A Test of a Causal Model of Children's Development with/without Resilience as Mediator: A Comparison Between Children Affected/Not Affected By The 2004 Tsunami.

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***Abstract**: The purposes of this study were to validate two competing developmental models of the children exposed to the 2004 Tsunami disaster with and without resilience as a mediator. The sample consisted of 603 grade 4-6 students who were studying in the elementary schools in Phang-nga and affected by the 2004 Tsunami disaster. The developed model composed of six latent variables: tsunami experience, resilience, protective factors, child development, physical development and emotional development. Data, collected by questionnaires, were analyzed using SEM, the results of which indicated that both causal models were fitted to the empirical data. The two models accounted for the same amount, 85% of the variance in child development. Comparing the relative chi-squares revealed that the causal model with resilience as a mediator was more valid than the one without a mediator. The 2004 tsunami experience, as well as protective factors, had an impact on resilience which affected child development. Moreover, the community level indicator, especially social support, had a stronger effect on resilience as compared to the other indicators of protective factors.*

Keywords: Tsunami, Child development, Resilience, Mediator, Elementary student, Protective factor

Introduction

Nowadays, natural disasters tend to become more frequent and more violent. A natural hazard is an extreme natural phenomenon that threatens human lives causing psychological and physical impacts on people, as well as damage to property (Masten & Obradovic, 2008).

The case of natural disaster that the researchers used in this study is the tsunami on December 26, 2004. The incident caused tremendous impacts on the disaster victims in all aspects – particularly on those who were in their childhood. This demographic was considered to be at risk of adaptation and developmental problems after the disaster (Wessells, 2005). Some research found that children who were exposed to the tsunami disaster would be psychologically affected, resulting in difficulties in normal development (Sirivunnabood & Tuicomepee, 2010; Rithakananon & Jarukasemthawee, 2010).

By reviewing a number of recent research studies on the impact of this tsunami on children and youth in Thailand, the researchers found that the study by Sirivunnabood and Tuicomepee (2010) on the impact of the tsunami on children and youth development five years after the event showed that the tsunami had long term effects on child and youth development. The results also showed that a number of youngsters who experienced the tsunami disaster had behavioral problems. Rithakananon and Jarukasemthawee (2010) also found that the cognitive development of the ones who were exposed to the disaster was lower than the ones who were not exposed.

All of the above findings confirmed that the impact of the tsunami on the children development remained – even though five years had passed by, despite of all the help in providing facilities and materials shortly after the event, the disaster victims were still in need of psychological help (Sirivunnabood & Tuicomepee, 2010).

However, some researchers found that a group of children were able to adapt and to develop normally despite the fact that their lives had been exposed to negative situations. Researchers called what helped these children to develop "resilience" (Masten, Best, & Garmezy, 1990). As far as the current research on resilience are concerned, Luthar, Cichetti and Becker (2000) suggested that studies on children's resilience are still rare. The majority of researchers usually focused on post traumatic stress disorder (PTSD), because they only studied the children with this specific symptom (Luthar et al., 2000). Thus, the results only identified the risk factors, without recognising any protective factors of those who were not affected and had been able to adapt after such a traumatic incident. For that reason, this study of resilience sought to identify various protective factors that helped children to overcome adversity.

The researchers studied the concept of resilience based on Garmezy, Masten and Tellegen (1984), who stated that resilience consists of two key factors: the individual characteristics (internal factors) and the relationship within family and with the others (external factors). Both of these key factors help children to adapt and to develop when having to face adversity in their lives. By studying the protective factors of resilience in children, we found that many studies categorised protective factors into three factors, including individual factors, family factors, and social support factors (Werner, 1998; Garmezy, Masten & Tellegen, 1984).

In this study, resilience consisted of four indicators: perception of self-competence, tolerance of negative feelings, accepting negative life changes, and having a stable relationship (Garmezy, Masten, & Tellegen , 1984). Protective factors are categorized into three levels including individual level (sex) (Werner & Smith, 1992; Bonanno, Galea, Bucciarelli, & Vlahov, 2007; Campbell-Sills, Forde, & Stein, 2009), family level, and community level (Werner & Smith, 1998; Garmezy, Masten, & Tellegen, 1984). Family level includes attachment styles (Greenbaum & Auerbach, 1992; Egeland, Carlson, & Sroufe, 1993), relationship within family (Milgram & Palti, 1993; Werner, 1993; Werner & Smith, 1992), and community level is social support (King, King, Fairbank, Keane, & Adams, 1998; Grotberg, 1997; Masten, Best and Gamezy, 1990).

