Comprehension of Symbolic Exit Signs I: Effects of Context

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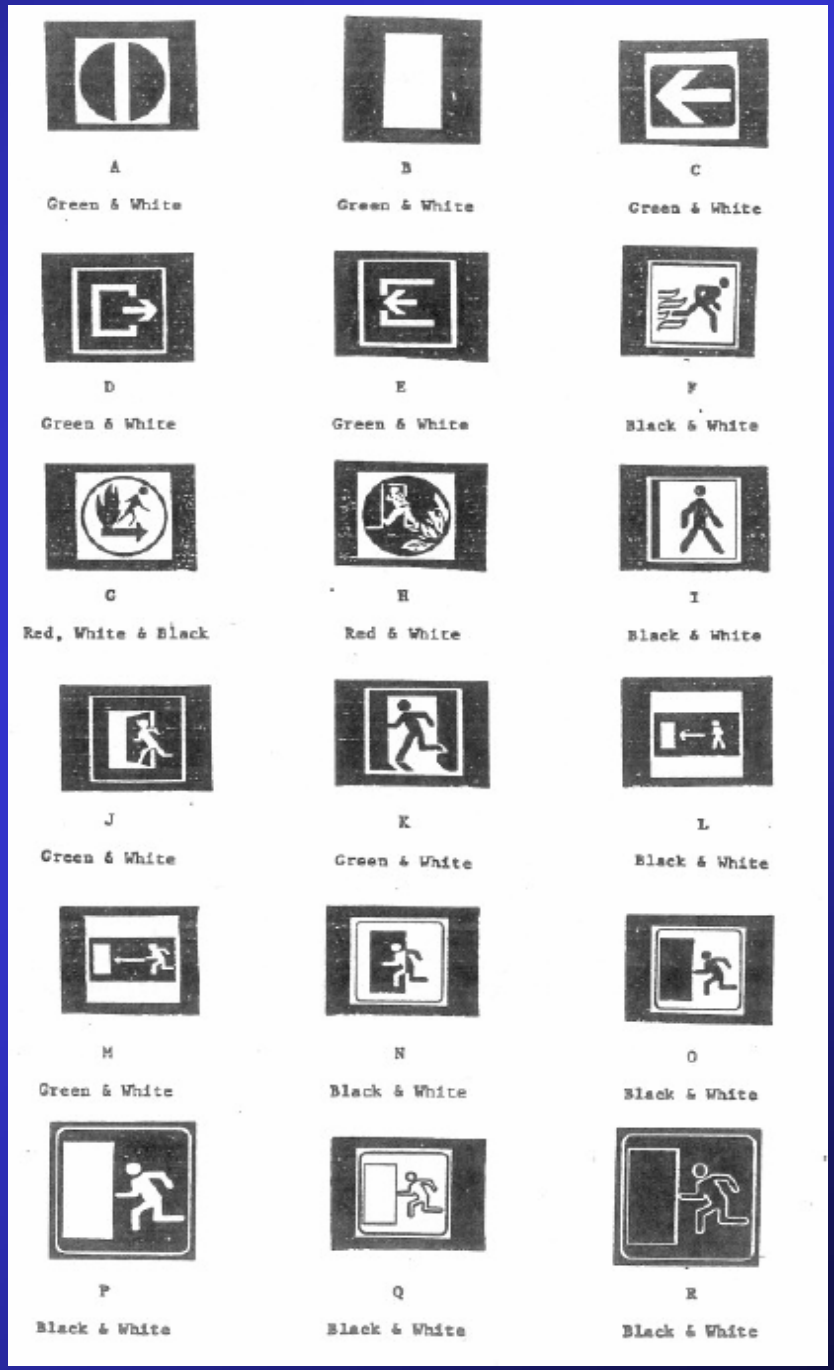
Federal Aviation Administration

Symbolic Exit Sign Exemplars



Collins & Lerner ©, 1983

Required Emergency Exit Sign

- 14CFR 25.811 – Emergency Exit Marking

  (d) (1) A sign located above the aisle

  (2) Next to each exit

  (3) On each obstructing bulkhead or divider

- 14CFR 25.812 – Emergency Lighting

  (a) (1) Illuminated emergency exit marking and locating signs

  (b)(1) (i) Red letters 1.5” high on white background, 21 sq in., stroke width between 6 and 7:1 contrast ratio 10:1, 25 ft. Lamberts, internally illuminated w/high to low background contrast < 3:1.

Symbolic Exit Sign

14CFR 21.21- Issue of Type Certificate

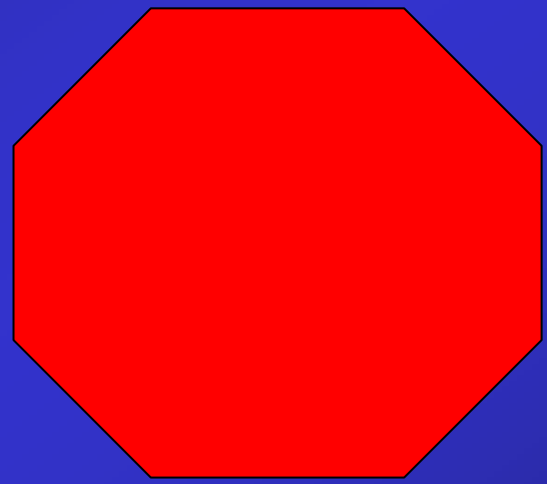
(b)(1) the type design and product [must] meet the applicable airworthiness requirements of the Federal Aviation Regulations or… any provisions not complied with [must be] compensated for by factors that provide an equivalent level of safety.

Test Booklet Contents

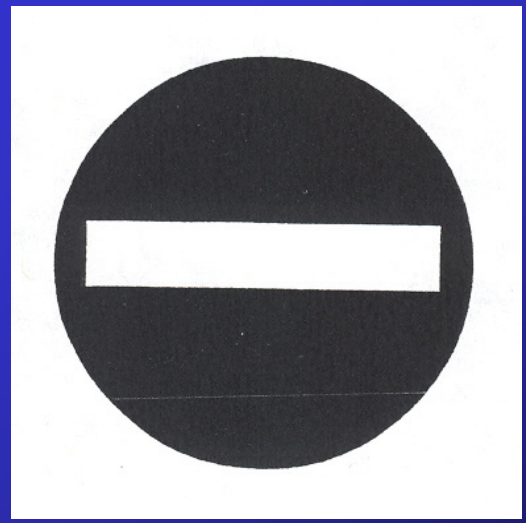
(6 Booklet Formats)

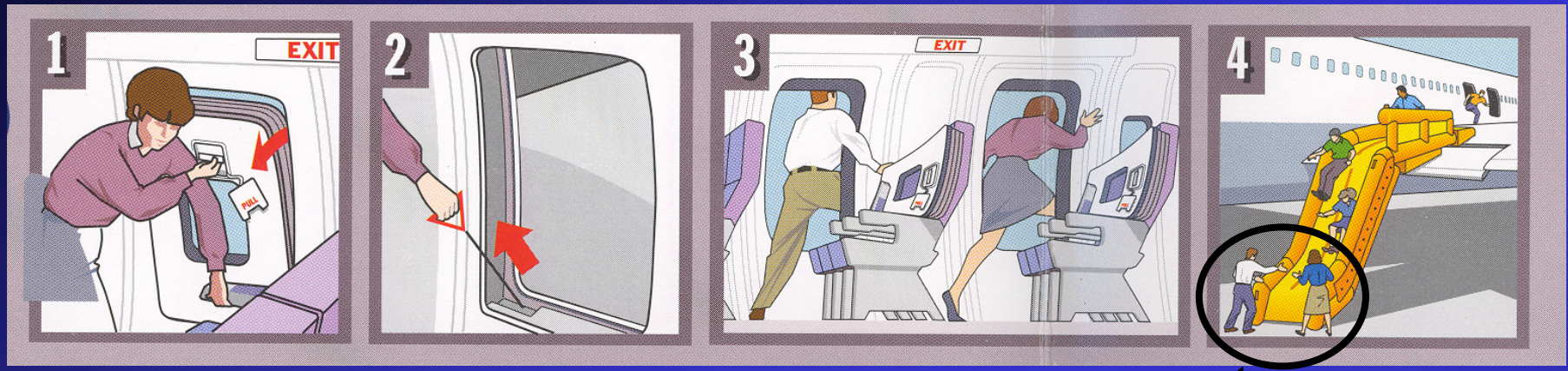
1. ANSI Z535 Symbols (7)
2. Briefing Card Pictorials (10)
3. 25.811 – Required Exit Sign (1)
4. Symbolic Exit Sign Exemplars (3)

ANSI Z535 Symbols



ANSI Z535 Symbols





- Who do you think these people are?

- What are they doing?

Response Categories & Weights

Category	Response Type	Weight
0	No response	
1	Don’t Know	
2	Opposite to the intended meaning	**- 1.00**
3	Wrong	**0.00**
4	Related but understanding is doubtful / suspect	**0.25**
5	Related but understanding is arguable	**0.50**
6	Understanding is likely	**0.75**
7	Understanding is certain	**1.00**

Comprehension Score Algorithm

(Modified ISO 9186 Convention)

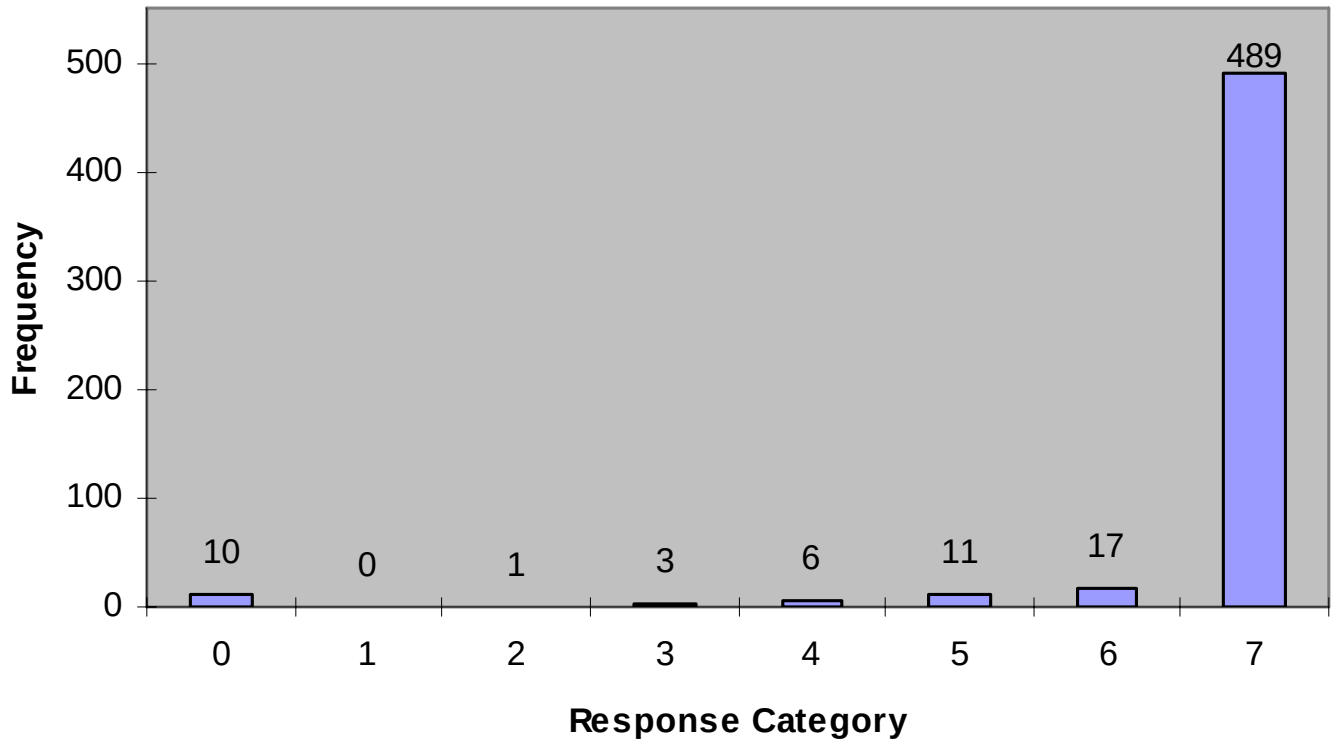
Category	Frequency	Usable %	Weight	Comprehension
0	8	0.0%		
1	11	3.1%		
2	6	1.7%	*-1.0	-1.7%
3	47	13.2%	0.0	0.0%
4	47	13.2%	*.25	3.3%
5	97	27.2%	*.50	13.6%
6	14	3.9%	*.75	2.9%
7	134	37.6%	*1.0	37.6%
		Total Comprehension Score		**55.8%**
Usable N=	356			

