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# An Exploratory Factor Analysis And Reliability Analysis Of The Kiddie Earthquake Preparedness Scale

## Introduction

So far this century there have been more than 1,100 fatal earthquake causing a total loss of life exceeding 1.53 million people. Reducing the loss of life is the primary protection strategies, and yet the processes that contribute to death tolls and the best strategies for for reducing injury levels are not well understood (Coburn, Spence & Promonis, 1992). When a strong earthquake hits an urban area, structures collapse, people are injured or killed, infrastructure is disrupted, and business interruption begins. The immediate impacts caused by an earthquake can be devastating to a community, challenging it to launch rescue efforts, restore essential services, and initiate the process of recovery (National Research Council, 2011). This disastrous earthy activity may alarm any national and local authority to prompt the Disaster/Emergency Management Committee to regroup, mobilize and deploy Rescue/Medical Team. The Philippines is susceptible to various types of natural hazards due to its geographical location and physical environment; being situated in the "Pacific Ring of Fire", between two Tectonic plates (Eurasian and Pacific), an area encircling the Pacific Ocean where frequent earthquakes and volcanic activity result from the movements of said tectonic plates. In fact, the country experiences an average of 20 earthquakes per day (most are too weak to be felt).

There are also about 300 volcanoes, of which 22 are active and have been recorded in history to have erupted; while 5 are considered to be the most active namely: Taal, Mayon, Bulusan, Kanlaon and Hibok-Hibok. Also, being located along the typhoon belt/superhighway in the Pacific makes it vulnerable to extreme weather events (Orallo, 2011). It was noted by our national disaster council that the country will expect the worst "Big One" earthquake in history any given time. Analyzing past historically recorded earthquakes and instrumentally recorded earthquakes, a total 18 earthquakes were selected as scenario earthquakes, which have potential damaging effect to Earthquake Impact Reduction Study for Metropolitan Manila in the Republic of the Philippines -2- Metropolitan Manila; also earthquake ground motion, liquefaction potential, slope stability and tsunami height are estimated. Finally three models (namely, model 08 (West Valley Faults M. 7. 2), Model 13 (Manila Trench M. 7. 9), Model 18 (1863 Manila Bay M. 6. 5)), were selected for detail damage analysis because these scenario earthquakes show typical and severe damages to Metropolitan Manila. Model 08, as the worst case, 170,000 residential houses will collapse, 340,000 residential houses will be partly damaged, 34,000 persons will die, 114,000 persons will be injured. Fire will breakout and burnt approximately 1,710 hectares and totally 18,000 additional persons will be killed by this secondary disaster. Moreover, infrastructures and lifelines will also be heavily damaged (JICA, MMDA & Philvolcs, 2004). Japan is also very vulnerable to natural disasters specifically earthquake due to its geographical vicinity in the Pacific "Ring of Fire", a chain of collective volcanoes where seismic activity is highly active. But the Japan tend to create a more dynamic system of Emergency Management and trained-well their citizens as well as their children on Preparedness. Children's participation is influenced by their evolving cognitive development and socio-cultural expectations and opportunities (Hart, 1997; Wong, Zimmerman, & Parker, 2010)

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Disaster preparedness should include efforts to educate children about disasters and available

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resources (Peek, 2008) and to provide developmentally appropriate information about potential hazards and risks, how children can prepare for events, what to do in the face of an event, and what they might need from adults (Mitchell et al. , 2008). Teaching children about natural hazards promotes their involvement in preparedness, response, and recovery (Morris & Edwards, 2008). Children are more vulnerable than adults in emergency events because they are emotionally and physically delicate. Thus, they must be urgently protected and defended by governments, parents and regulations. This task is our priority for the health of the next generations. Approximately 1. 2 billion students are enrolled in primary and secondary schools; of these, 875 million school children live in high seismic risk zones all over the world (Hancilar et al. 2014). Considering all the information stated on the introduction, the researchers seek forth to create a brief, concise, reliable and a valid instrument which will measure using a scale on children or kids on Earthquake Preparedness and that it can aid for their protection and decrease possible negative incidence.