The research project by Sirivunnabood et al. (2010) indicated that tsunami experience had a direct effect on child development. Significantly, this result was elaborated by Sukprasert (2011), who concluded that resilience is a variable that mediates the effect of the tsunami experience on child development. In this study, the model has been expanded to include protective factors as the antecedents of resilience (Garmezy, Masten & Tellegen, 1984; Werner and Smith, 1998), and resilience as a causal factor of child development (U.S. Department of Health and Human Services, 2000; Brody & Flor, 1998). In other words, resilience has been perceived as a mediator between the tsunami experience and child development, and between protective factors and child development. However, since the result from Sirivunnabood et al. (2010) model indicated an effect of the tsunami experience on child development without resilience as a mediator, whereas Sukprasert (2011) and U.S. Department of Health and Human Services (2000), Brody and Flor (1998) confirmed the mediating effect via resilience, therefore, in this study, the competing models with and without resilience as a mediator were the main focus, as shown in Figures 1 and 2. The two research hypotheses were: 1) the model with resilience as mediator (model 1) is better than the model without resilience as mediator (model 2) in terms of goodness of fit statistic; 2) resilience is a significance mediator between tsunami experience and child development, and between protective factors and child development.

The purposes of this study were to validate the model of child development in children who were exposed to the 2004 Tsunami disaster with and without resilience as a mediator (model 1 and model 2), to examine resilience as mediator between tsunami experience and child development, and also between protective factors and child development.

Methodology

Sample: The researcher selected the sample by using a convenience sampling technique. The sample consists of 603 grade 4 – 6 students from six elementary schools located in Phang Nga Province, who experienced the tsunami on December 26, 2004.

Material:

The research material was a questionnaire, consisting of six scales measuring resilience, tsunami experience, family relationships, attachment styles, social support and emotional intelligence. It had been validated by four experts and tried out on a group of grade 4-6 student with similar characteristics to the research sample. The six parts of the questionnaire measuring the aforementioned six variables consisted of 29, 12, 26, 26, 20, and 16 items of a 5-point Likert rating scale. The constructs for each of the six variables and the original instrument are as follows: 1) resilience consisted of 4 indicators (perception of self-competence, tolerance of negative feelings, accepting negative life changes, and having stable relationship), based on Connor and Davidson (2003), and Sun and Stewart (2007), with a reliability of .90; 2) tsunami experience scale based on Objective Tsunami Experience Index: OTEI (Tuicomepee & Romano, 2006), with a reliability of .70; 3) family relationship scale based on a construct for measuring the relationships within the family after disaster by Sirivunnabood et al. (2010) with reliability of .88; 4) attachment styles questionnaire, based on the theory of attachment by Ainsworth (1989), with a reliability of .83; 5) social support questionnaire, based on the concept of measuring social support by Suphamongkhon (2005), with a reliability of .91; and 6) emotional intelligence questionnaire, based on Chetdatanaporn (2009), with a reliability of .84.

Method: The sample size estimation for this study was 600 and it was 1,000 to compensate for non-responders. Data were collected by the first author between November 2011 to December 2011 with a response rate of 60%, yielding the final sample of 603 students. Data were analyzed using descriptive statistics, correlation analysis and the analysis of structural equation model (SEM).

Results

To test the hypothesized pathway, analysis was performed with LISREL 8.72. The measurement model was computed and latent constructs with several indicators were used. For tsunami, the indicator is level of tsunami experience; for protective factors, the indicators are gender, attachment style, family relationships and social support; for resilience, the indicators are perception of self-competence, tolerance of negative feelings, accepting negative life changes and having a stable relationship; and for child development, indicators are second order latent variables which are physical development and emotional development. In the analysis, the model specified tsunami and protective factors as exogenous variables. Resilience and child development were specified as endogenous variables which have prior variables predicted. An initial model and competitive model was estimated with maximum-likelihood method for estimating the path coefficients. Modification indices were used for modifying the model to be a good fit to the data.