Non-Contextual Symbols

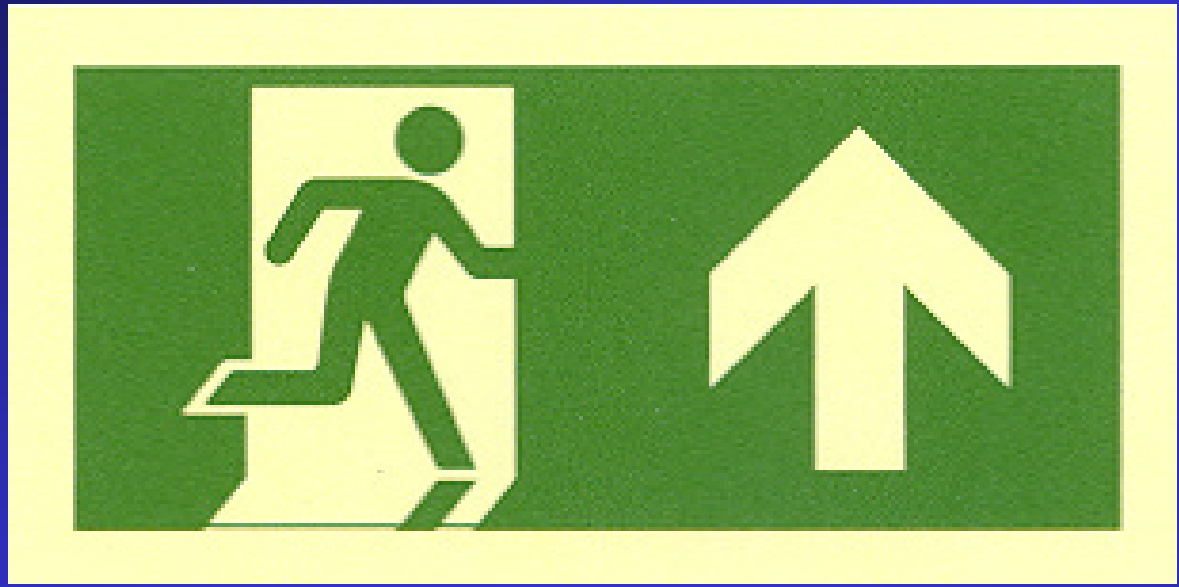
- Describe exactly what you think this symbol means.

Exit Here

Comprehension Score = 96.9%



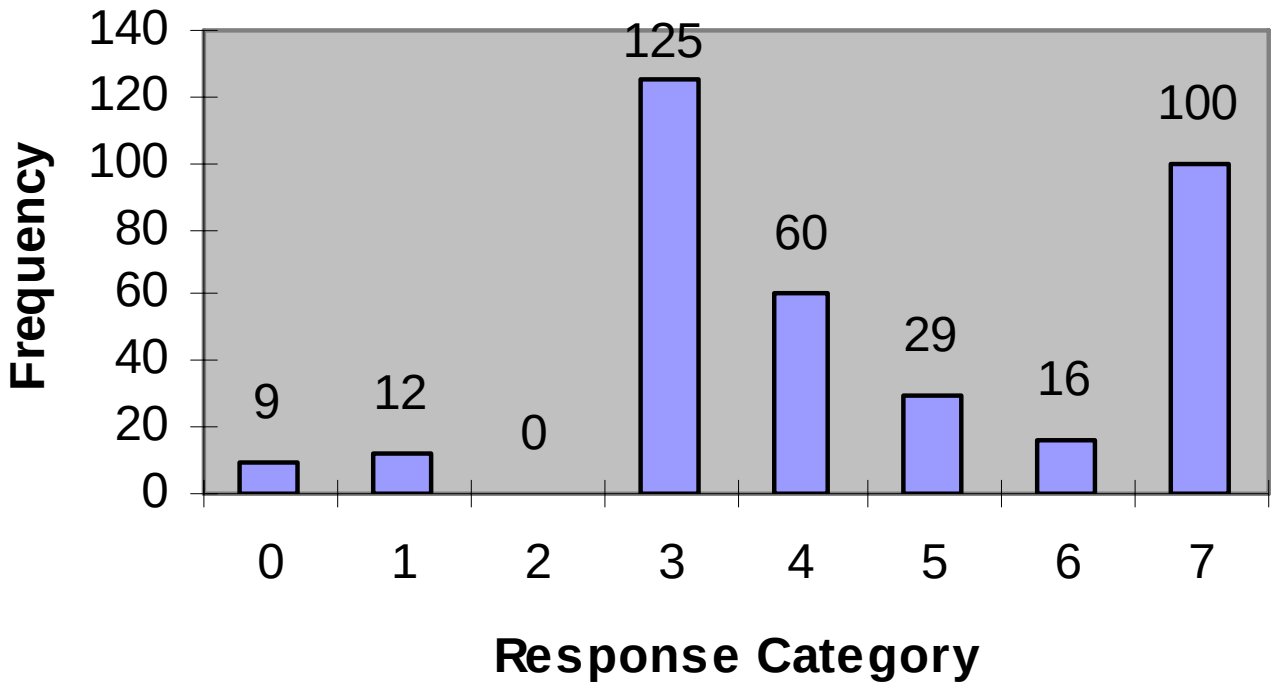
N=537



- Describe exactly what you think this symbol means.

Exit Straight Ahead

Comprehension Score = 43.3%

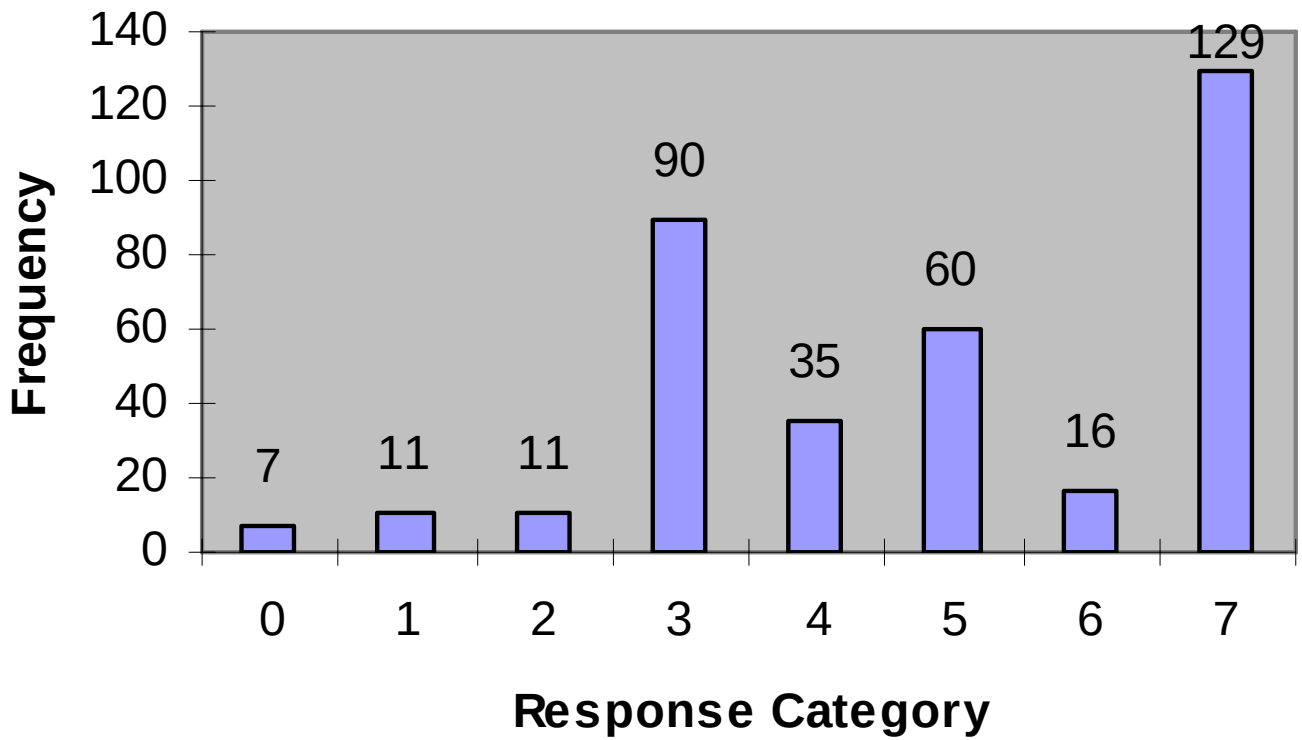


N=351

- Describe exactly what you think this symbol means.

Exit Here

Comprehension Score = 50.4%



N=359

- Describe exactly what you think this symbol means.

