We were unable to conduct similar saliva tests in Mainland China

due to time and resource constraints. Nevertheless, despite the small sample size, we were able to obtain a statistically significant correlation.

Another potential limitation of the study is the high attrition rate in the second wave of the survey, even though the response rate for the only participant hospital in Beijing for Wave 2 was very high. There is a concern that the participants who volunteered to be in Wave 2 were in some way different from the broader set of participants in Wave 1, and even more so for the people who volunteered to give their saliva. For instance, the only participant hospital in Beijing for Wave 2 is the most famous infectious disease prevention hospital in Beijing, which took an important role during SARS in 2003. The health care workers there are supposed to be more resilient and well adjusted. Furthermore, most participants in Hong Kong who gave saliva also took part in Wave 2. However, we do not think this disputes the validity of our results. This is because if only the most conscientious or resilient or well adjusted people remained in both waves and gave saliva, this range restriction of participants would only have attenuated the correlations, thus providing us with a conservative test of the hypotheses. Notwithstanding, future longitudinal surveys should provide incentives for more participants to remain in the study.

Table 1 Demographic Characteristics of the Samples

	<i>Participants for Wave 1</i> (<i>N</i> = 773)	<i>Participants for saliva tests</i> (<i>N</i> = 33)	<i>Participants from Wave 1 who agreed to take part in Wave 2 survey</i> (<i>N</i> = 411)	<i>Participants for Wave 2 survey</i> (<i>N</i> = 287)
Gender				
Female	614 (79.4%)	28 (84.8%)	352 (85.6%)	253 (88.2%)
Male	153 (19.8%)	5 (15.2%)	57 (13.9%)	34 (11.8%)
Age	Range: 18-65 years <i>M</i> = 34.66, <i>SD</i> = 10.20	Range: 29-60 years <i>M</i> = 44.56, <i>SD</i> = 8.52	Range: 19-60 years <i>M</i> = 37.57, <i>SD</i> = 9.82	Range: 20-59 years <i>M</i> = 36.99, <i>SD</i> = 9.78
Tenure	Range: 0-40 years <i>M</i> = 10.85, <i>SD</i> = 9.13	Range: 1-32 years <i>M</i> = 15.39, <i>SD</i> = 9.87	Range: 0-37 years <i>M</i> = 12.29, <i>SD</i> = 9.02	Range: 0-42 years <i>M</i> = 12.94, <i>SD</i> = 9.70
Shift Duty				
Yes	438 (56.7%)	14 (42.4%)	204 (49.6%)	157 (54.7%)
No	324 (41.9%)	18 (54.5%)	201 (48.9%)	128 (44.6%)
Front Line				
Yes	463 (59.9%)	22 (66.7%)	296 (72.0%)	205 (71.4%)
No	297 (38.4%)	10 (30.3%)	108 (26.3%)	81 (28.2%)

Table 2 Means, Standard Deviations, and Cronbach's Alphas of the Main Variables

	Wave 1 (N=773)			Wave 2 (N=287)		
	<i>M</i>	<i>SD</i>	<i>α</i>	<i>M</i>	<i>SD</i>	<i>α</i>
1. Resiliency	3.99	0.78	.88	3.99	0.82	.90
3. Quality of life	4.29	0.82	.79	4.44	0.84	.84
4. Work-life balance	3.49	0.78	.69	3.59	0.81	.76
5. Physical/psychological symptoms	3.13	1.04	.88	2.92	1.00	.88
7. Job satisfaction	4.13	1.02	.89	4.23	0.95	.90
9. Injuries at work	1.86	0.87	.80	2.02	0.85	.77

Table 3 Resilience Scale: Factor Loadings

Items	EFA	
	Wave ₁	Wave ₂
1 I feel capable of overcoming my present or any future difficulties and problems I might face such as resolving dilemmas or making difficult decisions.	.64	.71
2 I have high capacity for facing adversity.	.74	.76
3 When there is a great deal of pressure being placed on me, I remain calm.	.76	.80
4 During stressful circumstances, I never experience anxiety.	.65	.71
5 When I have made a mistake during a stressful situation, I continue to like myself.	.48	.54
6 When I need to stand up for myself, I can do it easily.	.67	.70
7 In really difficult situations, I feel able to respond in positive ways.	.60	.67
8 I experience peacefulness -- free of thoughts and worries, when I need to relax during stressful times.	.72	.74
9 I remain calm, when I am in a frightening situation.	.75	.79

Table 4 The Goodness-of-fit Statistics for the Resiliency Model and its Stability Model (completely standardized solution) of Resiliency