## Literature Review

Catastrophes exists on a conceptual scale, ranging from events to emergencies that can bring about the annihilation of human. Vulnerability is the critical variable (or set of variables) in a disaster or catastrophe. Accordingly, vulnerability refers to the proneness of people to disasters based on factors such as their geographic location, exposed property and level of income. (Preparedness and Response for Catastrophic Disasters Edited by Rick Bissell, Steven Jensen, Shirley Feldman-Jensen) The ability of individuals, organizations and communities to deal with disaster also has a close relation to vulnerability (McEntire 2007, 2). Whereas, the key dependent factor in many studies in line with people's response to calamities such as earthquakes is preparedness. Several studies were used to assess earthquake preparedness. And, these studies have produced important insights into people's response and preparation to natural disasters such as earthquakes. Unfortunately, some of these studies have reported approximations of other significant psychometric data for their scales or reliability (Lindell and Perry, 2000). By showing how the occurrence of different types of preparedness a calibration of the ERS was obtained and activities changes through the range of replies on the scale. Apart from the benefits of disaster response indices, there have been numerous issues pertinent to the theoretical aspects in developing disaster response index (Covington and Simpson 2006)

However, emergency management theory doesn't seem to provide a solid foundation to guide the development of disaster preparedness indices, emergency management theory has three fundamental problems for developing disaster response indices as follows: (1) we are really interested in disasters, not emergencies; (2) the focus on emergency makes the field reactive and limits its applicability to first responders; (3) emergency management may imply that we have total control in our ability to deal with the adverse occurrences we call disasters. Hence, emergency management is both a misnomer and an oxymoron. Hence, emergency management is both a misnomer and an oxymoron. But a suitable replacement has not been found, and one may never be accepted due to the increasing professional recognition of the name emergency management (Covington and Simpson 2006). If these variables change prior to observation of the behavior, they can no longer permit accurate prediction. Whereas, this research focuses upon the fact that disasters such as earthquakes can destroy the physical living conditions of households as a basis for creating earthquake preparedness measure.

## Theoretical Background

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A number of theoretical frameworks can be used in attempts to engaged with behaviors that reduce the threat of natural disasters this includes the following: Person Relative to Event Theory (PrE), Protection Motivation Theory(PMT), Theory of Planned Behavior (TPB), Protective Action Decision Model (PADM), and Social-Cognitive Preparation Model. The main objective of the research is to examine the theory of planned behavior and investigate its used in clarifying and forecasting the factors linked with disaster preparedness behavior. The Theory of Planned Behavior is an effective framework for inspecting precursors of behavior. A crucial factor in the Theory of Planned Behavior is the individual's intention in performing a particular behavior. Getting the motivational factors that can affect it, a behavior, intetion are assumed. Where these intentions are determined preceding motivational factors. First is the attitude, the second is social factor and the is perceived behavioral control. The higher the attitude and subjective norm toward a behavior, and the greater the perceived behavioral control, the powerful should be a person's intention to perform the behavior under circumstances.

However, one's intention itself does not justify the level of success but also the non-motivational factors as availability of basic resources and oppurtunities represent people's actual control over the behavior. In this study three key factors signify the response of each individual in regards with natural disasters such as earthquakes. These factors are the following: gadget readiness, knowledge and trust. Gadget readiness has a great impact when it comes to kid's preparedness towards earthquake, gadgets such as whistles and flashlights could provide a great chance of survival. It helps rescuers in locating survivors and identifying their exact location.

Second is knowledge, each individual must possess the right knowledge during disaster in order to react correctly and automatically. If each persons has the right information and knowledge for a certain situation they could secure the best plan and execute the right decision. And last the trust to almighty creator and to those persons who are with during calamities, one cannot rescue himself alone, help from other people and power creator is needed in order to survive. In the Behavior box, two (2) items were raised: Sense of Obedience and Safety/Security. Sense of Obedience, following Higher Authorities by the kids can promote law abiding individuals for their preparedness. Safety and Security will guarantee their extra protection by keeping and bringing their survival gear/kit and brief knowledge on earthquake itself.