The result of the two competing models' validation indicated that both model 1 and 2 fitted the empirical data, with chi-square = 56.46, 62.90; df = 41, 42; p = .054, .019 and RMSEA = .03, .03, respectively. The p-value in the first model shown accepts the null-hypothesis which means the hypothesized model that was developed from the literature in this study was consistent and fitted the empirical data. A further analysis yielding relative chi-square, as shown in Table 1, revealed that model 1 (1.38) was a better fit, as compared to model 2 (1.50). It implied that model 1 was more valid with resilience as mediator, the result of which confirms the first research hypothesis. The estimation of the direct effect, indirect effect, and total effect of model 1, as shown in Table 2, gave strong support for the second research hypothesis. Based on the direct effect of tsunami experience on resilience (.12) and direct effect of resilience on child development (-.92), with a non-significant direct effect from the tsunami experience on child development, it can be concluded that resilience is a perfect mediator between the tsunami experience and child development. Similarly, the analysis result also revealed that resilience is a perfect mediator between protective factors and child development.

Table 1. The result of comparison between hypothesized model and competitive model

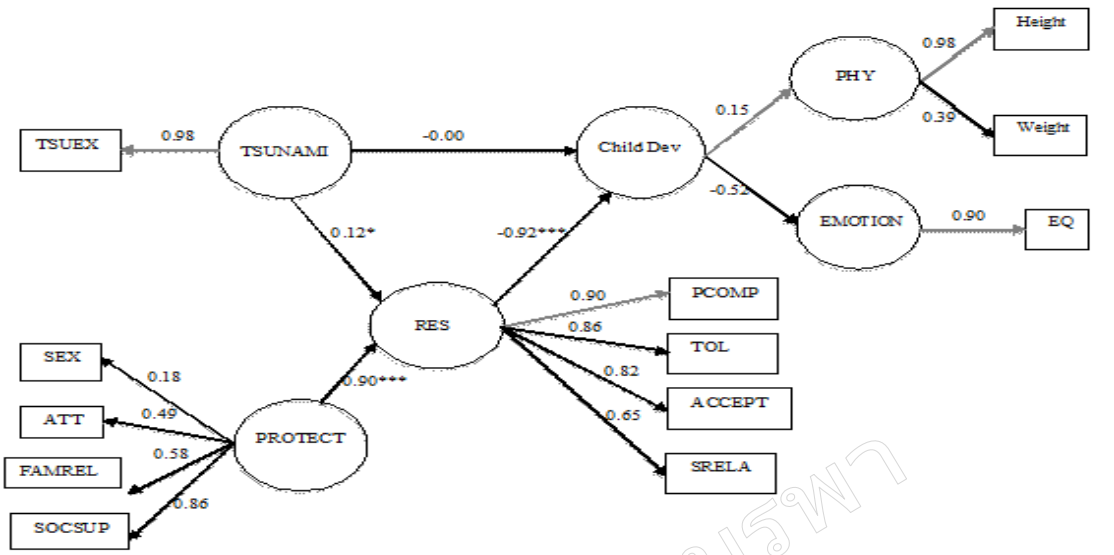
Model	χ^2	*df*	χ^2/df	*p*	GFI
1. Causal model of child development with resilience as mediator	56.46	41	1.38	0.05	0.98
2. Causal model of child development without resilience as mediator	62.90	42	1.50	0.02	0.98

Note. χ2= Chi-square, χ2/df = relative chi-square, GFI = Goodness of fit index.

Table 2. Direct effect, Indirect effect, Total effect and a test of causal model of child development with resilience as mediator (N = 603)