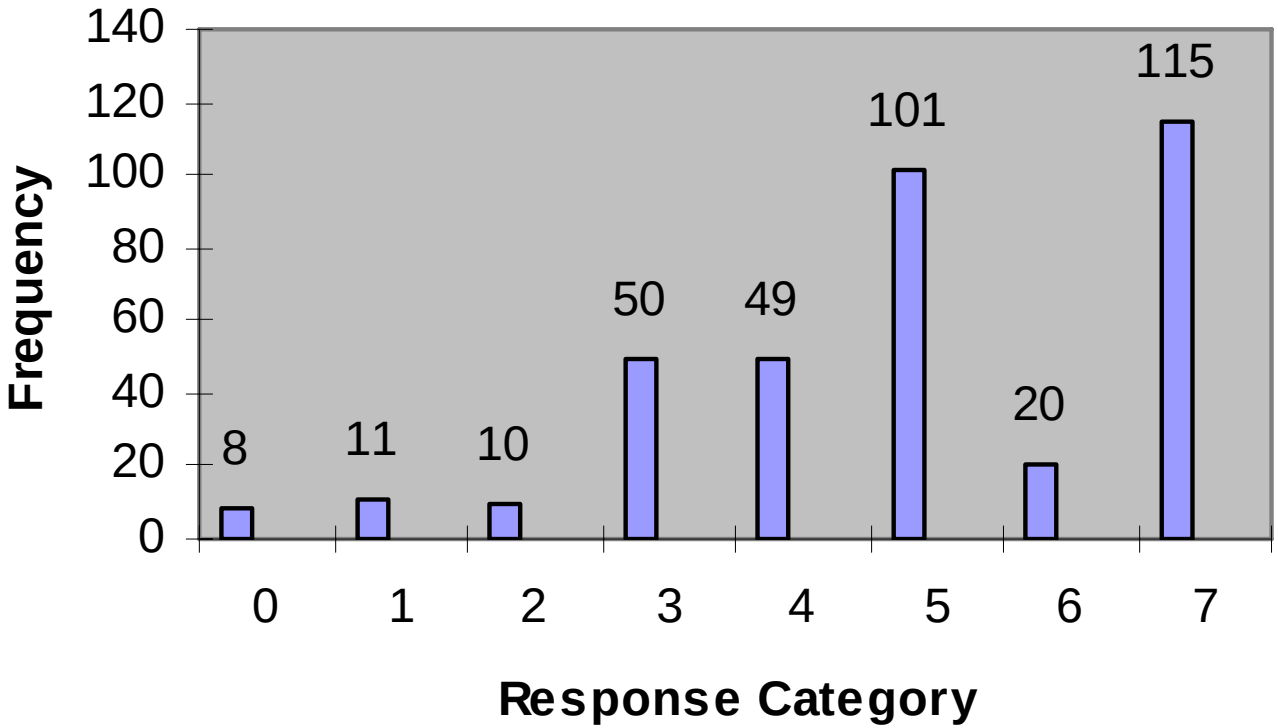
_____

_____

_____

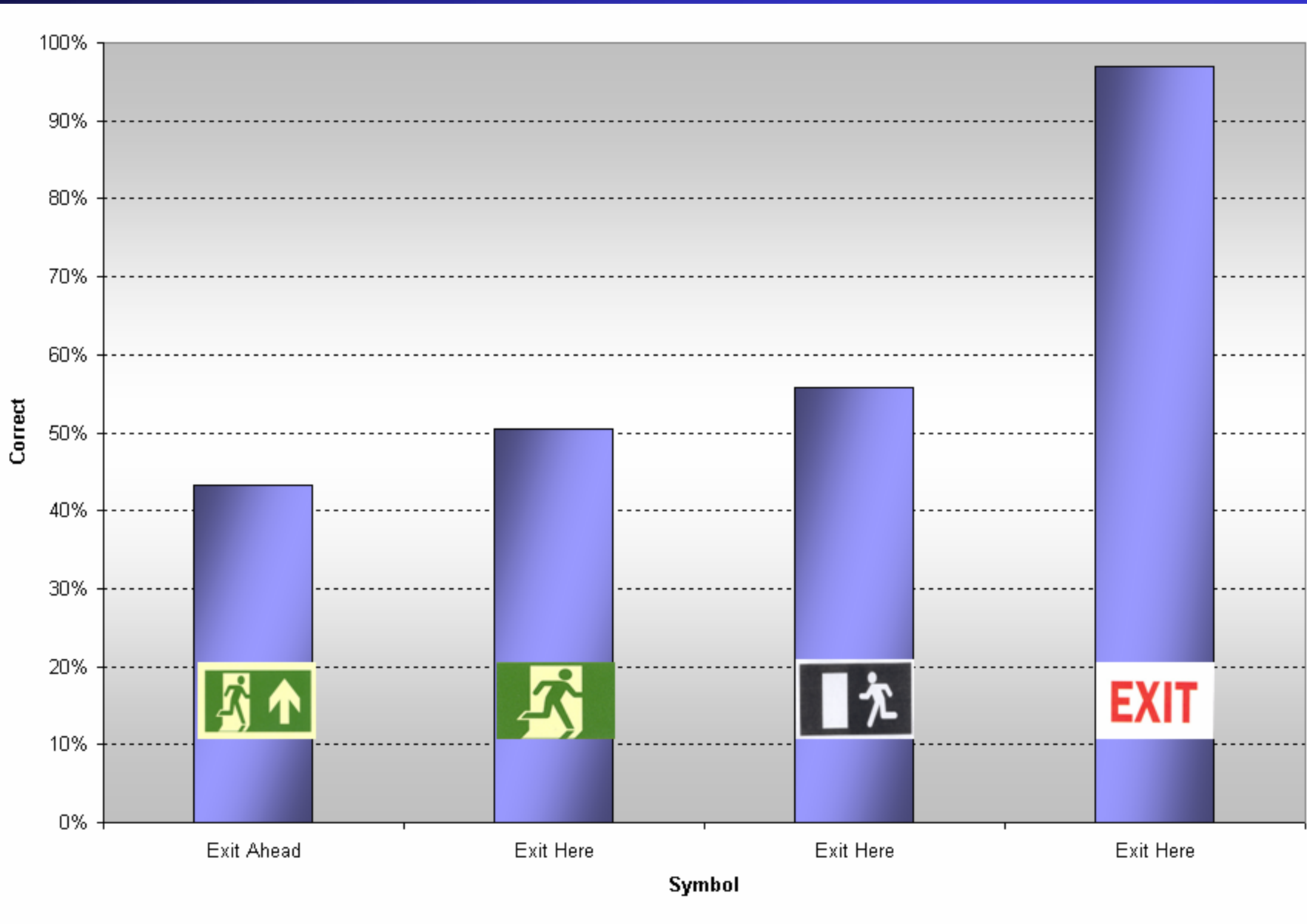
Exit Here

Comprehension Score = 55.8%



N=364

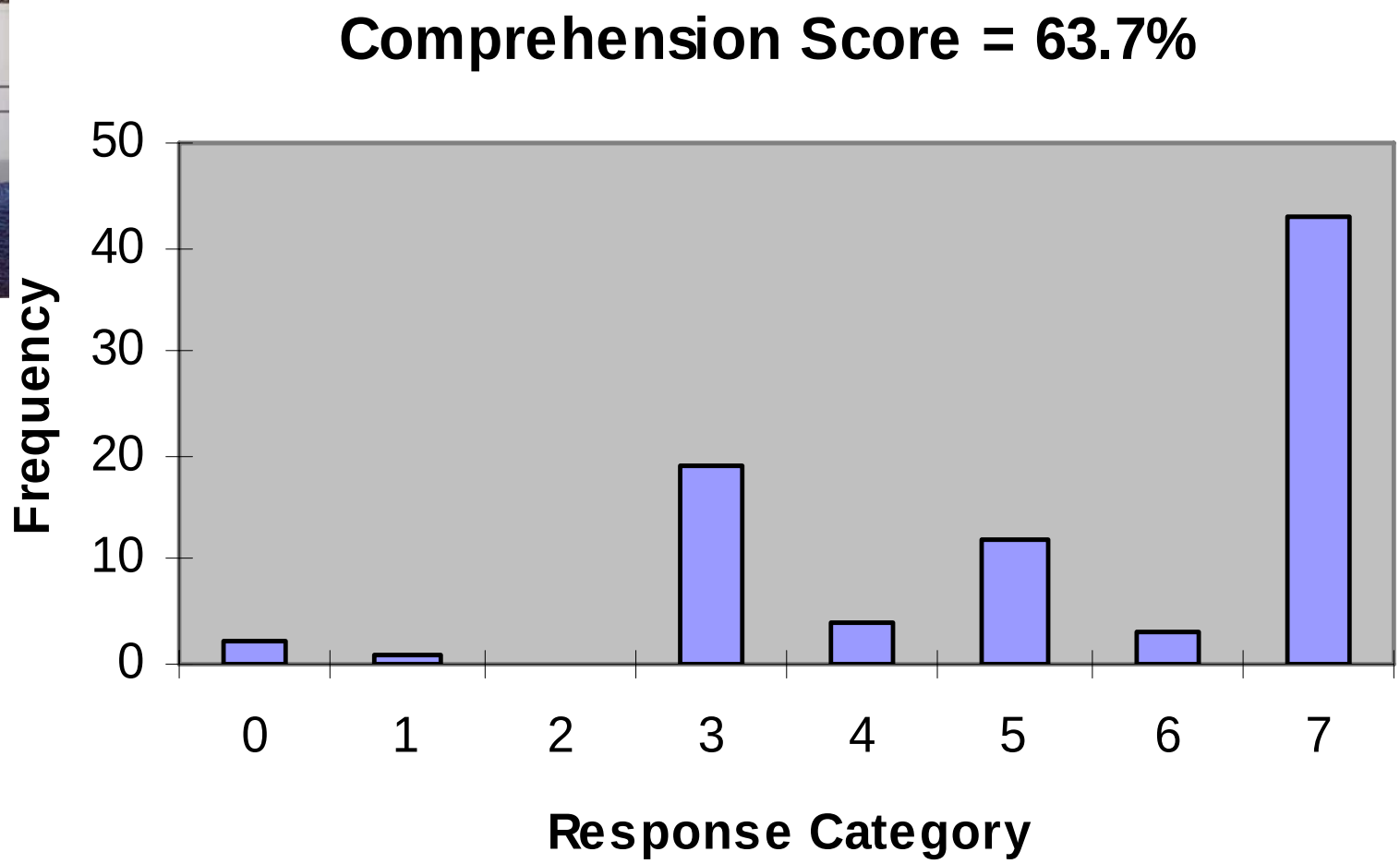
Comparison of Comprehension Scores



Contextual Symbols

- Describe exactly what you think this symbol means.

