

The Influence of Perceived Risk Knowledge on Risk Communication

Jason S. Wrench

This study developed and validated the Risk Knowledge Index (RKI). The RKI is designed as a simple measure of the degree to which an individual perceives he or she understands the nature of a specific risk. The study examined the criterion validity of the RKI using variables common in instructional communication: nonverbal immediacy, communication clarity, receiver apprehension, satisfaction, and perceived credibility. An individual's perceived understanding of a risk was significantly related to all of the variables in the study.

Keywords: Clarity; Credibility; Instructional communication; Receiver apprehension; Risk communication; Scale development

Much of the history of risk communication has attempted to explore how to properly educate lay audiences about the morbidity and mortality associated with various hazards (Leiss, 1996; Plough & Krinsky, 1987). Unfortunately, many risk communicators have innately seen the education of lay audiences about risk frustrating because the risk communicators have seen the process as innately sender-based (Lundgren & McMakin, 2004). According to Mottet and Beebe (2006), the transactional model of instructional communication purports that understanding is co-created between the source of an instructional message and the receiver of the instructional message. Furthermore, “[a]s instructional communication becomes more transactional, it becomes more focused on the other’s feelings or *affective responses*. The relationship, rather than the messages, yields the influence. Through the relationship, teachers and students grant each other permission to influence one another” [emphasis in original] (p. 14). This more interactional view of instructional communication has been alluded to by many risk communication scholars without drawing on the ample

Jason S. Wrench (Ed.D., West Virginia University, 2002) is an assistant professor in the School of Communication Studies at Ohio University-Eastern. This paper represents a portion of the author’s dissertation under the direction of Dr. James C. McCroskey and Dr. Perry Phillips. Correspondence to: Jason S. Wrench, 45425 National Road, St. Clairsville, OH 43950, USA; E-mail: wrench@ohio.edu

instructional communication literature on this subject (Arvai, 2003; Fiorino, 1990; Laird, 1993; McComas, 2003). Therefore, the goal of the current project is to initiate a conversation of the symbiotic nature of instructional communication and risk communication while demonstrating the reliability and validity of a new scale for examining an individual's perceived understanding of a risk. Before posing a series of hypotheses, a brief explanation for why a scale examining perceived understanding of risks is important will occur.

Years of risk communication research has demonstrated that people perceive risks for a variety of different reasons, but often the perceptions of a risk by experts and non-experts are drastically different (Lundgren & McMakin, 2004; Sandman, 1993; Sjöberg, 2000; Sjöberg & Wählberg, 2002). In fact, Sandman (1993) notes that "if you took a long list of hazards and rank-ordered them by something such as expected annual mortality (how many people they kill in a good year) and then rank-ordered the same list by how upsetting the various risks are to people, the correlation between the two rank orders would be approximately .2" (p. 2). In other words, only about 4% of the variance in a person's tendency to get upset by a risk has anything to do with how hazardous the risk actually is. Some have argued that the public's lack of statistical and scientific training is the primary culprit (Weinstein, 1999; Yamagishi, 1997), while others have argued that people are not adequately equipped to analyze basic health information products and services to make appropriate determinations of a risk (Joint Committee on Health Education Terminology, 1991; Schuster, Nicholson, Simoneu, & White, 1999). Whatever the reason, experts and non-experts often disagree over the morbidity and mortality associated with a specific hazard. For a comprehensive analysis of the different theoretical reasons why and how the public creates its views of risk, see Sjöberg (2000).

How the public goes about creating a perception about a risk is not a concern for the current study; instead, the current study takes the notion of public risk perceptions as a given. People are going to create thoughts about risks; therefore, it becomes important to have a reliable and valid way of measuring the degree to which an individual perceives he or she understands the nature of a risk. This is not to assume that an individual's perceived understanding is correct, only that it is believed by the person who holds the perception. And one thing risk communication research has shown us is that beliefs about risks do affect behavior (Sjöberg, 2000). At the same time, research in the field of instructional communication has consistently shown that measuring a student's belief of her or his own cognitive learning is important for ascertaining the impact of instructional communication (Richmond, Lane, & McCroskey, 2006). Previously developed scales in risk communication have either examined various behaviors related to understanding of a risk (e.g., Witte, Cameron, McKeon, & Berkowitz, 1996) or how people perceive the risk level of a specific hazard (e.g., Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001). The goal of the current project is to create and initially validate a research measure (Risk Knowledge Index, RKI) for examining an individual's perceived understanding of a communicated risk.

