Training Effects on Emergency Management Activation Response

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Emergency management personnel play an important role in keeping our citizens safe. This study considered whether local and long-term emergency management training could produce different behavioral reactions to severe weather situations. Results indicate a significant positive effect for both long-term and local training on emergency management behavioral response. Individuals with higher levels of training initiated a significantly higher proportion of emergency response activation. Discussion centers on the notion that while these results indicate training has an effect on behavioral reaction, quantity of training rather than the specific type of training was most important.

INTRODUCTION

As the frequency of natural and man-made disasters continues to increase worldwide (National Weather Service, 2011), it is vital for emergency management professionals to maintain a constant state of preparedness to respond effectively. Across numerous professions, a wide variety of variables have been cited as having significant effects on ability to perform effectively (e.g., organizations, technology (Globerson & Salvendy, 1984), employee attitudes, and workplace stress (Jex & Britt, 2008), (Morss, Demuth, Bostrom, & Lazo, 2015). Training and professional development are key tools in improving employee performance in a variety of ways. Researchers have shown that use of these tools can potentially increase an individual's job-related knowledge and skills (Ittner & Larcker, 2003), can increase employee morale (Rothwell, 2008), and may lead to higher productivity on organizational tasks (Erickson, Noonan, & McCall, 2012; Lim & Morris, 2006). However, very little is known about the effects of training on preparedness as it affects timeliness of response for individuals working in the field of emergency management (Caruson, & MacManus, 2007).

Individuals with responsibilities falling under the umbrella of the emergency management system come from a wide variety of backgrounds and educations (Weaver, Harkabus, Braun, Miller, Cox, Griffith, et al., 2014). These disparate backgrounds may make it difficult without proper training to insure

emergency management workers perform their duties effectively. Additionally, due to the wide variety of events that could occur involving emergency management, certain skills may be used frequently, while others are seldom used (Weaver, et al., 2014). It is not easy to plan for disasters when "natural disasters range widely in terms of severity, the type of damage caused, and related warning times—hurricanes typically offer a small window of time to prepare, whereas tornadoes and earthquakes present little to no warning" (Management Connections, 2012). This indicates individuals working in emergency management may experience long periods over which trained skills are not put into practice. Examining the level of effect of training on action is, therefore, critical. Multiple skills must be developed in order to maintain abilities at functional levels over periods of downtime. A constant regimen of training is one effective method for developing and retaining these skills.

Although emergency management may be an ideal discipline for studying the effects of training decay on reaction, at this time very little is known about training procedures or refresher techniques that lead to maintenance over time within this industry. Understanding how training affects emergency management is essential for the development of programs that enable a timely and effective response. Emergency Operation Center (EOC) personnel are required to make critical decisions at critical times; therefore, it is essential that they are not overworked (Burgess, 2007). In the dynamic environment of an unfolding natural disaster, bottlenecks in the process can lead to devastating impacts, with each second of hesitation spelling the difference between life and death. Advancements in science, observation and technology have improved forecast lead times for tornadoes and other natural disasters; however, the potential benefits are lost without capable, skilled personnel to disseminate the information in a rapid and coordinated way (Brotzge & Donner, 2013; Brotzge & Erickson, 2009). To better understand the linkages between training and time-critical decision-making, the present study examines the effects of short-term, long-term, and local-training on reaction of emergency management personnel toward three different behavioral scenarios involving the threat of a tornado. As expected, results show that training is important, but there are some surprising results regarding the type of training received.

METHOD

Participants

A sample of 1,224 individuals working within the emergency management community nationwide was obtained. Recruitment methods included varied strategies, including posting a link to the online survey within all available emergency management journals (e.g., Emergency Management Bulletin), and emailing directly to various emergency management websites. Responses were received from 49 out of the 50 states (Delaware excepted). The participants were primarily male (80.8%), and ages ranged from 26 to greater than 55, however 72% of those responding were 46 years of age, or older. The majority of participants listed their race as Caucasian (N=982, 94%).

Measures and Procedure

Emergency management personnel who agreed to participate on a volunteer and anonymous basis answered a 10-min online survey (the encrypted and protective program Qualtrics was used).