Exit Straight Ahead

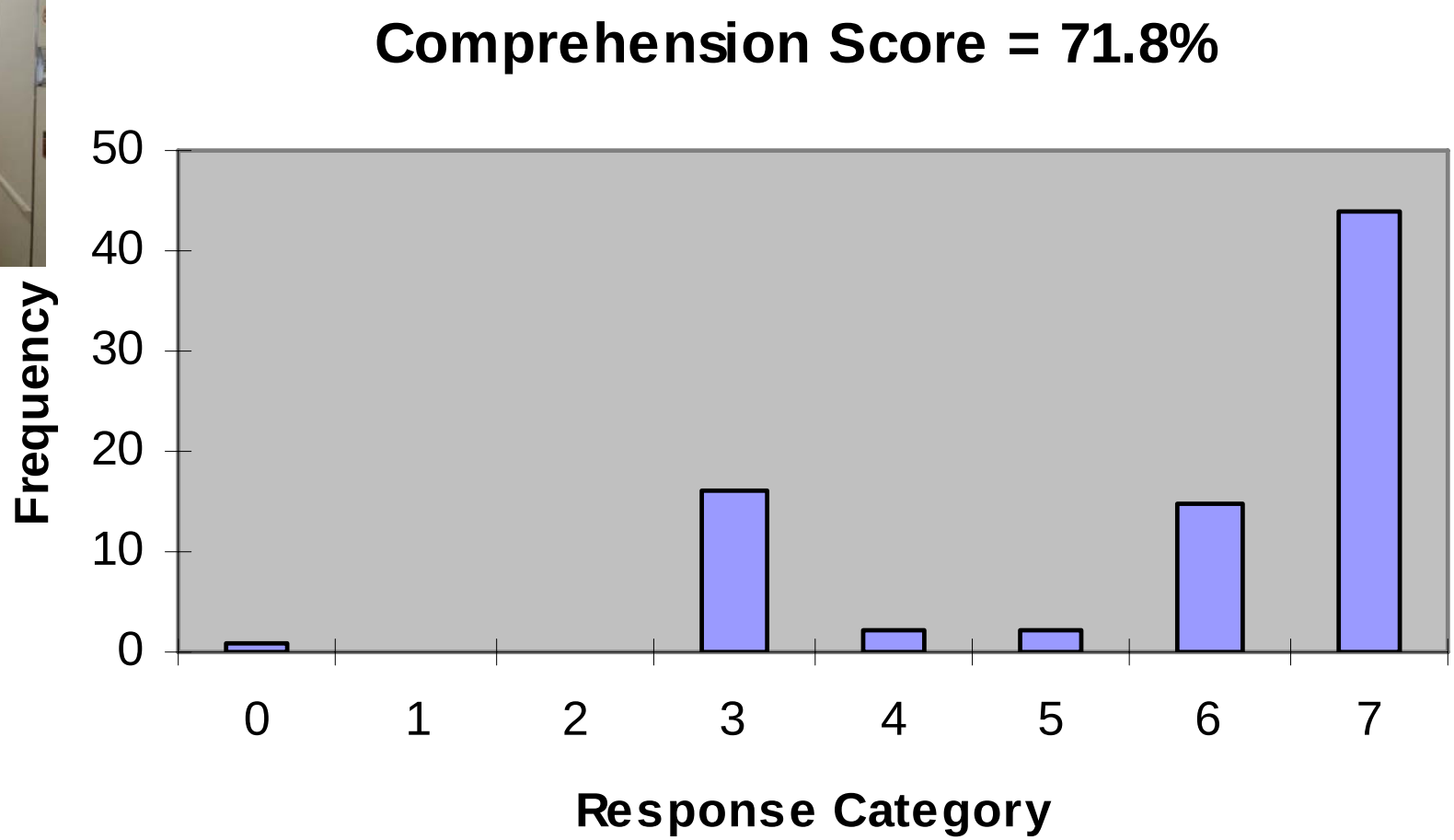


Exit Straight Ahead

emergency exit that way (straight ahead)	**(7) Certain**
this is an emergency escape	**(6) Likely**
shows where the closest exit is to where you are sitting	**(5) Arguable**
proceed in this direction	**(4) Suspect**
The floor between the compartments is not level and requires a step up.	**(3) Wrong**

- Describe exactly what you think this symbol means.

Exit Both Sides

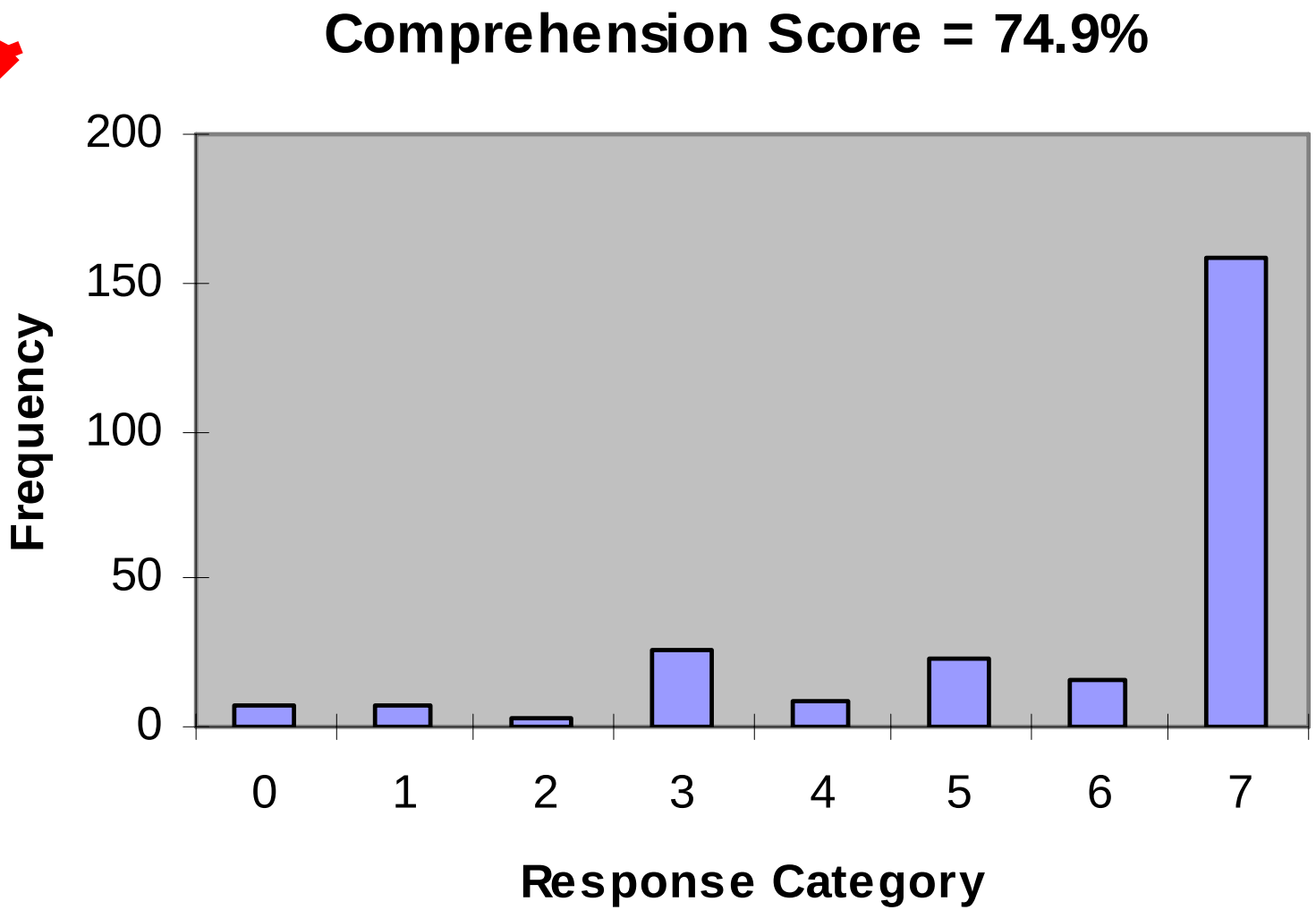


Exit Both Sides

emergency exits either side	**(7) Certain**
which directions you can go	**(6) Likely**
you can walk either way	**(4) Suspect**
Caution when approaching ...people may be moving back and forth and crossing in that area.	**(3) Wrong**

- Describe exactly what you think this symbol means.

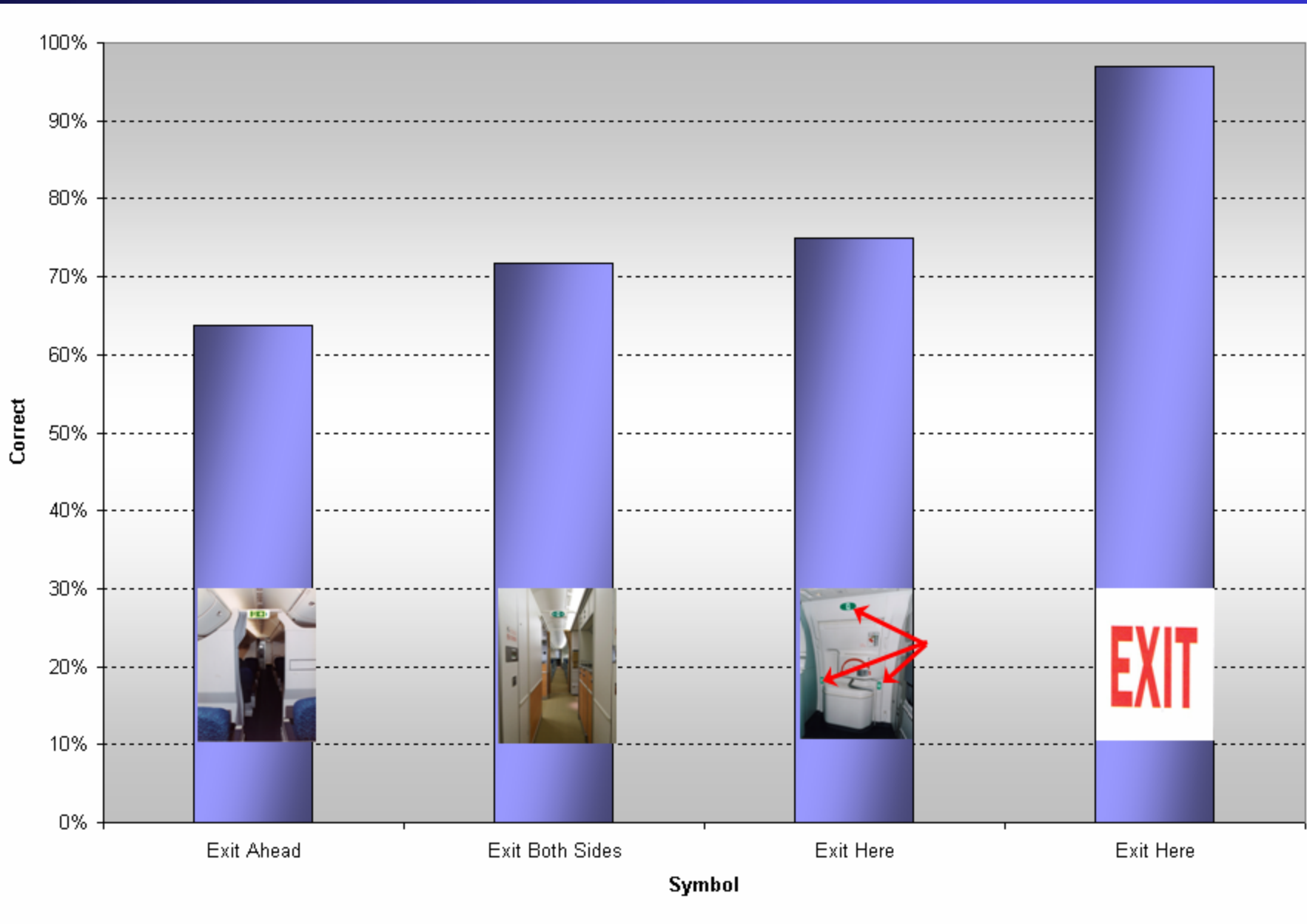
Exit Here


Comprehension Score = 74.9%
Frequency
200
150
100
50
0
0
1
2
3
4
5
6
7
Response Category

Exit Here

that's the get out door	(7) Certain
exit possibility	(6) Likely
exit is clear and free from debris. Safe to use exit since the green is indicated	(5) Arguable
go one at a time through door	(4) Suspect
no running in this area	(3) Wrong
do not leave the plane	(2) Opposite

Comparison of Comprehension Scores



Context-Based Conclusions

- Traditional Part 25.811 / .812 **EXIT** Sign Universally Understood
- Symbolic Signs Without Context Had Mean Comprehension of About 50%
- Addition of Contextual Cues Improved Mean Comprehension to About 70%
- Symbolic Signs Were Shown NOT to be Equivalent to Traditional **EXIT** Sign
- Additional Compensating Factors Would be Required to Establish an Equivalent Level of Safety