To examine the criterion validity of the RKI, a variety of variables positively related to cognitive learning will be analyzed: nonverbal immediacy (Richmond,

Lane, & McCroskey, 2006; Wrench & Richmond, 2004), communicator clarity (Chesebro & McCroskey, 2001), communicator satisfaction (Wolf, Putnam, James, & Stiles, 1978), and perceived credibility (McCroskey & Teven, 1999; Wrench & Richmond, 2004). And one variable previously shown to be negatively related to cognitive learning will be analyzed: receiver apprehension (Chesebro & McCroskey, 2001).

- H1a: Perceived cognitive understanding of a risk will be positively related to non-verbal immediacy, communicator clarity, communicator satisfaction, and perceived credibility.
- H1b: Perceived cognitive understanding of a risk will be negatively related to an individual's level of receiver apprehension.

Method

Participants

Participants were students from a large mid-Atlantic university enrolled in both upper and lower level courses that serve as large service classes for the university. All participants received extra credit for their participation. Of the 415 participants, there were 215 (51.8%) males, 199 (48.0%) females, and 1 (.2%) not responding, with a mean age of 20.45 ($SD = 2.16$).

Procedure

Two scenarios were generated to introduce participants to the basic terminology of risk communication (risk, risk communicator, hazard, and method of communication).¹ After reading the two scenarios, participants were asked to “think of a time in the past six months when an individual or group of individuals has attempted to communicate a risk to you directly. Use this specific instance when a risk was communicated to you to answer the rest of this survey.” The participants then read a list of different categories of risk and selected the category that the risk communicated to them most closely resembled: 56 (13.5%) health, 76 (18.3%) medical, 4 (1.0%) environmental, 50 (12.0%) transportation, 3 (0.7%) technological, 82 (19.8%) terrorist, 11 (2.7%) food, 23 (5.5%) human, 100 (24.1%) substance, and 10 (2.4%) other. The categories were selected because of their inclusiveness of different types of risks and their distinctness from the other categories (Gordon & Rowan, 2000).

Creation of the Risk Knowledge Index

The *Risk Knowledge Index* (RKI) was designed to measure an individual's perceived understanding of a risk. The RKI is a series of ten Likert-type questions that ask individuals to recall the degree to which they perceive they understand a risk using a scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items on the RKI should

Table 1 Factor Analysis of the Risk Knowledge Index

	Pilot study	Current study
1. I know the risks involved.	.77	.783
2. I do not feel knowledgeable about the risks involved.	-.65	-.719
3. The risks involved are very clear to me.	.80	.700
4. I do not know the risks involved.	-.77	-.822
5. I do not comprehend the risks involved.	-.71	-.732
6. My knowledge of the risks involved is limited.	-.74	-.719
7. I completely understand the risks involved.	.72	.768
8. I feel knowledgeable about the risks involved.	.79	.808
9. I comprehend the risks involved.	.75	.777
10. The risks involved are not clear to me.	-.86	-.808

This factor analysis is unrotated.

be coded so that higher scores are given to those people who believe they know more about a specific risk than those with lower scores. The RKI is very similar to the types of scales used to measure perceived cognitive learning in instructional communication (Richmond, Lane, & McCroskey, 2006). The scale is an even mixture of both positively and negatively worded items to prevent random answering. The ten questions generated for this measure can be seen in Table 1. The scale was initially piloted in an unrelated study to determine if any changes to the scale needed to be made before conducting the current study. The pilot study occurred at the same mid-Atlantic University, and had 137 (59.8%) males and 87 (38%) females, with 5 (2.2%) not indicating sex. The mean age for the sample was 21.49 ($SD = 4.63$). The principal component factor analysis indicated that only one eigenvalue was above 1 accounting for 57.27% of the variance (factor loadings can be seen in Table 1). The scale also had an alpha reliability of .91 ($M = 40.64$, $SD = 7.03$). Based on these initial findings, no revision of the scale was deemed necessary.