Demographics

Participants were asked a variety of questions pertaining to their demographics, including: age, gender, and education.

Training

Participants were asked to report on their experiences with training. Questions involved the types of training each individual had experienced, including types of emergency training exercises they had participated in locally. They were also asked to specify all types of emergency training courses they had been taken over the past 5-years from a list (categories included natural disasters (such as hurricanes, floods, tornadoes), industrial/chemical accidents, terrorism, mass transportation disasters, plus an open-

ended 'other,' category with a fill-in-the-blank line). Participants were scored 1-point for each of the different scenarios checked-off; scores ranged from 0 to 5. They were then divided into low- and high-categories of training, using a median split of 3.0 for long-term training, and a median split of 2.0 for local training.

Behavioral Scenarios

At the end of each survey, participants were exposed to three different behavioral scenarios and asked to indicate: What proportion of your response system would you activate based on this information alone? The three scenarios can be classified as (1) first notification: radar suggests that a tornado may exist in an approaching thunderstorm, (2) first confirmation notification: law enforcement confirms two sightings of a tornado on the ground, and (3) second confirmation notification: personal visual confirmation of a large and damaging tornado on the ground (see Appendix A). As expected, the proportion of the emergency response system activated increased from first notification (M=47.84%, SD=39.94) to first confirmation (M=60.14, SD=43.43), and increased again from first confirmation to second confirmation (M=63.86, SD=45.43).

RESULTS

To investigate the initial assumption that different levels of training would result in different reactions to our three behavioral scenarios various standard statistical tests were run (t-tests, regression analysis, etc.). Multivariate analysis of variance (MANOVA) was also utilized, followed by ad-hoc analyses for long-term and local-training on each of the three scenarios. MANOVA results indicate that both long-term (Table 1) and local training (Table 2) have a significant effect on the proportion of the emergency system activated for all three theoretical scenarios. Individuals categorized as high Long-Term-Training (LTT) activate a significantly larger proportion of the emergency response system than individuals categorized as low LTT (e.g., 80.47% activated for high-long-term trained individuals after the second confirmation compared to 57.26 for individuals categorized as low-long-term training).

TABLE 1
LONG-TERM TRAINING MEANS FOR PROPORTION OF EM SYSTEM ACTIVATED, STANDARD DEVIATIONS, & MULTIVARIATE EFFECTS

	High LTT	Low LTT		
	M (SD)	*M* (SD)	*F*	*P*
First Notification	61.82 (36.29)	42.29 (39.99)	14.82	0.00
First Confirmation	76.24 (34.57)	53.75 (44.93)	26.84	0.00
Second Confirmation	80.47 (36.04)	57.26 (47.08)	29.43	0.00

TABLE 2
LOCAL TRAINING MEANS FOR PROPORTION OF EM SYSTEM ACTIVATED, STANDARD DEVIATIONS, & MULTIVARIATE EFFECTS

	High LTT	Low LTT		
	M (SD)	*M* (SD)	*F*	*P*
First Notification	60.04 (36.53)	38.01 (39.89)	16.23	0.00
First Confirmation	74.81 (35.61)	48.33 (45.54)	33.45	0.00
Second Confirmation	79.19 (36.90)	51.51 (47.85)	33.53	0.00

Following initial t-tests, regression analyses were conducted for each of the three behavioral scenarios to determine whether long-term and local training could significantly predict the proportion of the emergency response system activated while controlling for certain demographic variables (e.g., age). Overall results (Table 3) indicate that together local and long-term training have a significant effect on all three behavioral scenarios while controlling for age, with results predicting roughly 9% of the variation in activation of the emergency management system across all three scenarios. These results show that long-term training, regardless of specific type of training (e.g., terrorism vs. natural disaster) can predict the behavioral reactions of these emergency management personnel.

TABLE 3
REGRESSION RESULTS FOR THE THREE BEHAVIORAL SCENARIOS

Predictors	Model 1 DV First Notification		Model 2 DV First Confirmation		Model 3 DV Second Confirmation	
	b	*t*	*b*	*t*	*b*	*t*
Age	.13	4.65**	.11	3.79**	.09	3.23**
Local Training	.18	5.03**	.18	5.07**	.19	5.29**
Long-term Training	.24	8.26**	.26	8.81**	.27	8.97**

Note. Standardized coefficients are presented here.
* $p < .05$. ** $p < .01$.

