Exploring Risk Literacy in Spanish-Speaking Communities

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Introduction

Risk Literacy

The ability to understand and interpret probabilistic information for informed decision-making. It is crucial in extreme weather scenarios where individuals must quickly assess risks to ensure safety (Cokely et al., 2012).

RQ1. *How do education level, Hispanic ethnicity, and English proficiency affect the numeracy and probability interpretation skills of Spanish-speaking populations in the U.S.?*

RQ2. *Is there a significant relationship between perceived tornado risk and numeracy performance in Spanish-speaking communities?*

RQ3. *What are the differences between numeracy and risk literacy across Spanish-speaking populations with varying education levels, English proficiency, and Hispanic ethnicity?*

Design & Methods

- 2023 Extended WxSurvey: A nationwide survey that measures comprehension, reception and response of severe weather hazards and risk information of Spanish speaker adults in the United States (***N* = 1,598**)
- 20-25 minutes to complete, survey only distributed in the Spanish language
- Recruited Spanish speakers based on representative U.S. Census (2022) data

	Spanish-Speaking Population from 2022 Census (%)	Spanish-Speaking Research Participants (%)
Gender		
Male	49.0	36.0
Female	51.0	62.5
Hispanic Origin		
Not Hispanic	5.9	6.6
Mexican	56.5	45.6
Puerto Rican	7.3	9.9
Cuba	4.1	5.5
Guatemala	3.1	4.0
El Salvador	4.6	3.9
Dominican	4.2	5.6
Multiple Origins	-	4.4
Eng. Proficiency		
Not at all	7.4	8.0
Yes, but not well	14.4	19.0
Yes, well	17.3	27.7
Yes, very well	60.9	50.4

Geographic Location of Participants

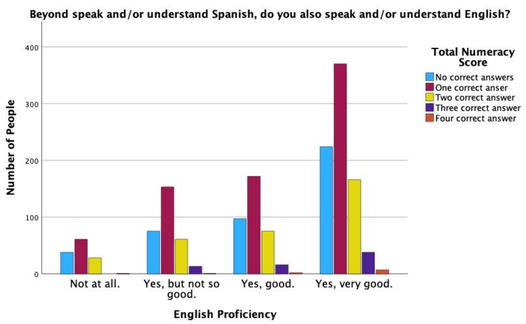


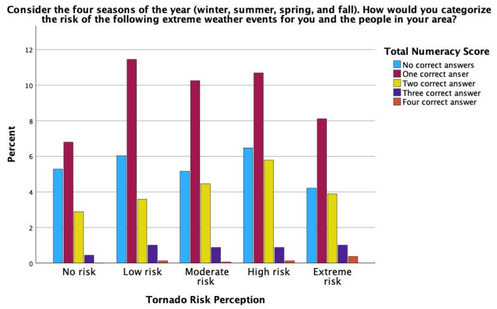
English	Español
Imagine that we roll a 5-sided die 50 times. On average, out of these 50 throws, how many times will the 5-sided die show an odd number (1, 3, or 5)?	Imagina que lanzamos un dado de 5 caras 50 veces. ¿En promedio, cuántas veces mostrará el dado un número impar (1, 3 o 5)?
In a small town of 1,000 people, 500 of these people are members of a choir. Of these 500 people who are members of a choir, 100 are men. Of these 500 residents who are not members of the choir, 300 are men. What is the probability that a choir member will be chosen at random? Please indicate the probability in percent.	En un pueblo pequeño de 1,000 personas, 500 de estas personas son miembros de un coro. De estos 500 miembros, 100 son hombres. De los 500 residentes que no son miembros del coro, 300 son hombres. ¿Cuál es la probabilidad de que se escoja aleatoriamente un miembro del coro? Indique la probabilidad en porcentaje.

Analysis & Findings

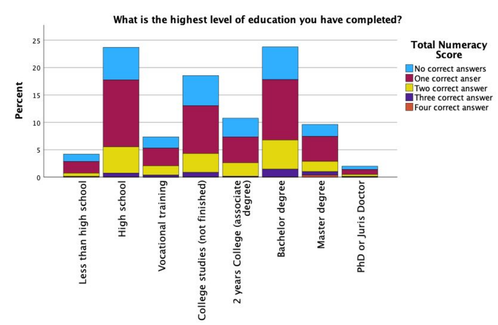
Table below with results with Total Numeracy Score (all risk literacy questions combined among participants (0, 1, 2, 3, 4 correct answers) with demographic, language proficiency and tornado risk perception variables.

Variable(s)	Test Performed	Statistic	Result	Significance (p-value)
Education Level & Total Numeracy	Multiple Regression	Beta = 0.10 R^2 = 0.05	**(Small) Significant relationship**	p = 0.03
English Proficiency & Total Numeracy	Multiple Regression	Beta = 0.08 R^2 = 0.02	**(Small) Significant relationship**	p = 0.045
Perceived Tornado Risk & Total Numeracy	Regression	Beta = 0.095	**Significant positive relationship**	p < 0.001
Hispanic vs. Non-Hispanic Numeracy	Independent Samples T-test	t(1596) = -0.260	No significant difference	p = 0.795
Hispanic Country of Origin & Total Numeracy	One-Way ANOVA	F(8,1589) = 1.109	No significant differences across groups	p = 0.354
Education x Proficiency x Ethnicity	Two-Way ANOVA	F(8,1565) = 1.517	No significant interaction effect	p = 0.146





*****Perceived tornado risk, education, and English proficiency are significant predictors for risk literacy for Spanish speakers*****



Discussion

Education Level:
Education was the **strongest predictor** of numeracy, with higher education linked to better risk comprehension. This aligns with prior studies showing that education enhances numeracy and risk literacy (Finucane et al., 2000; Rothman et al., 2006), suggesting that education-focused interventions are crucial to improving public understanding of risk.

English Proficiency:
English proficiency had a **weak but significant effect** on numeracy, indicating language influences comprehension, though education remains the primary factor. This supports findings that language plays a role in interpreting complex information but is less impactful than education (Schwarz et al., 2006).

Perceived Tornado Risk:
Perceived tornado risk was a **strong predictor** of numeracy, suggesting that individuals who perceive higher risk engage more with risk-related information, as seen in previous research (Slovic et al., 2004). This highlights the importance of addressing risk perceptions in effective communication.

Hispanic Ethnicity:
No significant difference in numeracy between Hispanic and Non-Hispanic groups suggests that **ethnicity** alone does not impact numeracy. Instead, education and socioeconomic status are more critical factors influencing numeracy performance.

Country of Origin:
Country of origin within Hispanic subgroups did not affect numeracy, implying that socioeconomic factors and educational access are more significant in shaping numeracy skills than national background. This reinforces the need for improving educational systems to enhance risk literacy.

Conclusions

1. English proficiency has a weak but significant effect on numeracy, though education is the more influential factor in understanding risk.
2. Perceived tornado risk is a strong predictor of numeracy, suggesting that individuals' risk perceptions motivate them to engage more with risk-related information.
3. No significant differences in numeracy performance were found between Hispanic and Non-Hispanic groups or across Hispanic subgroups based on country of origin.
4. Socioeconomic factors and educational access are more critical in shaping numeracy than ethnicity or national background.
5. Future strategies should focus on improving educational access and addressing risk perceptions to enhance risk literacy.

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