BREAK

Comprehension of Symbolic Exit Signs II: Effects of Passenger Attributes

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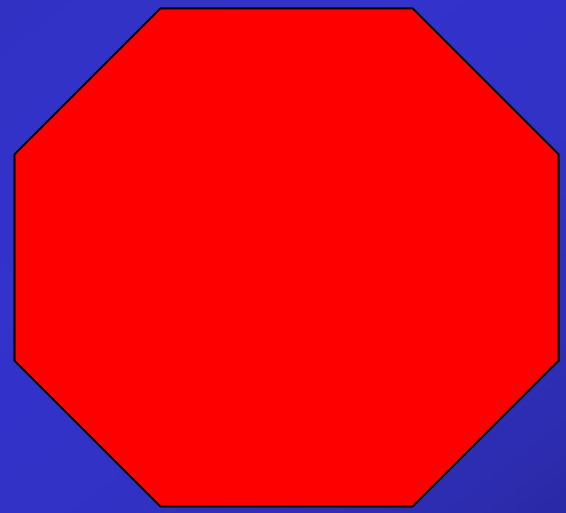
Correlation Matrix for Subject Demographics

Demographic		Gender	Age	Education	Flights
Individual Age	*r*	.055			
	p	.122			
	N	785	785		
Education Level	*r*	.078*	.734**		
	p	.029	.000		
	N	785	785	785	
Number of flights	*r*	.029	.183**	.189**	
	p	.420	.000	.000	
	N	781	781	781	781
Expertise Level	*r*	.061	.784**	.750**	.335**
	p	.090	.000	.000	.000
	N	785	785	785	781

(Pearson *r*; 2-tailed)

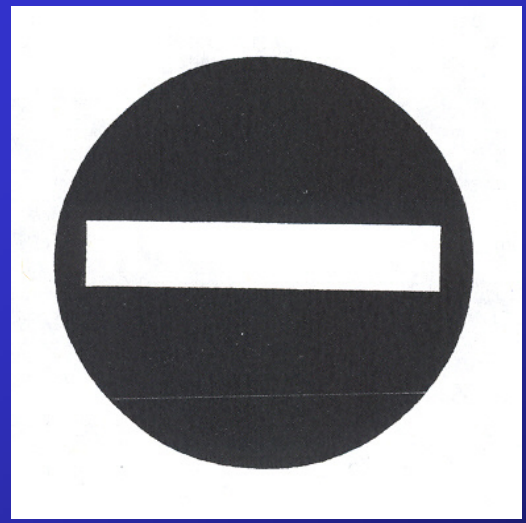
ANSI Z535 Symbols

Mean Comprehension = 94.4%



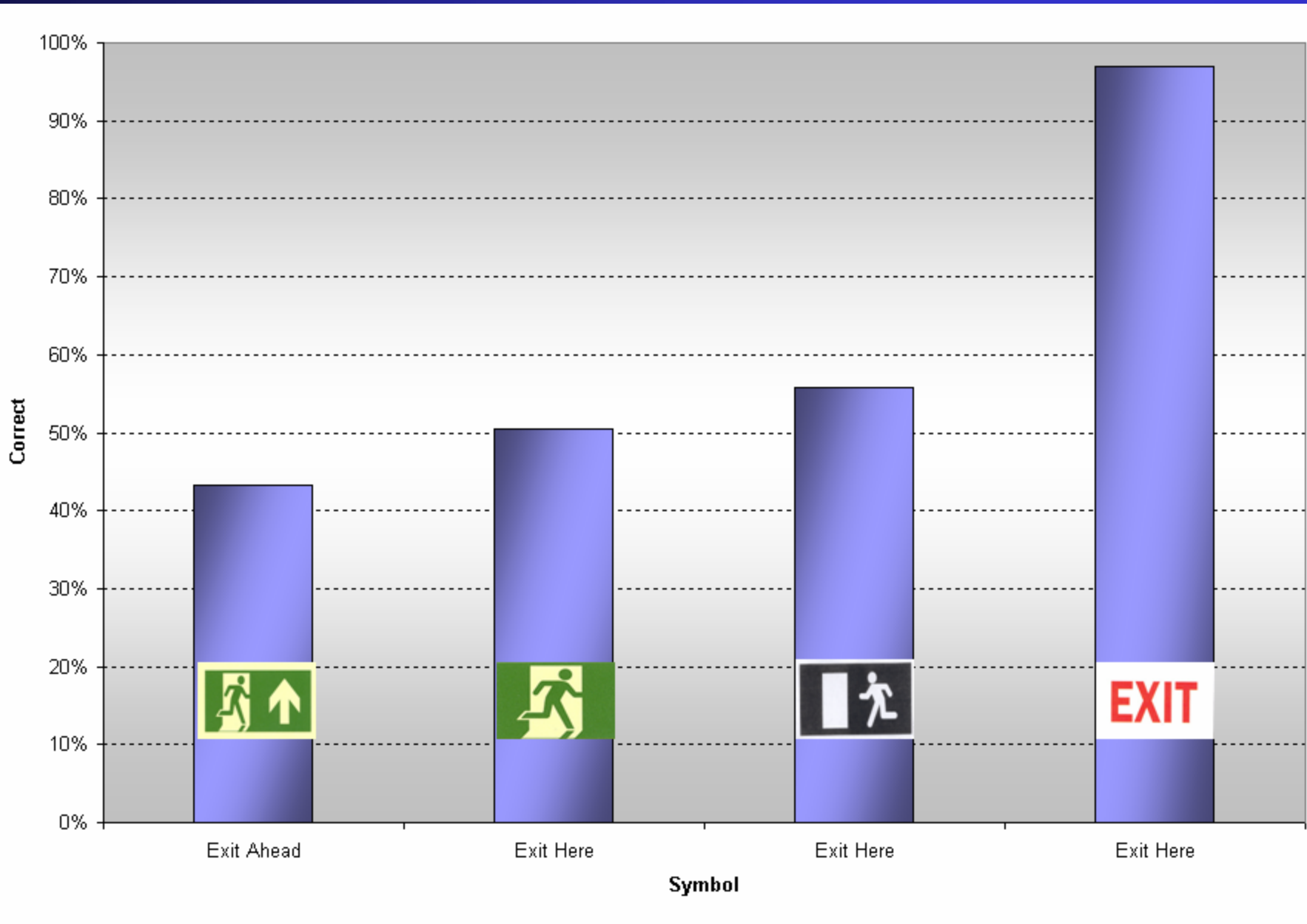
ANSI Z535 Symbols

Mean Comprehension = 51.2%



Non-Contextual Demographic Effects

Comparison of Comprehension Scores



Response Categories & Weights

Category	Response Type	Weight
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3	Wrong	**0.00**
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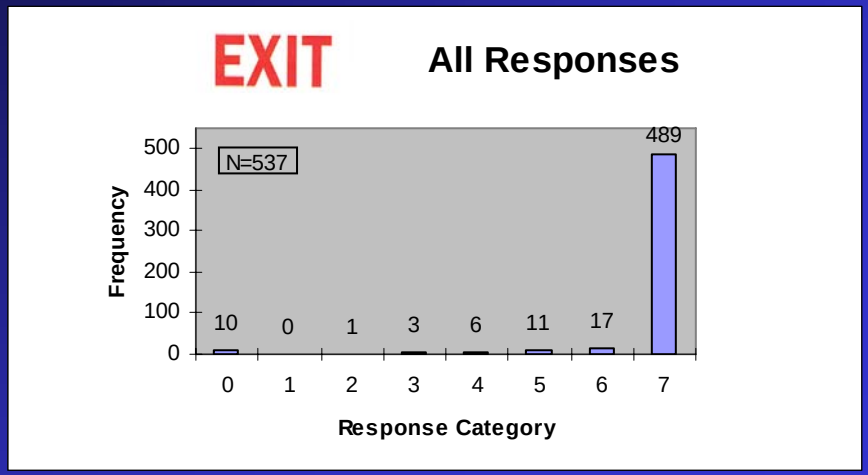
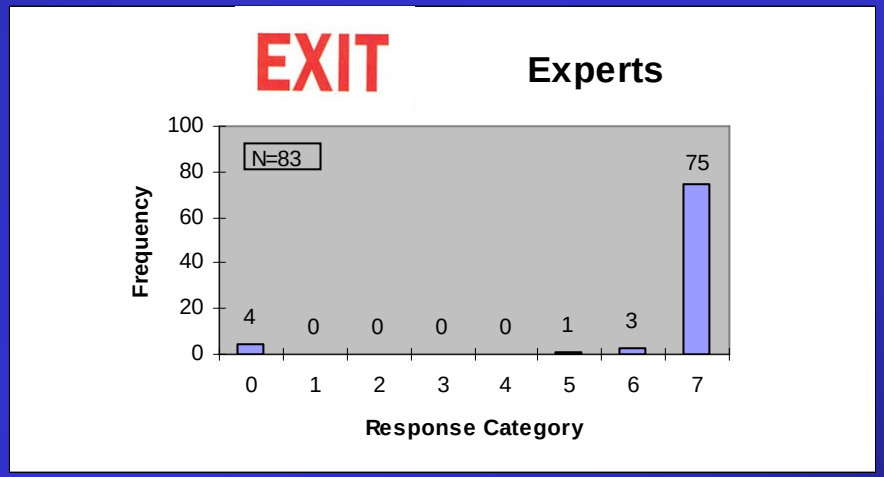
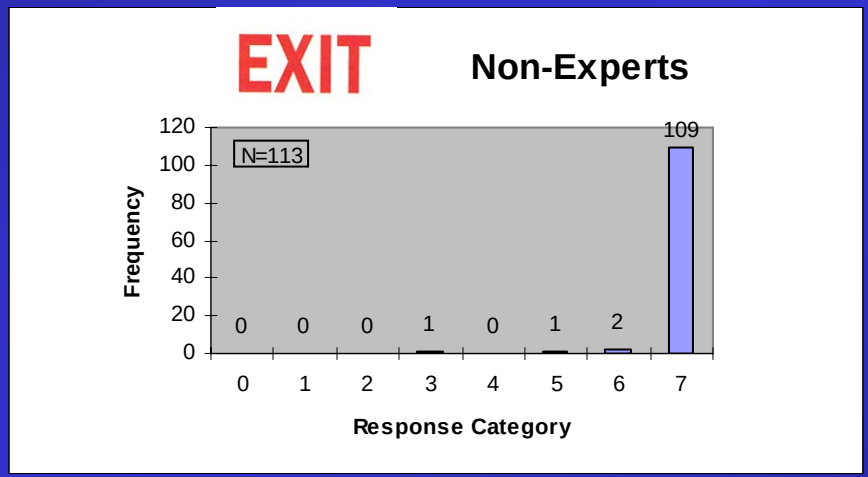
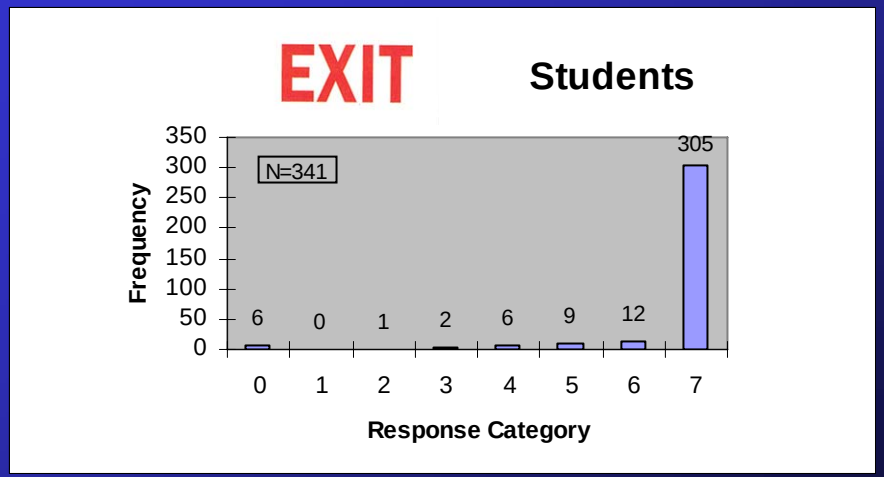
Expertise Effects

