Understanding Knowledge Of Tornado Protective Actions In A Tornado-Prone Community

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Introduction

Tornado-prone communities suffer the devastating effects of deadly tornadoes on a much too frequent basis. Examining the community's knowledge and understanding of tornadoes, tornado warnings and protective actions will help specify risk and facilitate communication changes for improved decision-making.



Background:

- Research suggests that the safest action to take is highly conditional upon the specifics of the situation. (Farley, 2007)
- Risk communications that contain repeated clear and understandable messages about the nature of the risk and protective actions to take lead to significantly higher adoption of appropriate preparedness and response actions. (Mileti, 1997)
- It is difficult and confusing to issue:
  - Guidelines that say to do one thing in one situation (drive away if you are in open country with no congestion) but something else in another (avoid vehicles if congestion is likely).
  - Changing the guidelines causes confusion. (Farley, 2007)
- Vehicles may be safer than outdoor locations such as ditches, and there is no research supporting the concept that a ditch is safer than a vehicle. (Hammer and Schmidlin, 2002)

Key Questions for this study:

1. Are there gaps in the information being disseminated to the public on the Internet concerning tornado response and preparation?
2. Are there differences in knowledge of planned actions by age group?
3. Where do individuals obtain information to guide their protective action decisions?

Method

Participants:

- All participants lived in the Southeast region of the U.S. for at least 4 years.
- 30 older adults, community-dwelling, 60-75 years old
  - 6 participants claimed disabilities (5 motor; 1 hearing)
  - 6 individuals had weather information access on a smartphone
  - 47% watch The Weather Channel™ frequently
- 30 Younger Adults, undergraduate students at UAH, (18-42 years old)
  - Enrolled in introductory Psychology courses; No Atmospheric science majors.
  - 53% of students live in homes; 27% live in dorms
  - 26 individuals had weather information access on a smartphone.
  - 13% watch The Weather Channel™ frequently

Procedure:

Two parts to determine A) authoritative guidelines, and B) participant knowledge about these questions:

- How should you **prepare your house** or apartment for a tornado?
- How should you respond to a tornado warning **at home**?
- How should you respond to a tornado warning **while driving**?
- How should you respond to a tornado warning **while in a public place** such as a store?
- How should you determine when it's safe to leave a **safe place**?

A) Reviewed internet websites for authoritative guidelines

a. Searched Google™ for "tornado," "response," "protective actions" and bolded terms in questions.
b. Retrieved guidelines from authoritative and broadcast media websites such as NWS, FEMA, American Red Cross, and The Weather Channel™.

B) Interviewed 60 participants living around UAH.

a. Structured interviews and questionnaires used to elicit their advice to an undergraduate student with no tornado warning experience or residence in tornado prone community.
b. Audio recorded interviews were professionally transcribed and evaluated using MAXQDA™ Qualitative Data Analysis software.

Results

Part A Question 1: Are there gaps in the information being disseminated to the public on the Internet concerning tornado response and preparation?

The following table shows the initial websites that were found by using keywords in the search feature of Google™. The importance of this figure shows the diversity of information that any one person could get based on opinions of experts and/or individuals.

Orgnization	Source	Brief Description	Preparing the house/ apartment	Hearing siren at home	Hearing siren in car	Hearing siren in public location (such as store)	Determine safe to leave
		Federal Govt					
NOAA	http://www.erh.noaa.gov/iwx/swep/Spotting.html	Federal		■	■		
★ SPC	http://www.spc.noaa.gov/faq/tornado/safety.html	Federal	■	■	■	■	■
★ NWS	http://www.nws.noaa.gov	Federal	■	■	■	■	■
★ FEMA	http://www.ready.gov/tornadoes	Federal	■	■	■	■	■
★ CDC	emergency.cdc.gov/disasters/tornadoes	Federal	■	■	■	■	■
SKYWARNWx Spotters Field Guide	Spotter Training Manual	Spotters Guide		■	■		
		State Universities					
The University of Alabama	prepare.ua.edu	Uni. Emergency Plan		■			■
The University of Oklahoma	http://ou.edu/oupd/tornado.pdf	Uni. Emergency Plan	■	■		■	■
Iowa State University Press,	http://www.public.iastate.edu	Uni. Emergency Plan		■	■	■	
		City					
City of Moore, OK	http://www.cityofmoore.com/storm-shelters	City Web Page		■	■	■	
★ NWS Nashville, TN	http://www.srh.noaa.gov/ohx/?n=safety-severe-safetyplan	City/Federal	■	■	■	■	■
★ NWS Birmingham, AL	www.srh.noaa.gov/bmx/	City/Federal	■	■	■	■	■
		Non-Government Aid					
American Red Cross (ARC)	http://www.redcross.org/prepare/disaster/tornado	American Red Cross		■	■	■	
ARC Tornado App	ITUNES	ARC App		■	■	■	■
		Private Media					
★ Weather Channel	http://www.weather.com/video/safest-place-during-tornado-35477	Popular Wx Channel	■	■	■	■	■
ACCU Weather	http://accuweather.com/en/weather-news/important-tornado-safety-tips/30770	Wx Forcasting Co.	■	■	■	■	
		Opinion					
Rick Bissell	http://talkingheadstv.wordpress.com	Individual Opinion			■		
Justin Berk	www.justinweather.com/	Individual Opinion					
Thornton Weather blog	http://www.thorntonweather.com	Individual Opinion, CO					
★ NWS's SPC Roger Edwards	http://www.spc.noaa.gov/faq/tornado/safety.html	Individual Opinion	■	■	■	■	■