The dimensionality of the 10 items for the RKI in the current study was analyzed using an unrotated principal component factor analysis. To examine sampling adequacy, Kaiser's Measure of Sampling Adequacy was used. The MSA obtained was .92, which is considered "marvelous" for conducting a factor analysis (Kaiser, 1974). The principal component factor analysis indicated that only one eigenvalue was above 1 accounting for 58.49% of the variance (factor loadings can be seen in Table 1). Scores for the RKI can range from 10–50, which was seen in this study. The RKI had an alpha reliability of .92 ($M = 42.81$, $SD = 6.59$).

Validity Instrumentation

Nonverbal immediacy was measured using McCroskey, Richmond, Sallinen, Fayer, and Barraclough's (1995) 10-item Nonverbal Immediacy Measure, which uses a

five-point Likert format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The alpha reliability for the Nonverbal Immediacy Measure was .74 ($M = 33.41$, $SD = 5.69$). Risk communicator clarity was measured using a re-tooled version of Chesebro and McCroskey's (1998) 10-item Teacher Clarity Measure, which also uses a five-point Likert format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The alpha reliability for Risk Communicator Clarity was .83 ($M = 39.81$, $SD = 6.19$). Receiver apprehension was measured using Wheeless' (1975) 20-item Receiver Apprehension Test, which uses a five-point Likert format ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The alpha reliability for the Receiver Apprehension Test was .89 ($M = 47.76$, $SD = 10.67$). Risk communicator-risk receiver interaction satisfaction was measured using the Wolf, Putnam, James, and Stiles (1978) Medical Interview Satisfaction Scale, which is a 26-item self-report measure that uses a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) and has three factors: nine items that measure cognitive satisfaction and had a reliability of .83 ($M = 34.29$, $SD = 6.03$); nine items that measure affective satisfaction and had a reliability of .80 ($M = 32.35$, $SD = 6.45$); and eight items that measure behavioral satisfaction and had a reliability of .83 ($M = 30.36$, $SD = 5.58$). Lastly, risk communicator credibility was measured using McCroskey and Teven's (1999) Source Credibility Scale, which consists of 18 semantic differential items with seven steps between the oppositely worded adjectives. The Source Credibility Scale consists of three six-item subscales: competence, .83 ($M = 32.80$, $SD = 7.34$); trustworthiness, .91 ($M = 34.38$, $SD = 7.86$); and caring/goodwill, .89 ($M = 32.78$, $SD = 8.33$).

Results

The goal of this study was to test the newly developed Risk Knowledge Index's (RKI) criterion validity. According to Bryant (2000), Pearson Product Moment correlation coefficients can be used to provide concurrent validity coefficients. Simple Pearson Product Moment correlations were calculated between the two factors of the RKI and the previously validated variables (nonverbal immediacy, communicator clarity, receiver apprehension, satisfaction, and credibility). The Risk Knowledge Index was correlated with the study variables using an alpha level of .01 to account for possible Type I error: nonverbal immediacy, $r(404) = .44$, $p < .0005$; communicator clarity, $r(414) = .54$, $p < .0005$; receiver apprehension, $r(415) = -.29$, $p < .0005$; cognitive satisfaction, $r(412) = .54$, $p < .0005$; affective satisfaction, $r(412) = .37$, $p < .0005$; behavioral satisfaction, $r(412) = .43$, $p < .0005$; competence, $r(409) = .27$, $p < .0005$; caring/goodwill, $r(411) = .31$, $p < .0005$; and trustworthiness, $r(411) = .30$, $p < .0005$.

Discussion

The predicted relationships between the Risk Knowledge Index (RKI) and the previously validated constructs (nonverbal immediacy, communicator clarity, receiver apprehension, interaction satisfaction, and credibility) were all correct based on

the Pearson product moment correlations. As the goal of this study was to ascertain the criterion validity of the RKI, this study examined the criterion validity using a concurrent approach. The concurrent approach to validating the RKI has supported the instrument's use as both a reliable and valid tool for measuring an individual's perceived understanding of a risk (Bryant, 2000). In essence, the relationship between the instructional communication variables and perceived risk understanding functions in a similar fashion to the relationships between the same instructional communication variables and perceptions of student cognitive learning as hypothesized in this study.