(p=.213)



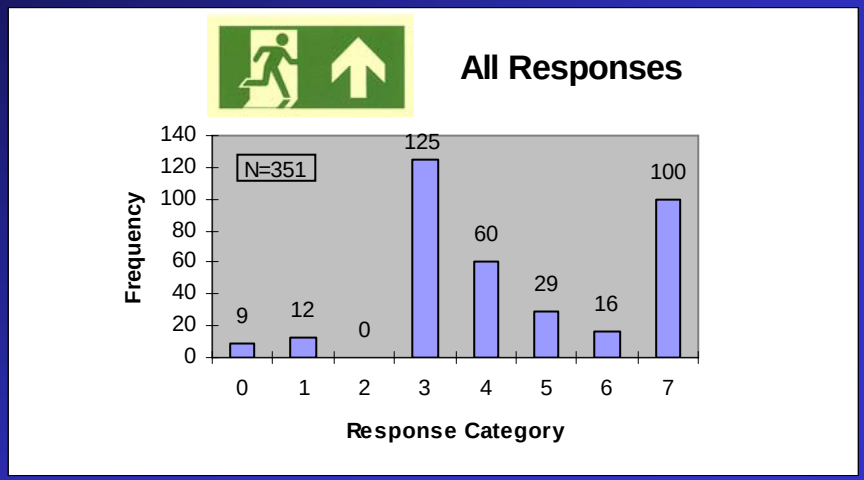


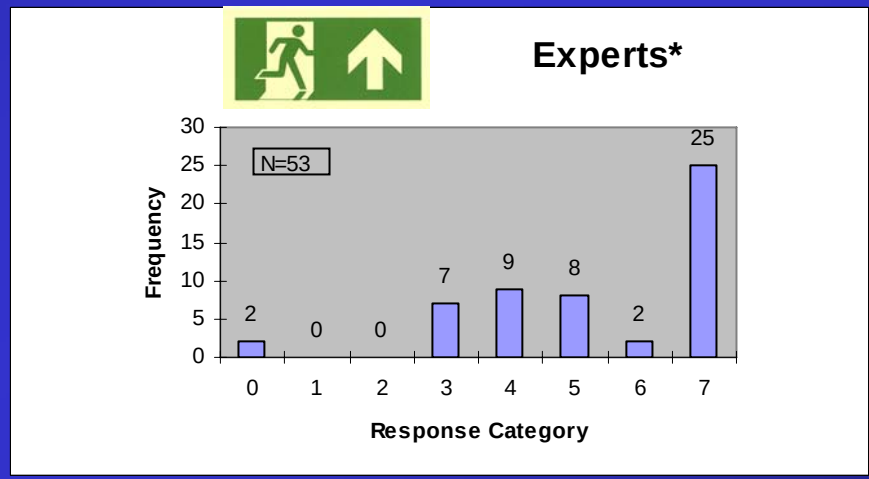


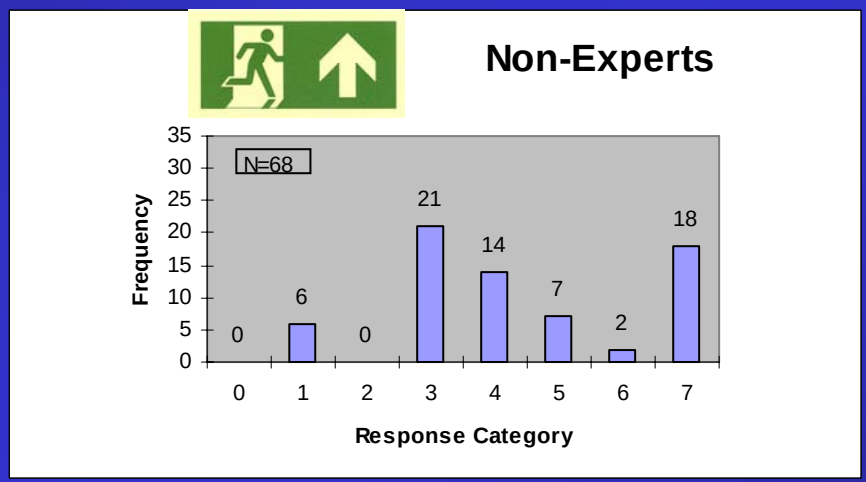


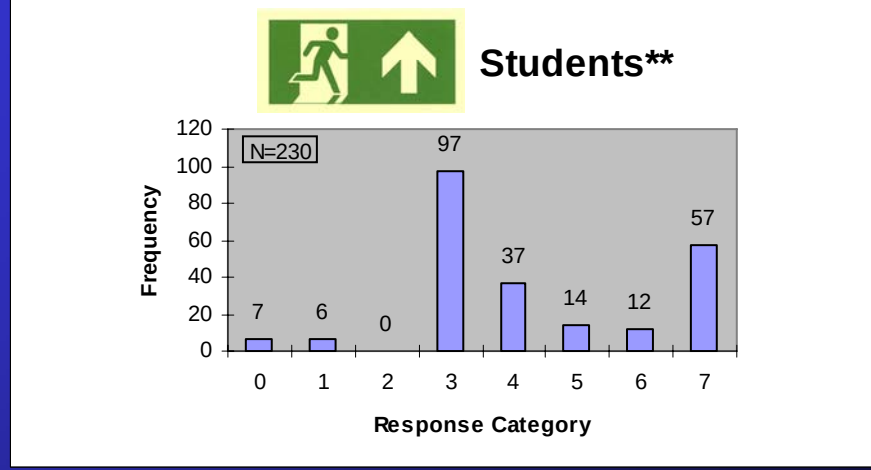
Expertise Effects

(p<.001)



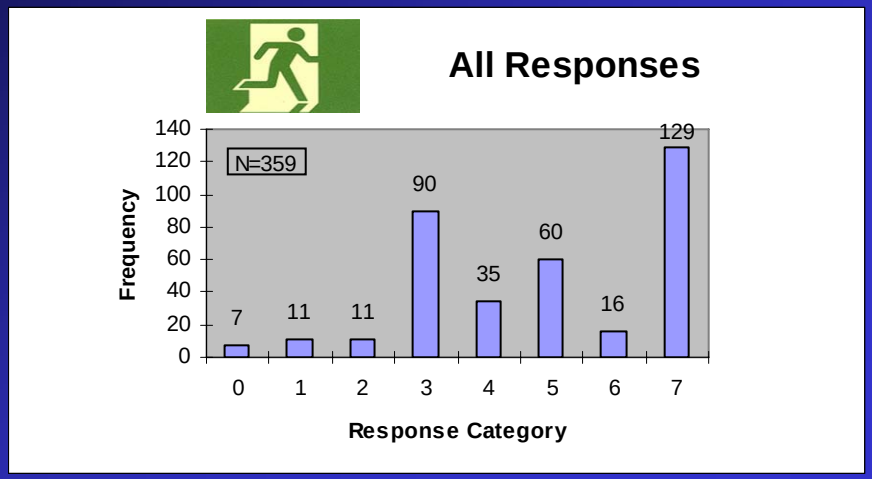


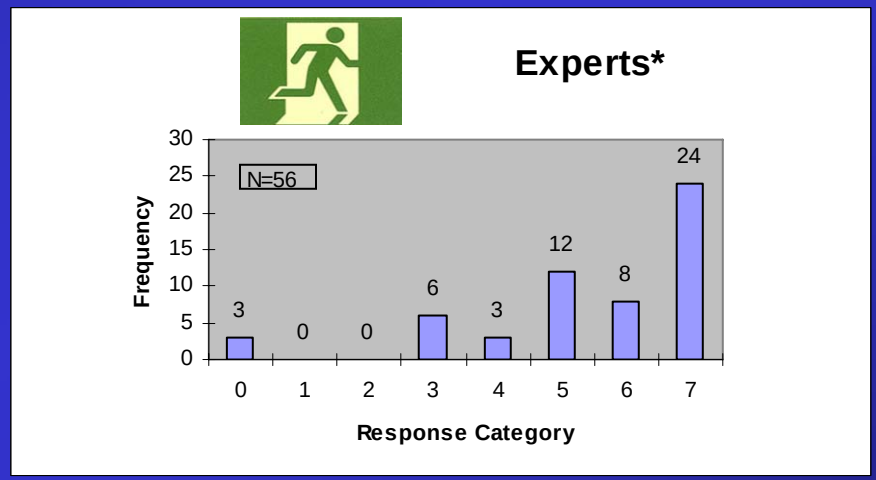


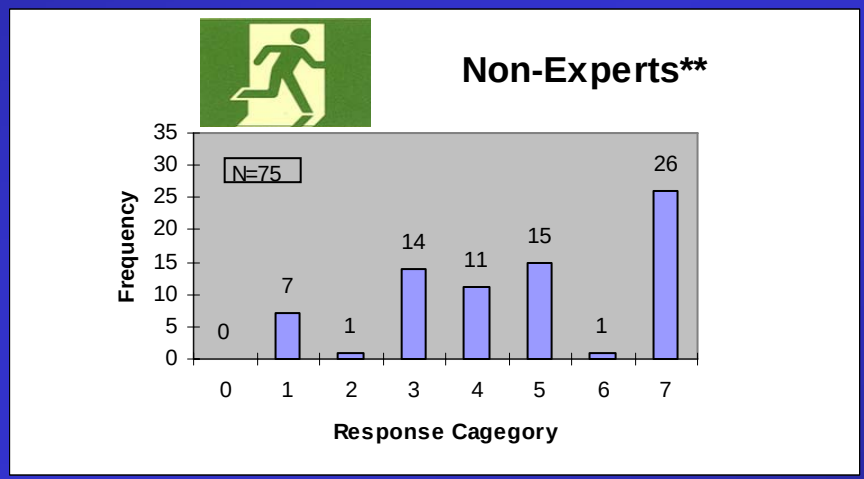


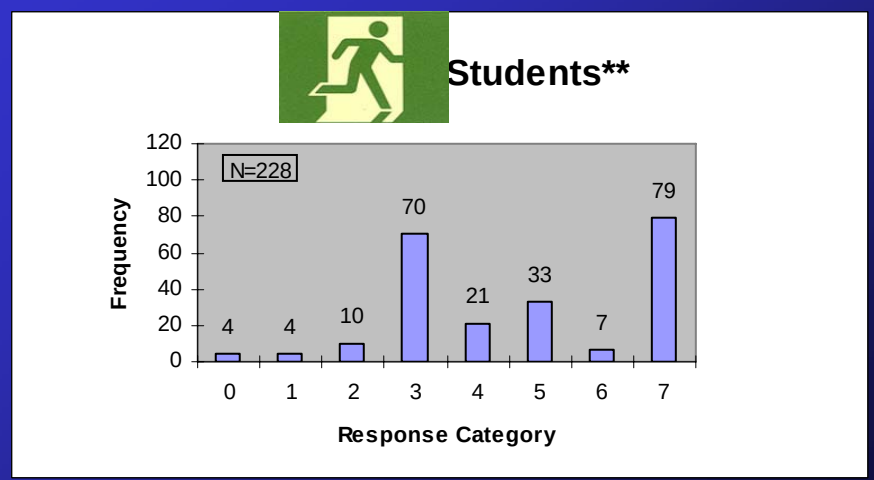
Expertise Effects

(p<.002)