Models	χ^2	<i>df</i>	CFI	IFI	NFI	GFI	RMR	RMSEA
Measurement model								
Resilience model (Wave 1)	109.12	24	.92	.92	.90	.92	.06	.11
Resilience model (Wave 2)	102.61	24	.94	.94	.92	.93	.05	.11
Stability model								
Baseline model	211.73	48	.93	.93	.91	.93	.06	.08
Measurement weights constrained model	218.61	56	.93	.93	.91	.93	.06	.07
Structural covariance constrained model	219.68	57	.93	.93	.91	.92	.08	.07
Measurement residual constrained model	235.20	69	.93	.93	.91	.92	.08	.07

Note. For all χ^2 , $p < .01$. RMSEA = mean square error of approximation; CFI = comparative fit index; IFI = incremental fit index.

Table 5 Intercorrelations Among the Main Variables

Variable	1	2	3	4	5	6	7
Wave 1 (N = 773)							
1. Resiliency	--						
2. Quality of life	.43**	--					
3. Work-life balance	.40**	.53**	--				
4. Physical/psychological symptoms	-.35**	-.40**	-.38**	--			
5. Job satisfaction	.31**	.37**	.39**	-.18**	--		
6. Injuries at work	-.20**	-.19**	-.23**	.37**	-.13**	--	
7. IgA (N = 33)	.58**	.42*	.39*	-0.30	.35*	-.51**	--
Variable	1	2	3	4	5	6	
Wave 2 (N = 287)							
1. Resiliency	--						
2. Quality of life	.60**	--					
3. Work-life balance	.44**	.61**	--				
4. Physical/psychological symptoms	-.48**	-.46**	-.50**	--			
5. Job satisfaction	.40**	.43**	.49**	-.36**	--		
6. Injuries at work	-.33**	-.31**	-.29**	.48**	-.29**	--	
Variable	1	2	3	4	5	6	IgA (W1)
Waves 1 & 2 (N = 287)							
1. Resiliency (Wave 2)	.68**	.34**	.35**	-.39**	.32**	-.33**	0.42

2.	Quality of life (Wave 2)	.50**	.63**	.51**	-.39**	.33**	-.36**	.45*
3.	Work-life balance (Wave 2)	.34**	.44**	.63**	-.37**	.33**	-.28**	0.36
4.	Physical/psychological symptoms (Wave 2)	-.45**	-.34**	-.41**	.64**	-.29**	.42**	-0.21
5.	Job satisfaction (Wave 2)	.33**	.29**	.36**	-.25**	.64**	-.17**	0.27
6.	Injuries at work (Wave 2)	-.28**	-.28**	-.27**	.38**	-.26**	.64**	-0.28

* $p < .05$. ; ** $p < .01$; W1 – Wave 1

Table 6 Hierarchical Regression of Quality of Life, Work-life Balance, Job Satisfaction, Injuries at Work, and Physical/Psychological Symptoms on Resiliency

Predictor	Quality of Life (Wave 2)		Work-life Balance (Wave 2)		Physical/Psychological Symptoms (Wave 2)		Job Satisfaction (Wave 2)		Injuries at Work (Wave 2)	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	Step 1									
Control Variable	.63***	.50***	.64***	.59***	.64***	.56***	.64***	.60***	.65***	.62***
Step 2										
Resiliency (Wave 1)		.27***		.11*		-.17***		.10*		-.10***
R^2	.39***	.45***	.40***	.41***	.41***	.44***	.41***	.42***	.42***	.43***
ΔR^2	.39***	.06***	.40***	.01*	.41***	.02***	.41***	.01*	.42***	.01*

Note. N = 287. Regression values are standardized betas. Controlled variables are each dependent variables measured at Wave 1.

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

References

- Block, J., & Kremen, A. M. (1996). IQ and ego-resiliency: Conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology*, 70, 349-361.
- Cammann, C., Fichman, M. Jenkins, D., & Klesh, J. (1979). *The Michigan Organizational Assessment Questionnaire*. Unpublished manuscript, University of Michigan, Ann Arbor.
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56, 81-105.
- Cartwright, S., & Cooper, C. L. (2002). *ASSET: An Organizational Stress Screening Tool, The Management Guide*. Manchester, UK: RCL Ltd.
- Carver, C. S. (1998). Resilience and thriving: Issues, models, and linkages. *Journal of Social Issues*, 54, 245-266.
- Coutu, D.L. (2002). How resilience works. *Harvard Business Review*, May, 46-55.
- de Groot, A. D. (1969). *Methodology: Foundations of inference and research in the behavioral sciences*. The Hague-Paris: Mouton & Co.
- Devellis, D. R. (2003). *Scale development: Theory and applications* (2 ed. Vol. 26). Thousand Oaks: Sage.
- Feldt, T., Leskinen, E., Kinnunen, U., & Mauno, S. (2000). Longitudinal factor analysis models in the assessment of the stability of sense of coherence.