## **Abstract**

The main objective of the research is to create a simplified instrument to measure and review the disaster preparedness of the kids and will generally create an awareness for the authority to check the readiness of their youngest students/children. Kiddie Earthquake Preparedness Scale (KIEPS) reliability and validity were tested using reliability analysis and explanatory factor analysis (EFA). Using extraction method, seven items from three components - gadget/tool readiness component, emotional readiness component, and spiritual readiness component - were extracted and designated for the initial index based on the Kiddie Earthquake Preparedness Scale (KIEPS) as a new conceptual model. A three factor-structures of the instrument of children earthquake preparedness was revealed using explanatory factor analysis (EFA) and explained 62. 219% of the variance in the arrangement of relationships among the items. Where these three factors were all above Cronbach's  $\alpha > 0.548$  and had high reliabilities.

After deleting eight items which cross-loaded on multiple factors seven items remained in the

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final questionnaire (I always carry flashlights in my bag; I always bring whistle in my bag; I was taught to be brave during earthquake; I know what to do if an earthquakes happen; I know what an earthquake is; I believe God will take care of me if there's an earthquake; I will follow my teachers/elders' instruction during earthquake). The three factor-structure of the Kiddie Earthquake Preparedness Scale (KIEPS) instrument has been confirmed through this study. This Kiddie Earthquake Preparedness Scale (KIEPS) instrument may encourage school authorities together with government agencies, Legislative bodies, and local government units to create, establish and promulgate to strengthen the previous existing laws for the cooperation of schools to participate actively in protecting and securing the students from disasters. The education agency may be enlightened and use this as a basis to check the knowledge of the children on earthquake and create precautionary measures thereto. For this will be demonstrated as an awareness program for children to be prepared for the unpredictable disasters like earthquakes.

## Methods

### Research Context

The Kiddie Earthquake Preparedness Scale (KIEPS) was conducted using the colourful Emoticon Based Survey Questionnaires which were distributed and answered through self administered way when the students have their free time or vacant time. The schools where the respondents came from are five (5) Private Schools around or near San Fernando, Pampanga. There were two hundred sixty-five (265) students who partook in this study, 151 (56.98%) of this were male and 114 (43.02%) were female. 175 (66.04%) of the participating students were from grade one (1) and 90 (33.96%) were from grade two (2). In this study it was recorded that the majority, with a total of 128 (48.30%), of the participating students were six (6) years of age. The survey is conducted in a guided manner through the help of the researchers and the teachers in order to assist the children in answering the questions properly. The estimated time it took for the participants to answer the survey was between seven (7) to fifteen (15) minutes. The total number of respondents are two-hundred sixty-five (265). All data were being collated and checked if there is an instance of no possible answers or same answers to determine an error by means of comparing the participating students age, grade and gender.

### Participants

Students who participated in this study has a total of 265 who all come from grade 1 and 2 levels, male and female and ranges their ages from 6 to 8 years old. In order for the survey to be accurate and realistic, all the students were all came from grade 1 and 2 primary educations, for it will determined how well they are prepared during disasters and calamities occurrence In order to discover the alertness and impulsiveness of the children in such early stage and also to minimize the possible bias in competency levels among learners in a particular age. All kids selected for this research had the following characteristics; a) children are all private elementary school students ; b) children are from grade one (1) and two (2); c) children ages from six (6) to nine (8) years old and are male and female. In terms of their level of preparedness when an earthquake occur, both grade 1 and 2 has almost the same high rate of number, Therefore, based on the statistics table above, it is to be concluded that almost of the numbers of the students are being prepared and taught what to do when such an earthquake happened.