After examining the effects of training on behavioral reactions, the effects of a number of individual difference variables (gender, age, education) on behavioral reactions were examined. Of all the variables tested, only one significant relationship emerged: age had a significant effect on the proportion of activation engaged for the first notification scenario ($F=3.85$, $p<.05$); specifically, individuals aged 45 and younger were less likely to activate the emergency response system ($M=36.93$, $SD=30.48$) when compared to individuals 46 and older ($M=56.37$, $SD=37.90$).

DISCUSSION

Overall results indicate long-term training and local training exercises had a significant effect on all three extreme weather scenarios; individuals with more training engaged a significantly higher proportion of emergency response activation. All forms of training were combined to create a 'level of training.' Thus, these results indicate that for this sample, the type of training (e.g., terrorism, natural disaster, etc.) did not matter as much As the quantity of training, in general. In conjunction with these findings, Wulf and Shea (2002) put into question the issue of whether learning response skills through training could translate, more generally, into effective behavior. These results support this idea by showing that individuals working in emergency management can benefit from attending training sessions as often as is practical, regardless of the topic for training. Researchers have suggested that specific training for certain geographical regions should be highlighted (McEntire & Myers, 2004; Dawson, 2007). One benefit to regionally-specific training is to provide a clear and specific shared model for all professionals that will be responding to disasters to which the area is prone (Morss et al., 2015). However results of the present study are especially interesting in that they suggest all training has value, regardless of whether one believes the training is applicable to their jurisdiction (e.g., a hurricane training simulation for an emergency management worker in Oklahoma).

These results also show that participant age may effect urgency in of response; that is, age had an effect on the proportion of activation engaged for the first notification warning. Individuals aged 45 and younger were less likely to activate the emergency response system (though there were no significant

differences in age when examining reactions to the two, more serious situations). These results may be related to the level of risk perception, experience, responsibility, or status of an individual aged 45 and younger - by default they have not had as much time to develop skills through training or actual experience. Individuals 45 and younger may not react accordingly due to a lack of training or confidence and needs to be further examined. It would be interesting to examine whether with more training would these individuals change their behavioral reaction, or if there is some other individual difference that would explain this difference. Research on the effectiveness of training within other industries indicates that age can effect training through ability and maintenance. Loftus (1985) affirms the important rule that knowledge and skill can be acquired to differing degrees and that those differences will influence the extent to which the skills are maintained. What now needs to be understood is whether differing degrees of acquisition are a result of individual difference variables, or the quality of training.

A wide assortment of individual difference variables may affect whether or not communication within the emergency management system is successful (Schumacher et al., 2010, Morss et al., 2015). These results, as noted, show that factors such as the specificity of training, time spent in training, and actual experience with disaster can play a critical role in the planning and response to disaster situations. Unfortunately, even with a large sample size (N=1224) in the present study, there was not enough power to test specific types of natural disasters against other types queried. This topic should be a point of focus in any follow-up study. Undoubtedly, factors such as time spent within the emergency management field, time spent in training, and actual experience with disaster can play a critical role in the planning and response to disaster situations and also need to be further explored and understood (Kendra and Wachtendorf, 2003; Moynihan, 2005).

Limitations

The present study has a number of limitations, in particular it lacked the power needed to compare specific types of training on the behavioral reaction scenarios. For example, it might have been interesting to determine whether specific training for tornados produced a different behavioral reaction. Unfortunately, our survey did not separate natural disaster types from one another; that is, the question set asked about natural disaster training and stated that this included tornadoes, hurricanes, flooding and etc. Thus, even though most emergency managers reported having received natural disaster training, the specific type could not be separated for comparison.

The majority of our participants had received training in both terrorism management and natural disaster response. Terror management training is not surprising, considering history effects. Prior to the 9/11 terrorist attacks there were few, if any, effective preventative measures in place for such incidents. There is a possibility that some governmental agencies were trained for the threat, but those who actually responded to the disaster were not prepared. That tragedy established the importance of intercommunication for multiple jurisdictions, while establishing a defined structure (Perry, 2003), and increased the number of training scenarios nationwide occurring for terrorism management. Disasters of this magnitude not only affect local areas, as it also affects adjoining regions.