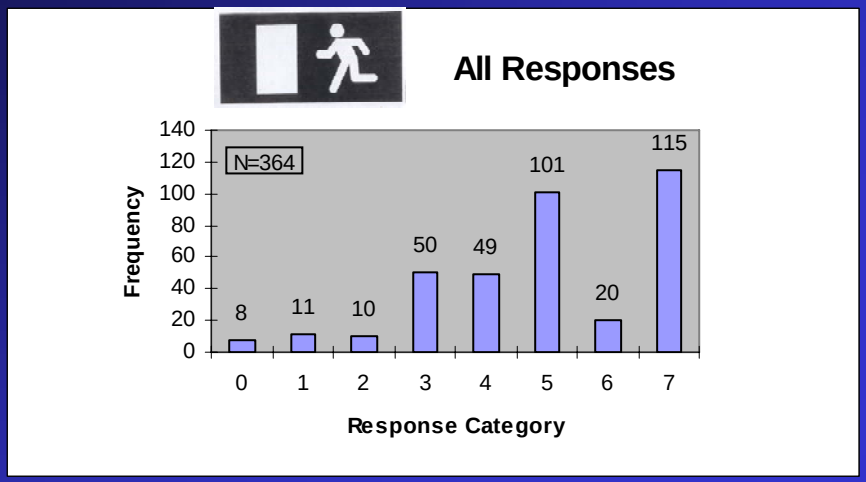


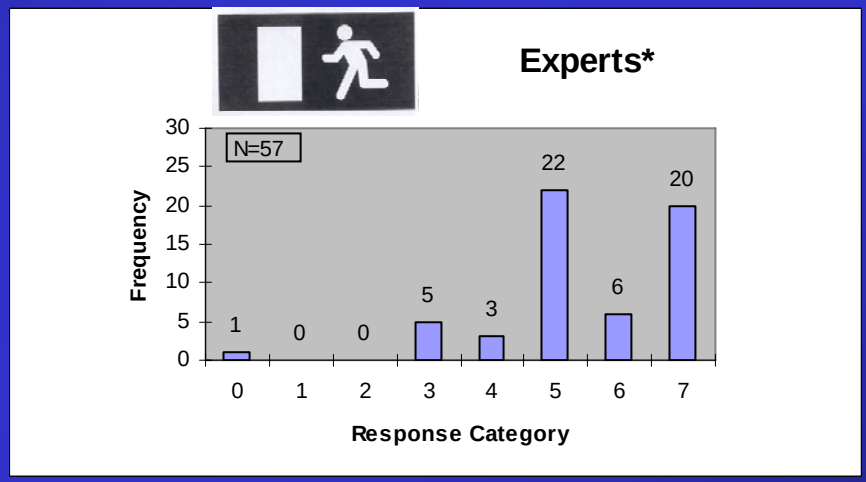


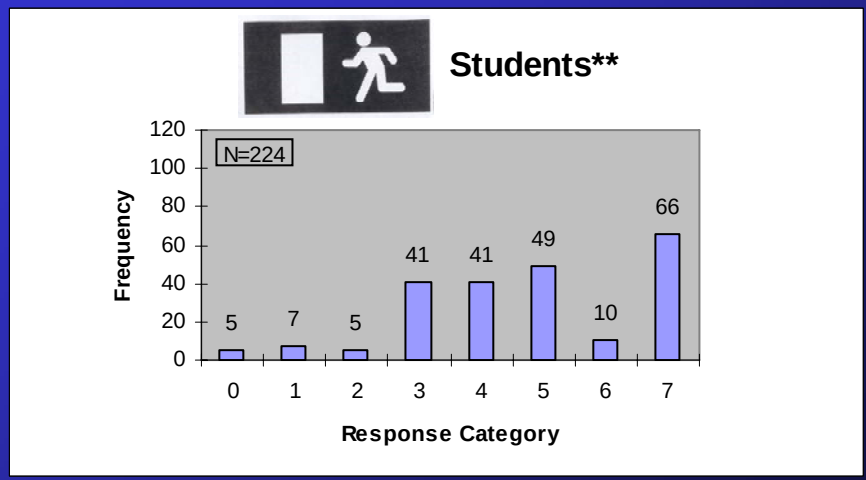


Expertise Effects

(p<.02)