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## Survey Instrument

The materials used in the study are coloured printed emoticon based questionnaires of two (2) pages consisting of fifteen (15) self explanatory questions which are translated both in English and Tagalog version. Each of the fifteen (15) questions is followed by an interesting picture demonstrating the said question. The levels of preparedness are scaled from 1 to 5, being 1 as the least prepared and 5 as the contrary. Coloured emoticons (happy to sad faces) being used for the students to determine and encircle which one justifies their answers. The questionnaire used in the study was made up of two (2) colored legal sized sheet of paper consisting of fifteen (15) self-explanatory questions in English that were translated in Tagalog. Each question was followed by an image depicting the situation. A five-point Likert Scale (1="Not at all", 2="Slightly", 3="Somewhat", 4="Moderately" to 5"Highly") was used for each item to measure the level of preparedness of the children. The scale was made of colored emoticons showing an angry to happy face for the students, who ages from six (6) to nine (8), to be able to encircle and determine which one justifies their answer. Knowledge Based CompetenciesThe five (5) items knowledge based competencies which are; (a) I know what an earthquake is. (b) was used to measure the student's level of awareness, how knowledgeable they are when it comes in dealing an earthquake.

## Gadget Based Competencies

These two (2) items Gadget based competencies namely (a) indicate the respondents readiness in bringing tools like flashlight and whistle which are very helpful especially when such disaster occurs.

## Instructional Based Competencies

To measure how well versed the students are in following instructions and sense of compliance, the researchers created a seven (7) items Instructional based competencies on earthquake preparedness which are; (a) Faith Based CompetenciesIn this area, a one (1) item was created (a) to test the respondent's

## Procedures

The study involved four key steps: Preparation (Observation, Formulation, Validation/Revision & Mass Printing of the Instrument), Approval of Permissions Letters, Data Gathering & Statistical Process

### Step 1. Preparation

Observation, Formulation, Validation/Revision & Mass PrintingThe researchers started with keen observation on how to gather relevant information and practices on making a formulated instrument. Next step was a 15-item questionnaire crafted through the guide of the references aforementioned. Each item target at a specific element that probably follow the preparedness rate. A five-point Likert Scale (1="Not at all", 2="Slightly", 3="Somewhat", 4="Moderately" to 5"Highly") was used for each item to measure the level of preparedness. The scale was made of colored emoticons showing an angry to happy face for the students, who ages from six (6) to eight (8) years old to attract and make them actively participate. The Drafted questionnaire was

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critically reviewed by a qualified professional Research experts and content validation to ensure the validity and reliability of the items in the questionnaire for suggestions. The researchers also asked an advice of language professionals/ Experienced teacher to further improve the instruments' simplicity and understandability of the words used for the kids. After further evaluation of our instrument, mass printing of at least 400+ set of copies (2pages each) were executed

## **Step 2. Approval of Permissions Letter**

Approval Permission to the School's Administration to conduct the study is very essential to conduct a study and use the questionnaire for the kids. After obtaining the necessary permissions, the researchers talk to several Principal of private schools near San Fernando, Pampanga. 5 out of 7 Private schools gave us permission to conduct our instrument in their free time and specific date.

## **Step 3. Data Gathering**

Upon approval of our permission letter, we enthusiastically start the study using our questionnaires. The assigned teacher of the participating school were given simple instruction on how to address our questionnaires to the children. Availability and interest of the Head of the School hindered our momentum to gather data on time. It is the major factor in the delay of our works. In addition, the survey proper occurred after it was being introduced to the student and was executed on the respondent's free or vacant time. After all the data has been gathered, the researchers collated it and rechecked if there was an error occurred.

## **Step 4. Statistical Process**

Data input through Statistical Package for Social Sciences (SPSS) All data collected were being consolidated and put in the Statistical Package for Social Sciences (SPSS) to determine their computation in testing the reliability of an instrument on collected 265 questionnaires. In lieu with this, An Exploratory Factor Analysis (EFA) was also executed to test the validity of an instrument and how it is related to its construct. For this objective, the researchers utilized a principal component analysis with Varimax method. Although there were eight (8) items from the first fifteen (15) items which were removed because of multiple cross loading, it didn't affect the validity of the study in having a 3 components analysis (a) Gadget readiness, (b) knowledge, (c) trust through the used of Varimax rotation method.

As a result, the Chronbach's Alpha reliability and the Total variance by means of extraction method were obtained. In this stage, the researchers analyzed the given extracted data which were revised and evaluated after a thorough examination, reliability and validity testing which will be used for future studies.