★ Website includes recommendations for all locations and most scenarios

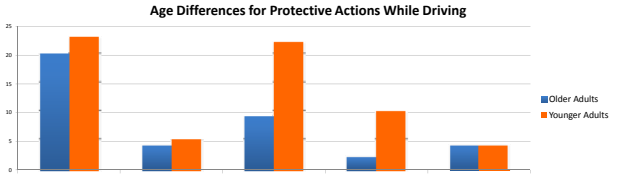
- No single question was covered by all of the websites.
- Hearing a siren at home was covered by all but one website.
- Most federal websites contain the same procedures for each question.
- Federal websites are not highlighted on an initial Google™ search for tornado guidelines.
- Each NWS office website had severe weather procedures specific for that area depending on types of severe weather it experiences.
- No single question was covered by every website.
- Participant interviews suggested that websites were not easy to navigate and find guidelines.

Part B Question 2: Are there differences in knowledge or planned actions by age group?

Age Differences Determined by Location

	HOME			CAR			SCHOOL	
	OA	YA		OA	YA		OA	YA
Seek Information	28	40		8	10		23	29
Primary Responsibilities	36	25		0	0		2	3
Immediate Actions	22	24		4	11		12	9
Preparatory Action	39	45		4	7		10	13
Interior Shelter	225	246		23	40		174	210
Exterior Shelter	2	9		33	50		1	9
χ^2	8.18	p= 0.15		1.3	p=0.86		6.3	*p*=0.28

No age differences found based on location when siren was heard.

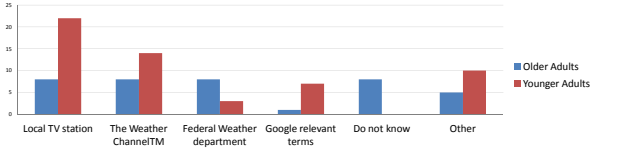


No significant age differences were found in recommended actions (X^2 (4,N=103)=5.4,*p*=0.25).

Younger adults were more likely to recommend finding a building (X^2 (1,N=31)=5.45,*p*=0.02) and stay in a car (X^2 (1,N=12)=5.33,*p*=0.02) than the older adults.

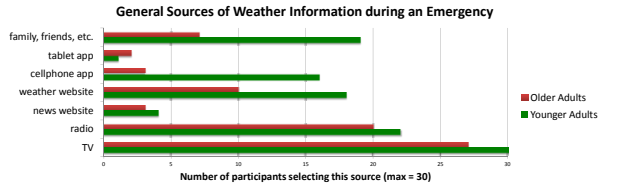
Part B Question 3: Where do individuals obtain information on current protective actions?

- Participants were asked the following question:
  - What websites would you recommend your friend visit to determine how to respond to a warning?



Significant age differences were found in recommended websites (X^2 (5,N=64)=21.97,*p*<0.001).
Younger adults were more likely to recommend local TV stations (X^2 (1,N=30)=6.53,*p*=0.01).

- Participants were asked the following question:
  - What information resources would you use in a potential weather emergency?



No significant age differences in distribution of weather sources in an emergency (X^2 (5,N=182)=7.14,*p*=0.21).
Younger adults reported more sources of information in an emergency than older adults (X^2 (1,N=182)=7.93,*p*=0.005).

Discussion

Key findings

- Multiple authoritative websites recommended safe protective actions from a tornado warning in typical locations such as at home, car, or public location, but other sites with similar names do not necessarily include the same relevant information.
- No age differences in recommended protective actions based on location were found.
- Age differences were found in use of websites to assess potential tornado impact or find recommended protective actions.
  - Younger adults were more likely to indicate multiple specific websites they would visit.
  - Older adults were more likely to suggest use of the National Weather Service websites.
  - Younger adults were more likely to just do a Google™ search for potential websites
  - For both groups, websites of local TV stations were most frequently mentioned.

Next Steps

- Assess consistency of recommendations between authoritative websites visited by the public.
- Conduct usability tests to evaluate the public's navigation and understanding of websites with recommended protective actions.
- Study participants about safety for their overall response.

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