The first major application that the Risk Knowledge Index can have is in the area of risk communication research. As mentioned previously, there is a wealth of information examining how beliefs affect risk behavior (Sjöberg, 2000); however, research thus far is scant on how the degree to which a person cognitively understands a risk affects behavior. In essence, how does the degree to which an individual perceives her or his understanding of a risk affect how he or she responds to that risk? On the same line with ideas for future research, we should mention that the current study used college students to test the initial reliability and validity of the RKI, so future research should examine how the RKI holds up when utilized in a more generalizable sample.

A second research application for the RKI could be in the area of crisis communication. As there is a close link between risk and crisis communication, it would be interesting to see if an individual's perception of a crisis influences how he or she responds to that crisis situation.

A third possible application for the Risk Knowledge Index has nothing to do with research, but rather how the RKI can be used by risk communication practitioners. Risk communication practitioners could use a cognitive test based on risk assessments to determine what an individual actually knows about the scientific assessment of a risk and further use the RKI to determine how strongly a person perceives her or his understanding of that risk. Theoretically, a person can have no objective knowledge about the nature of a risk but perceive her or his knowledge as very strong. If someone is simply incorrect in her or his perception of a risk but thinks he or she knows "everything," it will be much harder for a risk practitioner to educate that person about the nature of a hazard's incidence of morbidity and mortality. Furthermore, by shifting the focus to perceived understanding initially, it helps reinforce the notion that meaning is co-created in instructional communication and not one-sided (Mottet & Beebe, 2006).

Conclusion

Risk communication as a general field of inquiry for communication researchers is new primarily in name but not in the material studied. Just as when researchers started studying a teacher's use of persuasion in the classroom or a physician's use of persuasion in the medical interview, communication researchers have studied how to persuade individuals about certain risks. While persuading students and

patients about the realities of risk are not new, the field of risk communication is primarily a non-communication scholar endeavor. Hopefully, the current study and similar studies published in communication journals as well as traditional risk communication outlets will lead to a new proliferation of research by communication researchers interested in the study of risk communication, and will also demonstrate to the field of risk communication that communication scholars have a lot to offer the overall discussion.

Note

- [1] For this study, a risk is “any activity or object that has the possibility of an adverse outcome.” We are surrounded by hundreds of risk messages every day. A “risk communicator” would then be a person or group of people who communicate the possible risk(s) of an activity or object. For further clarification, I offer these two examples:

At a school board meeting, the district superintendent, Dr. Moses, informed parents of the possible hazards related to the asbestos removal currently underway in their children’s schools. In this case, the risk communicator is Dr. Moses, and the risk message is the possible hazards related to asbestos removal. Additionally, the method used to communicate this risk was through a planned meeting.

Dan is getting his prescription filled by his pharmacist, Dr. Wren. Dr. Wren sits down and counsels Dan about the possible side effects that his medication could have. In this case, the risk communicator is Dr. Wren and the risk message is examining the possible side effects that Dan’s medication could have.

References

- Arvai, J. L. (2003). Using risk communication to disclose the outcome of a participatory decision-making process: Effects on the perceived acceptability of risk-polity decisions. *Risk Analysis*, 23, 281–289.
- Bouyer, M., Bagdassarian, S., Chaabanne, S., & Mullet, E. (2001). Personality correlates of risk perception. *Risk Analysis*, 21, 457–465.
- Bryant, F. B. (2000). Assessing the validity of measurement. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding more multivariate statistics* (pp. 99–146). Washington, DC: American Psychological Association.
- Chesebro, J. L. & McCroskey, J. C. (1998). The development of the teacher clarity short inventory (TCSI) to measure clear teaching in the classroom. *Communication Research Reports*, 15, 262–266.
- Chesebro, J. L. & McCroskey, J. C. (2001). The relationship of teacher clarity and immediacy with student state receiver apprehension, affect, and cognitive learning. *Communication Education*, 50, 59–68.
- Fiorino, D. J. (1990). Citizen participation and environmental risk: A survey of institutional mechanisms. *Science, Technology, and Human Values*, 15, 226–243.
- Gordon, J. & Rowan, K. E. (2000, November). *The role of perceptions in risk communication*. Short course delivered at the National Communication Association’s Convention, Seattle, WA.
- Joint Committee on Health Education Terminology. (1991). Report of the joint committee on health education terminology. *Journal of Health Education*, 22, 97–108.
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39, 401–415.
- Laird, F. N. (1993). Participatory analysis, democracy, and technological decision making. *Science, Technology, and Human Values*, 18, 341–361.

