LONG-TERM LIFE RECOVERY PROCESSES OF THE SURVIVORS OF THE 1995 KOBE EARTHQUAKE: CAUSAL MODELING ANALYSIS OF THE HYOGO PREFECTURE LIFE RECOVERY PANEL SURVEY DATA

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SUMMARY

The present study aimed to examine models of life recovery using the 2003 panel survey data of the Hanshin-Awaji area (N=1203). Based on reviews of previous studies in Japan and US, the current paper constructed and compared several different models of life recovery. Structural Equation Modeling with latent variables was applied to the data. A final model provided causal chains of recovery promoting factors, recovery process variables such as event impact and evaluation, and recovery outcome. Research and practice implications were discussed.

INTRODUCTION

Background of the study

In January 2002 at the second workshop for Comparative Study for Urban Earthquake Disaster Mitigation, Tatsuki and Hayashi (2002) presented their study results on the seven critical element model of life recovery using the 2001 life recovery panel survey data collected from the 1995 Kobe earthquake survivors. The seven elements included housing, social ties, townscape, physical/mental health, preparedness, economic/financial situation, and relation to government. Seven respective indicators were prepared and entered into a GLM equation along with house/economic damages, demography and their interaction terms. This model accounted for 59.3% of the total variance in the life recovery scales. The presentation stimulated several questions which resulted in a realization that the study focused linearly on the outcome of life recovery (i.e., a sense of readjustment and that of life satisfaction) and did not pay enough attention to the recovery process per se. This discussion directed the authors to a new project to construct a model of psychosocial recovery processes and to include them into an integrated framework of life recovery from the 1995 Kobe earthquake.

Preceding studies on the recovery process in Japan and the US

Based on ethnographic interviews (cf., Shigekawa & Hayashi, 1997) with Kobe earthquake victims in Nishinomiya city, Aono, Tanaka, Hayashi, Shigekawa and Miyano (1998) found three distinctive time phases in the victims' disaster response behaviors. This finding provided the basis for the following quantitative analyses that incorporated the suggested "normalcy-to-disaster-to-recovery" pattern model utilizing macro level time-series statistics such as regional power consumption (Takashima & Hayashi, 1999) and Kobe city monthly reports on household and socio-economic activity statistics (Karatani, Hayashi & Kawata, 2000).

Webb, Tierney and Dahlhamer (2000) summarized results from four cross-sectional post-event large sample surveys on short- and long-term business recovery after major disasters such as the Loma Prieta earthquake in 1989, Hurricane Andrew in 1992, Midwest floods in 1993, and the Northridge Earthquake in 1994. They observed differential impacts upon business recovery due to disaster severity, business size, the degree of operational problems such as disruptions in supply and employee-related problems, and damage to the surrounding areas that provide the business customer base.

Based on numerous longitudinal/ethnographic interviews with disaster-hit small business owners and NGO leaders, Alesch (2001) pointed out the five most critical variables for long term recovery: a) the disaster's impact on the organization's clientele; b) the availability of convenient substitute goods or services; c) pre-disaster major trends in the organization's industry, and the individual organization's position in relation to those trends; d) the extent of financial resources lost by the organization; and e) the owner/operator's ability to adapt to the new business environment. These points seem to correspond closely with those reported by Webb et al. (2000). Alesch (2001) also noted common narratives being repeatedly told to interviewers across different disaster sites. Those included misplaced confidence, an illusion of security, a feeling of helplessness to change the outcome, a continuing nightmare, self-imposed limits on recovery efforts, imprudent use of financial resources, failure to discern changes in customer base, an assumption that circumstances will revert to normal, special impact on retirement age people, and a lack of short term help. Those common narratives seemed to reflect the victims' view of reality and the outside world, which in return might have had a strong influence upon what they did or did not do.