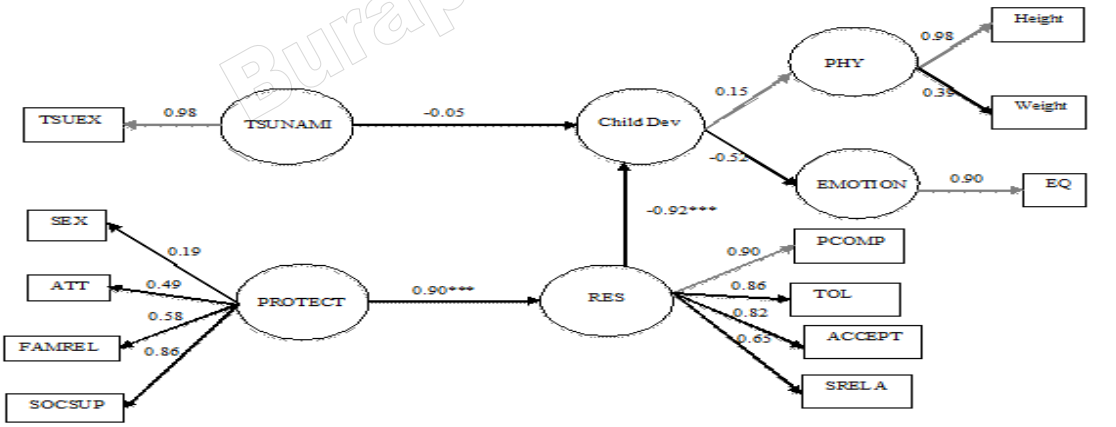
IV	statistic	DV					
		Resilience			Child Development		
		DE	IE	TE	DE	IE	TE
TSUEX	*b*	0.05*	-	0.05*	-0.00	-0.02	-0.02
	SE	0.02	-	0.02	0.01	0.01	0.02
	t	2.47	-	2.47	-0.05	-1.99	-1.35
	SC	**0.12***	-	**0.12***	**-0.00**	**-0.11**	**-0.12**
PRO	*b*	0.89***	-	0.895***	-	-0.35***	-0.35***
	SE	0.04	-	0.042	-	0.10	0.10
	t	21.54	-	21.544	-	-3.38	-3.37
	SC	**0.89*****	-	**0.895*****	**-**	**-0.83**	**-0.83**
RES	*b*	-	-	-	-0.396***	-	-0.39***
	SE	-	-	-	0.116	-	0.12
	t	-	-	-	-3.403	-	-3.40
	SC	-	-	-	**-0.923*****	-	**-0.92*****
R^2		.828			.854		
Chi-square = 56.46, *df* = 41 (*p* > .05), GFI = .98, AGFI = .97, RMR = .02, RMSEA = .03							

Note. IV= Independence variables, DV= Dependence variables, TSUEX = Tsunami experience, PRO = Protective factor, RES = Resilience DE= Direct effect, IE= Indirect effect, TE= Total effect, b= coefficient , SE= standard error, t= t-value, SC= completely standardized solution (*p<.05, ***p < .001, two-tailed test) SC= completely standardized solution (*p<.05, ***p < .001, two-tailed test)



Chi-square= 56.46, df= 41, p= .05; root mean square error of approximation (RMSEA) = .03; goodness of fit (GFI) = .98; adjusted goodness of fit index (AGFI)= .97; Normed fit index (NFI) = .99 (*p<.05, ***p<.001)

Figure 1. Structural equation model of child development with resilience as a mediator of children who affected by the 2004 Tsunami. Values are standardized coefficients. TSUEX = Tsunami experience, ATT = Attachment Style, FAMRELA = Family relationship, SOCSUP = Social support, PROTECT = Protective factor, RES = Resilience, PCOMP = Perception of self-competence, TOL = Tolerance with negative feeling, ACCEPT = Accepting negative life changes, SRELA = Having stable relationship, CHILD DEV = Children development, PHY = Physical development, EMOTION = Emotional development, EQ = Emotion Quotient.



Chi-square= 62.90, df= 42, p= .019; root mean square error of approximation (RMSEA) = .03; goodness of fit (GFI) = .98; adjusted goodness of fit index (AGFI)= .96; Normed fit index (NFI) = .98 (*p<.05, ***p<.001)

Figure 2 Structural equation model of competitive model (model of child development without resilience as a mediator of children who affected by the 2004 Tsunami. Values are standardized coefficients.

Discussion

The major findings indicated that the casual model of the development of children who were exposed to the 2004 tsunami disaster with resilience as mediator were fit to the empirical data. The result supported that being exposed to the tsunami disaster only affect child development indirectly, through resilience as a mediator, as well as protective factor affect child development indirectly through resilience, So, it can be said that although the tsunami disaster experience had an impact on child development, such impact decreased when resilience began to take place as a mediator. The resilience acted as a mediator that reduced the impact of risk factors on child development. This allowed children to be less affected by the impact. The finding of this research was consistent with many studies that suggested that resilience helped children to adapt when exposing to negative life circumstances (Werner & Smith, 1982; Grotberg, 1997; Masten, Hubbard, Gest, Tellegen, Garmezy, & Ramirez, 1999). Werner and Smith (1992) explained that resilience allowed people to be able to create balance between themselves and their social environment. The balance helped to reduce the impact of the risk factors that the individual experienced. With the findings on the impact of protective factors related to resilience, the researcher found that all the protective factors studied in this research (i.e., gender, relationship model, relationship within the family, and social support) affected resilience.