Personality and Individual Differences, 28, 239-257.

Feldt, T., Leskinen, E., Kinnunen, U., & Ruoppila, I. (2003). The stability of sense of coherence: comparing two age groups in a 5-year follow-up study. *Personality and Individual Differences*, 35, 1151-1165.

Fu, P. P., & Tsui, A. S. (2003). Utilizing printed media to understand desired leadership attributes in the People's Republic of China. *Asia Pacific Journal of Management*, 20, 423-446.

Harland, L., Harrison, W., Jones, J. R., Reiter-Palmon, R.

(2005). Leadership behaviors and subordinate resilience. *Journal of Leadership & Organizational Studies*, 11, 2-14.

Hoel, H., Sparks, K., & Cooper, C.L. (2002). *The cost of violence/stress at work and the benefits of a violence/stress-free working environment*. UK: University of Manchester Institute of Science and Technology. Report commissioned by the International Labor Organization (ILO) Geneva.

Hoyle, R. H., & Panter, A. T. (1995). Writing about structural equation models. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 158-176). Thousand Oaks, CA: Sage.

Hui, C., Lee, C., & Rousseau, D. M. (2004). Psychological contract and organizational citizenship behavior in China: investigating generalizability and instrumentality. *Journal of Applied Psychology*, 89, 311-321.

International Labor Organization (2006). Violence and stress at work in service sectors.

[\(<http://www.ilo.org/public/english/dialogue/sector/themes/violence/health.htm>\)](http://www.ilo.org/public/english/dialogue/sector/themes/violence/health.htm)

(extracted in December 2006)

Jackson, R., & Watkin, C. (2004). The resilience inventory: Seven essential skills for overcoming life's obstacles and determining happiness. *Selection & Development Review, 20*, 13-17.

Johnson, S., & Cooper, C.L. (2003). The construct validity of the ASSET stress measure. *Stress and Health, 19*, 181-185

Kinicki, A. J., & Latack, J. C. (1990). Explication of the construct of coping with involuntary job loss. *Journal of Vocational Behavior, 36*, 339-360.

Kirschbaum, C., & Hellhammer, D. H. (1994). Salivary cortisol in psychobiological research: recent developments and applications. *Psychoneuroendocrinology, 19*, 313-333.

Klohlmen, E.A. (1996). Conceptual analysis and measurement of the construct of ego resiliency. *Journal of Personality and Social Psychology, 70*, 1067-1079.

Luthans, F. (2002). The need for and meaning of positive organizational behavior. *Journal of Organizational Behavior, 23*, 695-706.

Luthans, F., Avey, J.B., Avolio, B. J., Noram, S.M., & Combs, G.J. (2006). Psychological Capital Development: Toward a Micro-intervention. *Journal of Organizational Behavior, 27*, 387-393.

- Luthans, F., Avolio, B.J., Walumbwa, F.O., & Li, W. (2005). The psychological capital of Chinese workers: exploring the relationship with performance. *Managerial and Organization Review, 1*, 247-269.
- Luthans, F., Vogelgesang, G. R., & Lester, P.B. (2006). Developing the psychological capital of resiliency. *Human Resource Development Review, 5*, 25-44.
- Luthans, F., Youssef, C.M., & Avolio, B. J. (2007). *Psychological Capital: Developing the Human Competitive Edge*. New York: Oxford University Press.
- Luthans, F., Youssef, C.M. (2007). Emerging Positive Organizational Behavior, *Journal of Management, 33*, 321-349.
- Masten, A. S., & Reed, M. G. J. (2002). Resilience in development. In: C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp.74-88). New York: Oxford University Press.
- Ng, V., Koh, D., Chan, G., Ong, H. Y., Chia, S. E., & Ong, C. N. (1999). Are salivary immunoglobulin A and lysozyme biomarkers of stress among nurses? *Occupational and Environmental Medicine, 41*, 920-927.
- Peterson, C. (2006). *A primer in positive psychology*. New York: Oxford University Press.
- Resiliency Self-test: Self Confidence During Stress.
- <http://www.hooah4health.com/toolbox/spirit/resiliencyquizscds.asp> (extracted in January 2005)
- Ryff, C. D., & Singer, B. (2003). Flourishing under fire: resilience as a prototype of