Although the above mentioned studies seem to reflect the current state of art on the study of long term recovery in Japan and the US, they do not seem to have fully responded to and/or solved some of the research issues raised at the 1996 Boulder workshop session titled "What is known and trends for improving recovery and reconstruction following disasters," in which Joanne Nigg, Trish Bolton, Claire Rubin, and Phil Berke participated as panelists. Dennis Wenger who moderated the session summarized some of the discussion points as follows: a) there exists a "need to shift the conceptualization of recovery from linear and outcome based to seeing it as an ongoing and long-term process"; b) antecedent recovery

studies tend to be "overly descriptive, fragmented, and short-term oriented"; c) not much attention has been paid to link a disaster response phase to a recovery phase; and d) more research is needed in order to understand the long-term effects of disaster recovery (Wenger, Rubin, Nigg, Berke & Bolton, 1996).

The 1996 Boulder workshop session participants agreed that an attempt should be made to overcome "overly descriptive, fragmented, and short- term oriented" studies by incorporating a large systematically sampled surveys.   The following studies (e.g., Webb, Tierney & Dahlhamer, 2000; Tatsuki & Hayashi, 2002), are cross-sectional, linear and outcome-based at best, and thus do not fully pay attention to ongoing recovery processes. In comparison, long-term, longitudinal, and ethnographic studies on disaster victims provided rich insights about recurring themes (e.g., Shigekawa & Hayashi, 1997; Aono, Tanaka, Hayashi, Shigekawa & Miyano, 1998; Alesch, 2001). Their insights have not yet been fully verified by either long-term large sample surveys or by those based on individual as opposed to aggregate data sources.

Two models of the life recovery process
The above brief comparisons of recovery studies in Japan and US consensually revealed a need to understand recovery as long-term, ongoing, individual processes by incorporating a systematic and longitudinal methodology.   Two sources of general literature were sought in order to build a working conceptual model of long-term, ongoing and individual recovery, which was defined in the current study as obtaining a sense of new normalcy or stable reality of everyday life that may not necessarily be the same as before.   One is a sociological view of how the reality of everyday life is constructed in transactions in a social context (Berger & Luckman, 1966). Based on this model a "normalcy-to-disaster-to-recovery" curve model was constructed (See Figure 1). Three types were identified by this model, i.e., return to normalcy, struggle for meaning and retreat.
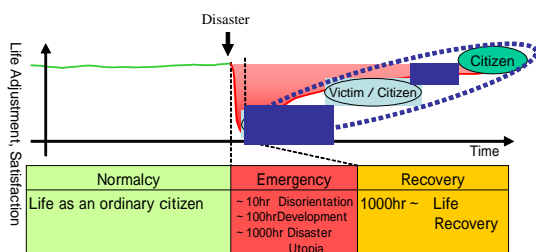

Figure 1. the "normalcy-to- disaster-to-recovery" model of life recovery
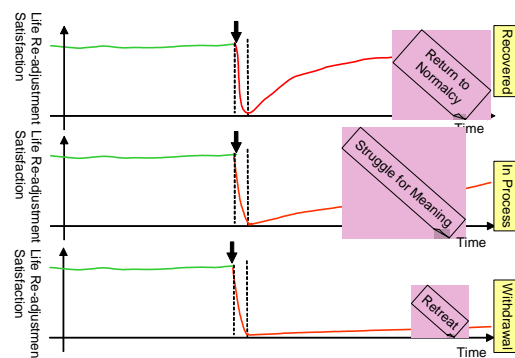

Figure 2 Three Recovery Curve Typologies

The other rich source of previous literature on human recovery was found in writings by psychologists and psychiatrists who had worked with holocaust survivors, hibakusha,
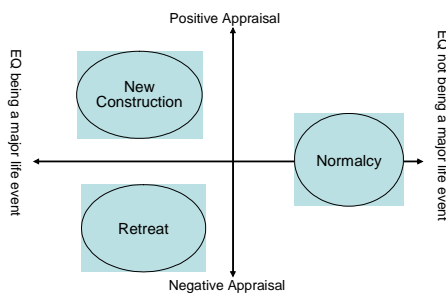
Figure 3 Life Change Appraisal Model

Vietnam veterans, and dying patients (Frankl, 1959, Lifton, 1968, 1976; Kubler-Ross, 1969). Their writings emphasize that victims never regain the same normalcy as before and that what matters the most is how one re-appraises the past event and makes sense out of it in the "here and now". Two axes were postulated in this model; one was whether the earthquake was still conceived to be a major life event or not (horizontal axis) and the other was whether life change after the earthquake was felt to be positive or negative (vertical axis). These two axes created three typologies of life recovery: normalcy, new construction, and retreat.