Another limitation of the current study is self-selection biases in survey participation (e.g., certain states had very low response rates). While it would be interesting to learn why certain emergency management workers entered into the study and others did not, the low response rate of some states can be at least partially explained by the number of emergency management workers registered for that state (e.g., smaller states should have fewer emergency management workers).

Implications/Future Directions

As always, it is essential to establish standards for the development of emergency management training programs (Alexander, 2003), while ensuring these standards do not place limitations on necessary changes (Doyle, 1996). In this process, it is essential for emergency management agencies to recognize that training for any situation, regardless of the size and scope, may be nearly as important as that providing specific training for the geographical location. By keeping the idea of rapid response in the

forefront of emergency manager's thinking via training, response to any emergency is likely to be quicker.

This initial study examined the effects of training on early response, based on these results, follow-on studies might be directed toward examining the issue of decay-of-knowledge and skills; that is, on comparing decay rates for differing degrees of original acquisition. It would be interesting to learn whether training in a wide variety of topics affects retention of training in others. Future studies should separate disaster types into more specific subtypes and should include a number of personality/individual difference variables that could further explain behavioral reactions within emergency management (e.g., resiliency). If possible, recruitment should be directed at crossing cultural barriers a little more significantly. It would be interesting to learn how different cultures view training and response. Do these different cultures respond differently to emergency messaging, and would communications be made more effective by recognizing these important cultural differences?

REFERENCES

Alexander, D. (2003). Towards the development of standards in emergency management training and education. *Disaster Prevention and Management, 12*(2), 113-123. Retrieved from http://search.proquest.com/docview/214376460?accountid=38769

Brotzge, J., & Donner, W. (2013). The tornado warning process: A review of current research, challenges, and opportunities. *Bulletin of the American Meteorological Society, 94*(11), 1715-1733. Retrieved from http://search.proquest.com/docview/1470776479?accountid=38769

Brotzge, J., & Erickson, S. (2009). NWS tornado warnings with zero or negative lead times. *Weather and Forecasting, 24*(1), 140-154. Retrieved from http://search.proquest.com/docview/196336638?accountid=38769

Burgess, P. A. (2007). Optimal shift duration and sequence: Recommended approach for short-term emergency response activations for public health and emergency management. *American Journal of Public Health, 97*, S88-92. Retrieved from http://search.proquest.com/docview/215081857?accountid=38769

Carey, G. (1998). Multivariate analysis of variance (MANOVA): I. Theory. Retrieved from: http://ibgwww.colorado.edu/~carey/p7291dir/handouts/manova1.pdf

Caruson, K., & MacManus, S. A. (2007). Designing homeland security policy within a regional structure: A needs assessment of local security concerns. *Journal of Homeland Security and Emergency Management, 4*(2), 1547-7355. doi:http://dx.doi.org/10.2202/1547-7355.1243

Dawson, C. (2007). Improve your emergency management process. *ISHN, 41*(6), 78-79. Retrieved from http://search.proquest.com/docview/196534461?accountid=38769

Doyle, J. C. (1996). Improving performance in emergency management. *Disaster Prevention and Management, 5*(3), 32-46. Retrieved from http://search.proquest.com/docview/214380120?accountid=38769

Erickson, A. S., Noonan, P. M., & McCall, Z. (2012). Effectiveness of online professional development for rural special educators. *Rural Special Education Quarterly, 31*(1), 22-32. Retrieved from http://search.proquest.com/docview/1011763659?accountid=38769

Globerson, S., & Salvendy, G. (1984). A socio-technical accounting approach to the evaluation of job performance. *International Journal of Operations & Production Management, 4*(3), 36-42. Retrieved from http://search.proquest.com/docview/232359064?accountid=38769

Ittner, C. D., & Larcker, D. F. (2003). Coming up short on nonfinancial performance measurement. *Harvard Business Review*, 88-95.