- challenged thriving. In: C. L. M. Keyes & J. Haidt (Eds.), *Flourishing: Positive Psychology and The Life Well-lived* (pp.15-36). Washington, DC: American Psychological Association.
- Schwab, D. P. (1980). Construct validity in organizational behavior. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 2, pp. 3-43). Greenwich, CT: JAI Press.
- Seligman, M. E. P. (2002). Positive psychology, positive prevention, and positive therapy. In: C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp.3-12). New York: Oxford University Press.
- Siu, O. L., Chow, S. L., Phillips, D. R., & Lin, L. (2006). An exploratory study of resilience among Hong Kong employees: Ways to happiness. In L.S. Ho and Y. K. Ng (Eds.), *Happiness and public policy: Theory, case studies, and implications* (pp. 209-220). Palgrave Macmillan.
- Siu, O. L., Phillips, D. R., & Leung, T. W. (2004). Safety climate and safety performance among construction workers in Hong Kong: The role of psychological strains as mediators. *Accident Analysis and Prevention*, 36, 359-366.
- Siu, O.L., & Phillips, D.R. (2005). Study of stress among staff in MTRCL. Commissioned by MTR Corporation Limited. Unpublished Report, MTRCL.
- Siu, O. L., Spector, P. E., Cooper, C. L., & Lu, C. Q. (2005). Work stress, self-efficacy,

Chinese work values and work well-being in Hong Kong. *International Journal of Stress Management*, 12, 274-288.

Spector, P. E. (1991). *Summated rating scale construction: An introduction (Vol. 82)*. Newbury Park, CA: Sage.

Spector, P. E., Cooper, C. L., Sanchez, J. I., O'Driscoll, M., Sparks, K., Bernin, P., Dewe, P., Lu, L., Miller, K., Renault de Moraes, L., Pagon, M., Pitariu, H., Poelmans, S., Radhakrishnan, P., Russinova, V., Salamatov, V., Salgado, J., Shanfa, Y., Shima, S., Siu, O. L., Stora, J. B., Teichmann, M., Theorell, T., Vlerick, P., Westman, M., Widerszal-Bazyl, M., & Wong, P. (2002). A 24-nation/territory study of work locus of control in relation to well-being at work: How generalizable are Western work findings? *Academy of Management Journal*, 45, 453-466.

Sutcliffe, K.M., & Vogus, T. (2003). Organizing for resilience. In K.S. Cameron, J.E. Dutton, & R.E. Quinn (Eds.), *Positive organizational scholarship*, pp.94-110. San Francisco: Berrett-Koehler.

Tisak, J., & Meredith, W. (1990). Longitudinal factor analysis. *Statistical methods in longitudinal research*, 1, 125-149.

Wagnild, G., & Young, H. (1993). Development and psychometric evaluation of the resiliency scale. *Journal of Nursing Measurement*, 1, 165-178.

Yang, Y., Koh, D., Ng, V., Lee, C. Y., Dong, F., Goh, S. H., Anantharaman, V., &

Chia, S. E. (2002). Self perceived work related stress and the relation with

salivary IgA and lysozyme among emergency. *Occupational and*

Environmental Medicine, 59, 836-841.

Appendix I

Resiliency items in English and Chinese:

1. I feel capable of overcoming my present or any future difficulties and problems I might face such as resolving dilemmas or making difficult decisions. (我有信心克服目前或將來的困難，並能解決可能面對的困境或難題。)
2. I have high capacity for facing adversity. (我面對逆境的能力很高。)
3. When there is a great deal of pressure being placed on me, I remain calm. (面臨巨大的壓力時，我仍能保持冷靜。)
4. During stressful circumstances, I never experience anxiety. (身處在充滿壓力的環境中時，我從未感到焦慮。)
5. When I have made a mistake during a stressful situation, I continue to like myself. (我在壓力下犯錯時，我還是喜歡自己。)
6. When I need to stand up for myself, I can do it easily. (即使在困難的環境下，我仍能積極面對。)
7. In really difficult situations, I feel able to respond in positive ways. (在壓力下放鬆自己時，我能體會到寧靜，而沒有擔憂。)
8. I experience peacefulness -- free of thoughts and worries, when I need to relax during stressful times. (即使身處恐怖的環境，我仍能保持冷靜。)
9. I remain calm, even when I am in a frightening situation. (即使我受到挫折，我也能很快恢復過來。)