Purpose of the study
This paper focuses on three types of variables, namely independent variables that precipitate life recovery process as well as the recovery outcome, intervening process variables that were influenced by independent variables on the one hand and also influence the life recovery outcome on the other, and dependent variables that measure levels of life recovery outcomes. The paper aims to identify a structural equation model that explains life recovery process as well as outcomes among the 1995 Kobe earthquake survivors.

METHOD

Sample
The population of the current study was the 1995 Kobe earthquake survivors who resided in the areas that were hit hardest by the earthquake. This included residents in ten cities in the Kobe-Hanshin area as well as those on Awaji island. Three hundred and thirty study points were randomly selected and ten residents over the age of twenty at each point were also randomly selected. Questionnaires were mailed to them in January, 2003 and 1,203 (or 36.5%) questionnaires were returned by mail.

Instruments
Questionnaire items were divided into four categories, including socio-demographic and damage variables, seven critical life recovery element variables (Tatsuki and Hayashi, 2002), life recovery process variables, and life recovery outcome variables.

Socio-demographic and damage: The following variables were asked in the questionnaire: age, gender, job, family members, types of housing, house damage, household goods damage, lifeline damage, and economic damage. For the final analysis, house damage and household goods damage responses were optimally scaled and their scores were used.

Seven critical life recovery element and recovery outcome variables: The variables used in the current study (see Table 1) were based on the 1995 grass root workshop results (Tamura, Hayashi, Tatsuki, & Kimura, 2001) as well as GLM analysis of the 2001 Kobe life recovery survey study (Tatsuki & Hayashi, 2002).

Table 1. Overview of the seven critical life recovery variables and related variables

Variables/Factors	Description
Housing	Types of Housing, Housing Structure, Housing Satisfaction
Social Ties	Self-Governance and Community Solidarity, Community Participation, Social Trust, Family Cohesion and Adaptability
Townscape	Awareness of Urban Commons, Size of my community
Mind and Body	Physical and Mental Stress Symptom Checklist, General Health Practices Index
Preparedness	Awareness/Preparedness for the next major earthquake, Personal, Community and Public Preparedness and Mitigation, Predicted Damages due to expected Toka and Tonankai EQ
Economic/Financial Situation	Increase/Decrease in Household Income, Expenditure, and Savings
Relation to Government	Paternalistic, Liberal, and Communitarian Views of Government, Willingness to Pay (WTP)
Life Recovery Outcome	Life satisfaction, QOL, Daily Activity level, Future Prospect
Social Desirability	MMPI Lie Scale

Life recovery process model variables: Table 2 illustrates seventeen recovery curve model items and five life change appraisal model items.   These items were designed to capture respondents' life recovery processes as "return to normalcy", "struggle for meaning", "retreat", "sense of life change" and "life change directions".

Table 2 Factor Analysis Results of 17 Recovery Curve and 5 Life Change Appraisal Model

Variables	Items
Return to Normalcy	I feel normal about my daily life.
	I feel that everyday is a repetition of routine things.
	I have a good prospect on my daily life
Struggle for Meaning	12. I feel strongly that living a life has a meaning.
	18. I think that there is a meaning in my life.
	9. I have emotionally grown thanks to EQ experiences.
	20. I have re-appraised people's willingness to help others. .
	7. I started thinking about the mission of my life.
	16.I have a courage that beats my fate.
	4.I have gained some valuable experiences during EQ.

Retreat	14.I don't want to be asked about my EQ experiences.
	19.I don't want to listen to EQ stories
	11.I don't want to recall EQ episodes.
	5.I want to erase EQ experiences from my past.
	13.I have had little emotionally moving experience afther EQ.
	8.I have become indifferent about my fate.
	6. I don't talk about EQ experiences anymore.
Sense of Life Change	I think that I have changed after EQ.
	I think that my life changed after EQ.
	I use EQ as a time boundary when talking about my life.
Life Change Direction	Myself has changed toward a positive direction after EQ.
	My life has changed toward a positive direction after EQ.