- Leiss, W. (1996). Three phases in the evolution of risk communication practice. *The Annals of the American Academy*, 545, 85–94.
- Lundgren, R. & McMakin, A. (2004). *Risk communication: A handbook for communicating environmental, safety, and health risks* (3rd ed.), Columbus, OH: Battelle Press.
- McComas, K. A. (2003). Citizen satisfaction with public meetings used for risk communication. *Journal for Applied Communication Research*, 31, 164–184.
- McCroskey, J. C., Richmond, V. P., Sallinen, A., Fayer, J. M., & Barraclough, R. A. (1995). A cross-cultural and multi-behavioral analysis of the relationship between nonverbal immediacy and teacher evaluation. *Communication Education*, 44, 281–290.
- McCroskey, J. C. & Teven, J. J. (1999). Goodwill: A reexamination of the construct and its measurement. *Communication Monographs*, 66, 90–103.
- Mottet, T. P. & Beebe, S. A. (2006). Foundations of instructional communication. In T. P. Mottet, V. P. Richmond, & J. C. McCroskey (Eds.), *Handbook of instructional communication: Rhetorical and relational perspectives* (pp. 3–32). Boston: Allyn & Bacon.
- Plough, A. & Krinsky, S. (1987). The emergence of risk communication studies: Social and political context. *Science, Technology, and Human Values*, 12, 4–10.
- Richmond, V. P., Lane, D. R., & McCroskey, J. C. (2006). Teacher immediacy and the teacher-student relationship. In T. P. Mottet, V. P. Richmond, & J. C. McCroskey (Eds.), *Handbook of instructional communication: Rhetorical and relational perspectives* (pp. 167–193). Boston: Allyn & Bacon.
- Sandman, P. M. (1993). *Responding to community outrage: Strategies for effective risk communication*. Fairfax, VA: American Industrial Hygiene Association.
- Schuster, C., Nicholson, T., Simoneau, I., & White, J. (1999). A multinational comparison of health knowledge: College students in Canada, Nigeria, and the United States. *College Student Journal*, 33, 494–503.
- Sjöberg, L. Factors in risk perception. (2000). *Risk Analysis*, 20, 1–11.
- Sjöberg, L. & Wählberg, A. A. (2002). Risk perception and new age beliefs. *Risk Analysis*, 22, 751–764.
- Weinstein, N. D. (1999). What does it mean to understand a risk? Evaluating risk comprehension. *Journal of the National Cancer Institute*, 25, 15–21.
- Wheless, L. R. (1975). An investigation of receiver apprehension and social context dimensions of communication apprehension. *Speech Teacher*, 24, 261–268.
- Witte, K., Cameron, K. A., McKeon, J. K., & Berkowitz, J. M. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication*, 1, 317–341.
- Wolf, M. H., Putnman, S. M., James, S. A., & Stiles, W. B. (1978). The medical interview satisfaction scale: Development of a scale to measure patient perceptions of physician behavior. *Journal of Behavioral Medicine*, 1, 391–401.
- Wrench, J. S. & Richmond, V. P. (2004). Understanding the psychometric properties of the Humor Assessment instrument through an analysis of the relationships between teacher humor assessment and instructional communication variables in the college classroom. *Communication Research Reports*, 21, 92–103.
- Yamagishi, K. (1997). When a 12.86% mortality is more dangerous than a 24.14%: implications for risk communication. *Applied Cognitive Psychology*, 11, 495–506.