Jex, S. M., & Britt, T. W. (2008). *Organizational psychology: A scientist-practioner approach.* Hoboken, NJ: John Wiley & Sons, Inc.

Kendra, J. M., & Wachtendorf, T. (2003). Elements of resilience after the World Trade Center disaster: Reconstituting New York City's emergency operations centre. *Disasters, 27*, 37–53. doi:10.1111/1467-7717.00218

Lim, D. H., & Morris, M. L. (2006). Influence of trainee characterisitics, instructional satisfaction, and organizational climate on perceived learning and training transfer. *Human Resource Development Quarterly, 17*(1), 85-115. Retrieved from http://search.proquest.com/docview/234905402?accountid=38769

Loftus, G. R. (1985, April). Evaluating forgetting curves. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 11*(2), 397-406.

Management connections: Natural disasters test adaptability of emergency response plans. (2012). *Association of Operating Room Nurses. AORN Journal, 96*(4), C1,C8-C9. doi:http://dx.doi.org/10.1016/S0001-2092(12)00920-9

McEntire, D. A., & Myers, A. (2004). Preparing communities for disasters: Issues and processes for government readiness. *Disaster prevention and management: An international journal, 13*(2), 140-152.

Morss, R.E., Demuth, J.L., Bostrom, A., & Lazo, J.K. (2015). Flash flood risks and warning decisions: A mental models study of forecasters, public officials and media broadcasters in Boulder, Colorado. *Risk Analysis*, 1-20, doi: 10.1111/risa.12403.

Moynihan, D. P. (2005). *Leveraging collaborative networks in infrequent emergency situations.* Washington, DC: IBM Center for the Business of Government.

National Oceanic and Atmospheric Administration. (2011, July). NWS Central Region service assessment: Joplin, Missouri, Tornado—May 22, 2011. Kansas City, MO, USA. Retrieved from U.S. Department of Commerce, Kansas City: http://www.nws.noaa.gov/om/assessments/pdfs/Joplin_tornado.pdf

National Weather Service. (2011, July 6). *NOAA's National Weather Service Strategic Plan: Building a Weather Ready Nation.* Retrieved from National Weather Service: http://www.nws.noaa.gov/com/weatherreadynation/files/strategic_plan.pdf

Perry, R. W. (2003). Incident management systems in disaster management. *Disaster prevention and management: An international journal, 12*(5), 405-412.

Rothwell, W. J. (2008). *Adult Learning Basics.* Alexandria, VA: ASTD Press.

Schumacher, R. S., Lindsey, D. T., Schumacher, A. B., Braun, J., Miller, S. D., & Demuth, J. L. (2010). Multidisciplinary Analysis of an Unusual Tornado: Meteorology, Climatology, and the Communication and Interpretation of Warnings. *Weather and Forecasting, 25*(5), 1412-1429. Retrieved from http://search.proquest.com/docview/761141605?accountid=38769

Weaver, J., Harkabus, L. C., Braun, J., Miller, S., Cox, R., Griffith, J., & Mazur, R. J. (2014). An Overview of a Demographic Study of United States Emergency Managers. *Bulletin of the American Meteorological Society, 95*(2), 199-203. doi:http://dx.doi.org/10.1175/BAMS-D-12-00183.1

Wulf, G., & Shea, C. H. (2002). Principles derived from the study of simple skills do not generalize to complex skill learning. *Psychonomic Bulletin & Review, 9*, 185-211.

APPENDIX A

Behavioral Scenarios

1. Assume you learn that the National Weather Service (NWS) has issued a tornado warning for your county, valid for the next 30 minutes. The warning is based on a strong Doppler radar signature that indicates a possible tornado roughly 15 miles away from you response area, that is headed your direction at 25 miles per hour.

2. Now suppose that you call the severe weather desk at the NWS and learn that they have just received two reports from law enforcement of a tornado on the ground. It is 12 miles away from your response area and moving in your direction at 25 miles per hour.

3. Now suppose that a few minutes later you turn on a television in time to see local news coverage of what seems to be a reasonably wide tornado doing damage on the ground at a location you recognize to be about 8 miles away from your response area. The storm is still headed in your direction.