RESULTS AND DISCUSSION

Integration of life recovery process models

Table 3 shows factor analysis results of seventeen recovery curve items and five life change appraisal items, indicating five clearly separated factors that correspond with retreat, struggle for meaning, sense of life change, return to normalcy, and life change direction. In order to examine causal relationships between these five factors on one hand and life recovery outcome on the other, several SEM analyses were conducted. The final model is shown in Figure 4. This result indicated that the five process variables were integrated into two second-order factors. Event evaluation was postulated in order to capture retreat, struggle for meaning and positive reappraisal. Also it was found to have a positive influence upon life recovery outcomes. Likewise, Event Impact was constructed to cover

Table 3 Factor Analysis Results of 17 Recovery Curve and 5 Life Change Appraisal Model items (Promax Rotation)

	Retreat	Struggle for Meaning	Sense of Life Change	Return to Normalcy	Life Change Direction	Communality
14.I don't want to be asked about my EQ experiences.	0.842	-0.134	0.026	-0.138	-0.145	0.719
19.I don't want to listen to EQ stories	0.828	-0.177	0.004	-0.116	-0.165	0.691
11.I don't want to recall EQ episodes.	0.806	-0.119	0.114	-0.072	-0.208	0.659
5.I want to erase EQ experiences from my past.	0.716	-0.101	0.208	-0.049	-0.212	0.552
13.I have had little emotionally moving experience afther EQ.	0.669	-0.226	0.130	-0.138	-0.228	0.469
8.I have become indifferent about my fate.	0.577	-0.254	-0.051	0.063	-0.259	0.380
6.I don't talk about EQ experiences anymore.	0.453	-0.186	-0.382	0.019	-0.083	0.385
12. I feel strongly that a living a life has a meaning.	-0.249	0.738	0.043	0.137	0.259	0.567
18. I think that there is a meaning in my life.	-0.200	0.706	0.040	0.060	0.215	0.520
9. I have emotionally grown thanks to EQ experiences.	-0.112	0.658	0.332	0.065	0.331	0.475
20. I have re-appraised people's willingness to help others. .	-0.192	0.620	0.185	0.169	0.295	0.402
7. I started thinking about the mission of my life.	0.013	0.612	0.282	-0.046	0.130	0.434
16.I have a courage that beats my fate.	-0.072	0.600	-0.007	0.071	0.292	0.398
4.I have gained some valuable experiences during EQ.	-0.208	0.412	0.210	0.256	0.096	0.264
I think that I have changed after EQ.	0.080	0.234	0.818	-0.224	0.349	0.740
I think that my life changed after EQ.	0.120	0.194	0.806	-0.301	0.216	0.700
I use EQ as a time boundary when talking about my life.	0.087	0.065	0.718	0.052	-0.082	0.592
I feel normal about my daily life.	-0.124	0.153	-0.140	0.850	0.146	0.730
I feel that everyday is a repetition of routine things.	0.049	-0.009	-0.094	0.749	-0.059	0.593
I have a good prospect on my daily life	-0.166	0.204	-0.138	0.713	0.269	0.562
Myself has changed toward a positive direction after EQ.	-0.251	0.353	0.257	0.106	0.872	0.783
My life has changed toward a positive direction after EQ.	-0.267	0.330	0.049	0.160	0.856	0.766
Eigenvalue after rotation	3.952	3.387	2.443	2.163	2.465	
Variance Accounted For	19.8%	16.9%	12.2%	10.8%	12.3%	N=1203

Event Evaluation has a positive influence upon Life Recovery.