The research results raised two interesting issues:

The first issue, concerning the indirect effect of tsunami experience on child development via resilience, can be explained as follows: a) the existence of only an indirect effect may be due to the long duration of six years. The effect of the tsunami incident may have had both direct and indirect effects on children's development upon the occurrence, but the six years duration gradually reduced the direct effects and strengthened more indirect effect via resilience. This explanation is consistent with the study of PTSD in children after the tsunami disaster in Thailand by Piyasil, Ketuman, Plubrukarn, Jotipanut, Tanprasert, Aowjinda and Thaeeromanophap (2007) Their research investigated students in Phang-nga province who were affected by the 2004 tsunami. The results showed that the prevalence of PSTD in the affected students were decreasing gradually at 57.3, 46.1, 31.6, 10.4, and 7.6% at 6 weeks, 6 months, 1 year, 1 1/2 years, and 2 years, respectively. This indicated that the symptoms of PSTD decreased as the length of time increased. b) Another explanation is that, although the tsunami disaster experience had an impact on child development, resilience was buffering the impact of the tsunami experience. Therefore, resilience is a mediator variable that reduced the impact of the tsunami experience on child development. This allowed children to be less affected by the impact and the result was consistent with many studies that suggested resilience helped children to adapt well when they were exposed to adversity. (Werner & Smith, 1982; Grotberg, 1997; Masten, Hubbard, Gest, Tellegen, Garmezy, & Ramirez, 1999). What remains to be further studied is the degree of increment of the indirect effect of the tsunami disaster on child development.

The second issue is that protective factors have affected resilience and resilience is a mediator between protective factors and child development. We found that all the protective factors studied in this research affected resilience; this was consistent with many studies (Bonanno et al., 2007; Campbell-Sills et al., 2009; Luthar & Zigler, 1991; Milgram & Palti, 1993; Greenbaum & Auerbach, 1992; Egeland et al., 1993; Werner, 1993; Werner & Smith, 1992; King et al., 1998). The result also revealed that protective factors have an indirect effect on child development through resilience as a mediator and all protective factors affected resilience. We could not find any empirical study in accord with the above result and it is most likely that this research finding has contributed significantly to the role of resilience as a mediator between protective factors and child development. This contribution is more like an integration between the research result by Garmezy, Masten, and Tellegen (1984) and Werner and Smith (1998), indicating a direct effect of protective factors on resilience and the research result by the U.S. Department of Health and Human Services (2000) and Brody and Flor (1998), indicating a direct effect of resilience on child development. This research finding could be explained in a similar way as for the first issue, the statement of which requires further empirical investigation.

The policy implication to be drawn from this study is mainly the significant role of resilience as a mediator between the tsunami experience and child development, together with protective factors

as an exogenous variable and child development as endogenous variable. Since tsunami experience is just one kind of risk factor that students, as well as children have to face, initiating a resilience training program will be extremely valuable to increase or promote child development. Yates, Egeland, and Sroufe (2003) pointed out that the process of development during the early years of life begins with the family which is an important fundamental process of developing resilience. Therefore, it is very important to encourage protective factors at early age, especially at the family level. Moreover the protective factor effect on child development will be strengthened due to the increased resilience level of the students, the result of which increases child development as well. Unfortunately, there are only a few experimental research studies investigating the effectiveness of resilience training programs and little research studying protective factors.

The limitation in this study was the low response rates to the questionnaires due to the excessive number of items in the 6-scales of the questionnaires, so that future studies should provide more than one session to answer the complete questionnaires. In addition, there should be further investigation of the following research issues: 1) the increasing indirect effect of the tsunami experience and impact of these factors on child development via resilience across time; 2) the decreasing direct effect of protective factors on child development across time; and 3) a study of the effectiveness of a resilience training project on risk factors (e.g., tsunami experience) and protective factors on child development.

Conclusion

This research studied resilience within the context of children who were exposed to natural disaster by using the tsunami disaster in December 2004 as the case study. The results showed the importance of resilience on development of children who were exposed to an unexpected event of natural disaster and resilience involved multiple protective factors in children's life. The research found that those protective factors could be enhanced – especially protective factors at the family level whereby secure attachment between children and the caregiver can be developed in the early years of life. A good relationship within the family is a protective factor at the family level which was indicated to be a significant foundation for interaction with others outside the family and positive interactions with others allowed children to gain enough social support to be able to face problems efficiently. The result indicated that social support has a strong effect on resilience. The process of development during the early years of life was an important fundamental process of developing resilience (Yates et al., 2003). Having protective factors early in life would virtually be the immunity for children when facing adversity and natural disaster that might occur in the future.

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