Event Impact has a negative influence upon Life Recovery

Model 6E
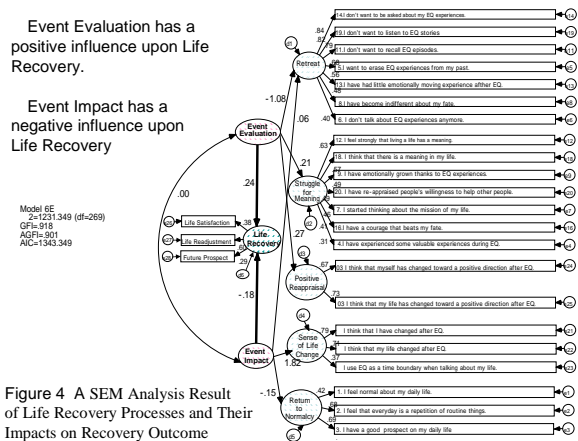χ^2=1231.349 (df=269)
GFI=.918
AGFI=.901
AIC=1343.349

Figure 4 A SEM Analysis Result of Life Recovery Processes and Their Impacts on Recovery Outcome

common characteristics including sense of life change, return to normalcy and retreat and was found to have a negative influence upon life recovery outcomes.

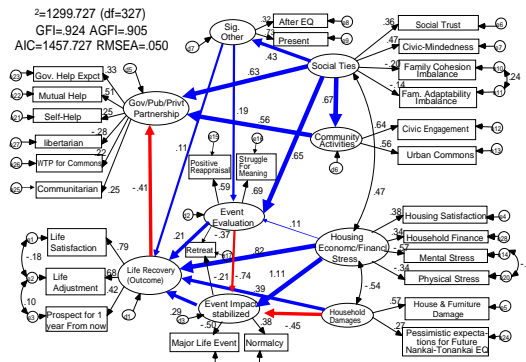## Structural Equation Modeling of life recovery process and outcome

Figure 6 Model of Long-Term Life Recovery Process from the 2003 General Survey Data of the EQ Survivors
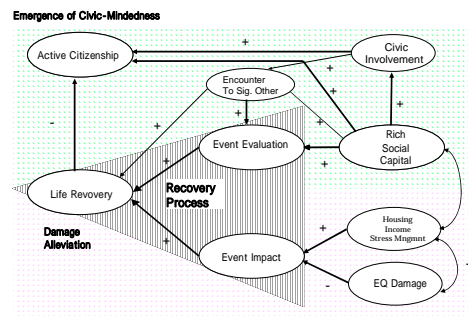

Figure 7 Bird's-Eye View of Life Recovery Process

The current study aimed to develop and test causal models of long term life recovery processes among those who experienced the 1995 Kobe EQ. The first aim of the paper was to connect recovery processes to outcome variables. SEM analysis using recovery process items and outcome variables revealed that life recovery processes consist of two different aspects: event impact and event evaluation. Event impact consists of sense of life change, return to normalcy and retreat. Event evaluation was measured by positive re-appraisal, struggle for meaning and retreat. The first SEM analysis confirmed two paths to recovery outcome. One path was through event impact alleviation where housing, income and stress management played a major role to counteract earthquake damage. The other path was through event evaluation where rich social relationships in families and in community life facilitated positively re-appraising earthquake experiences. Rich social relationships were also found to provide opportunities to encounter "significant others" who enabled survivors to positively reframe their experiences.
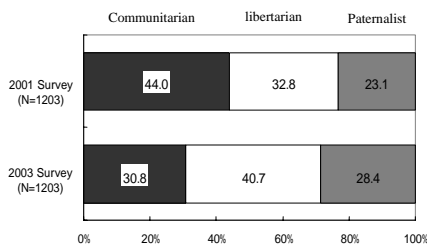

Figure 8 Changes in Views of Government from the 2001 to 2003 survey

An increase in communitarian active citizenship was found to be a by-product of the recovery process. It was found that rich family and community life relationships facilitated civic engagement opportunities. This resulted in a sense of civic-minded (communitarian) active citizenship as well as increased awareness/activities for personal, community and public preparedness as well as mitigation efforts.

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Finally, life recovery outcomes showed a negative impact upon the cultivation of active citizenship.   Figure 8 shows a proportion of communitarian decreased from 44% in the 2001 survey to 30.8 % in 2003.   SEM analysis explained that as life recovers, people feel less inclined to show communitarian attitudes and pay less attention to preparedness and mitigation efforts in personal, community and public arenas. In order to better prepare for future mega events, it is suggested that general civic-engagement promoting policies/ programs as opposed to life recovery promoting policies/programs are needed.

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