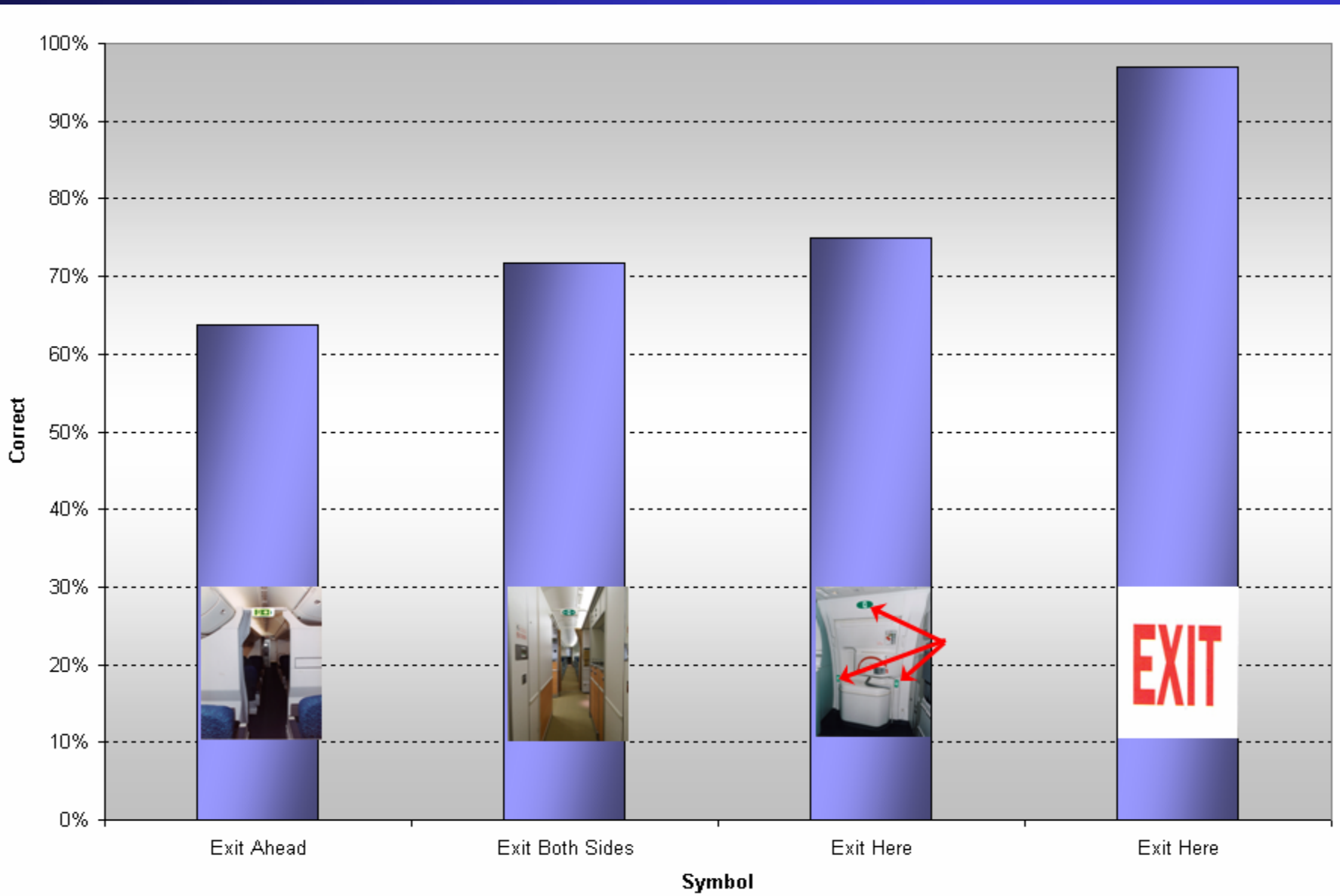




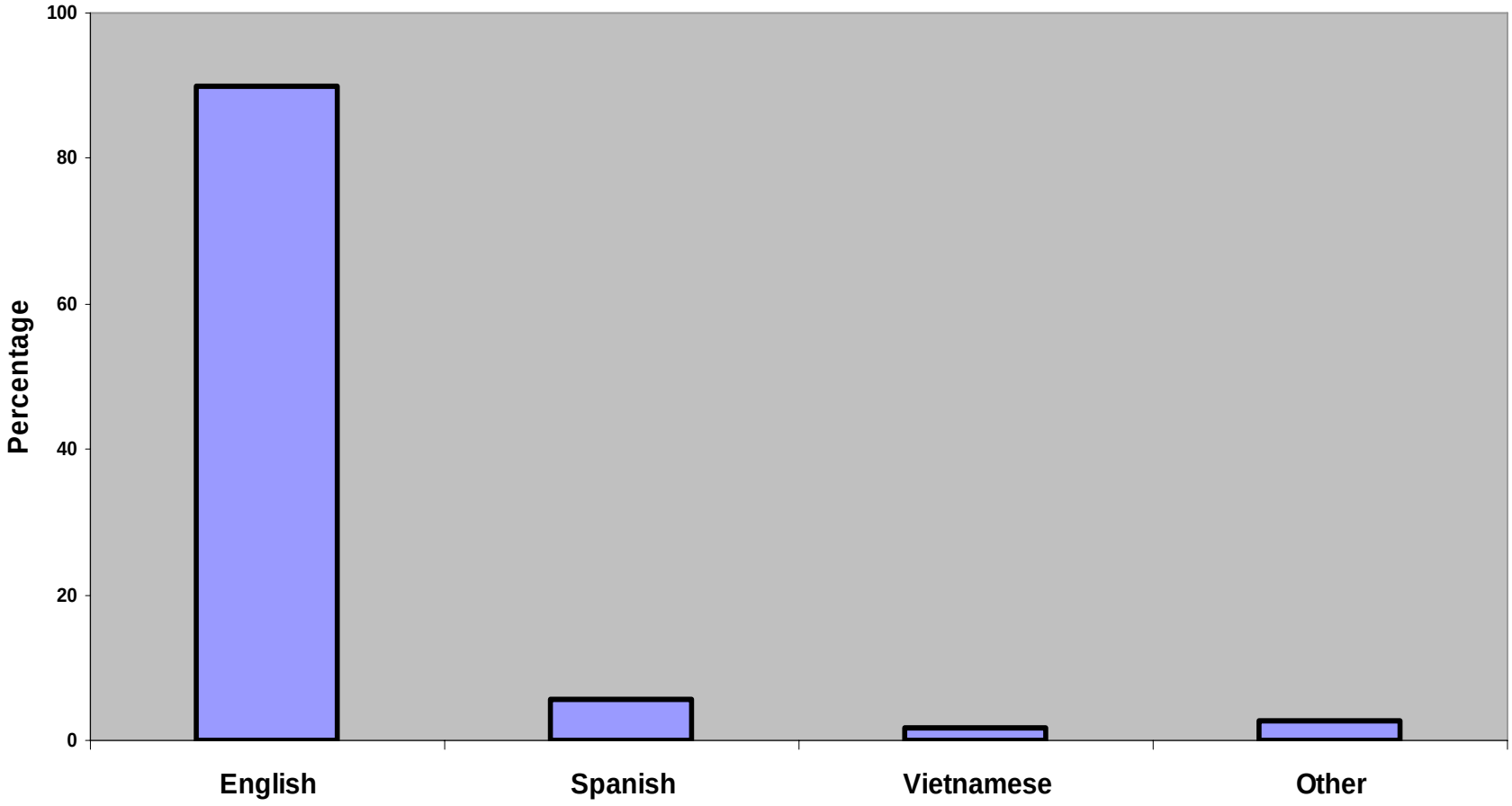


Contextual Demographic Effects

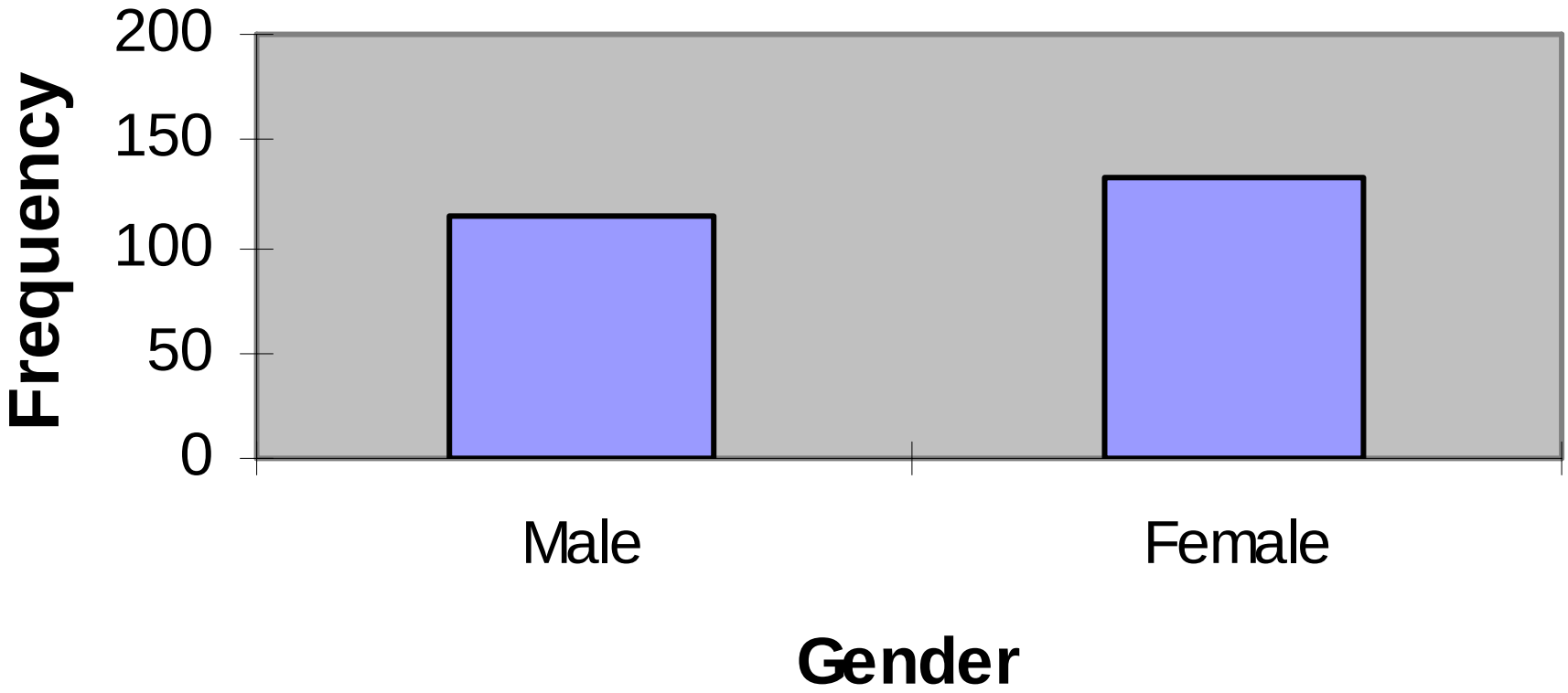
Comparison of Comprehension Scores



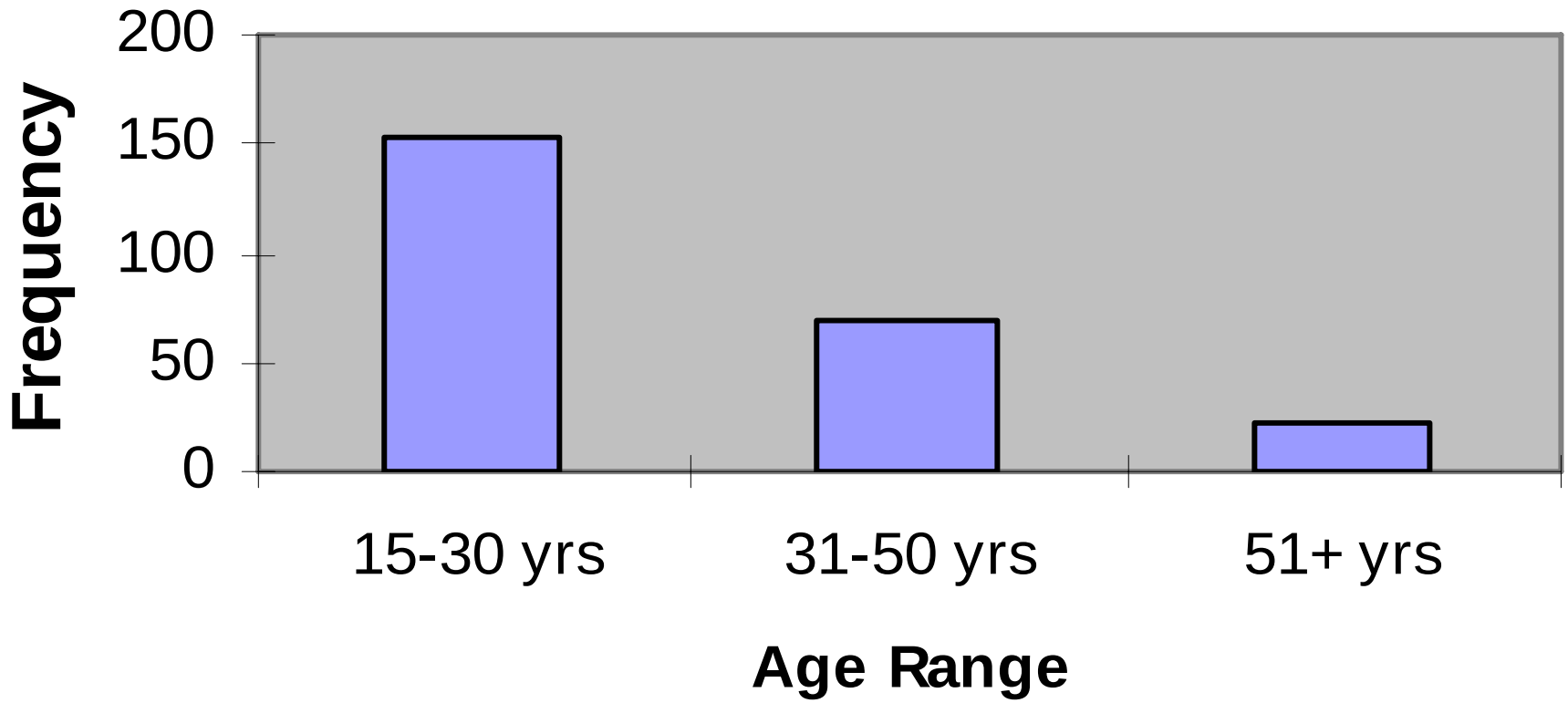
Primary Language Spoken at Home



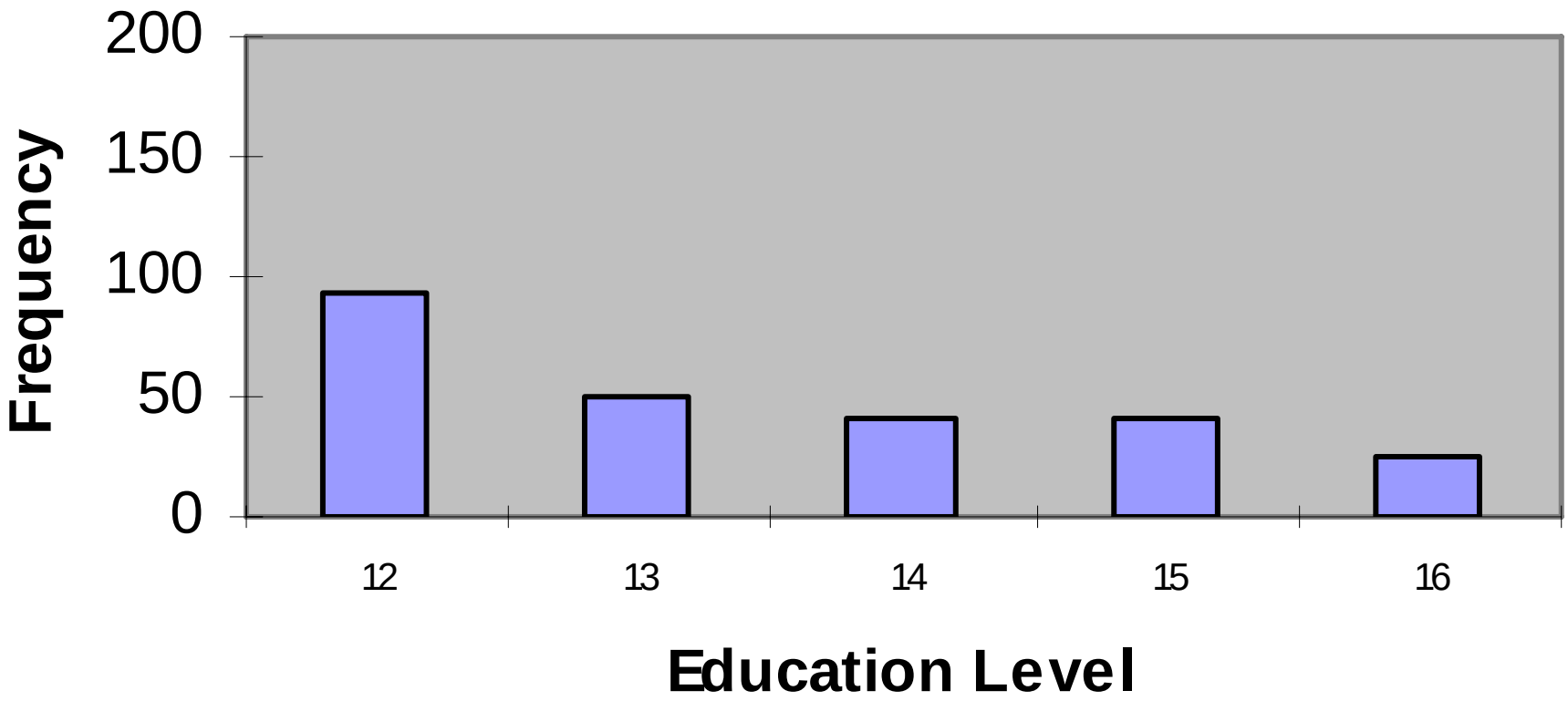
Subjects' Gender Split



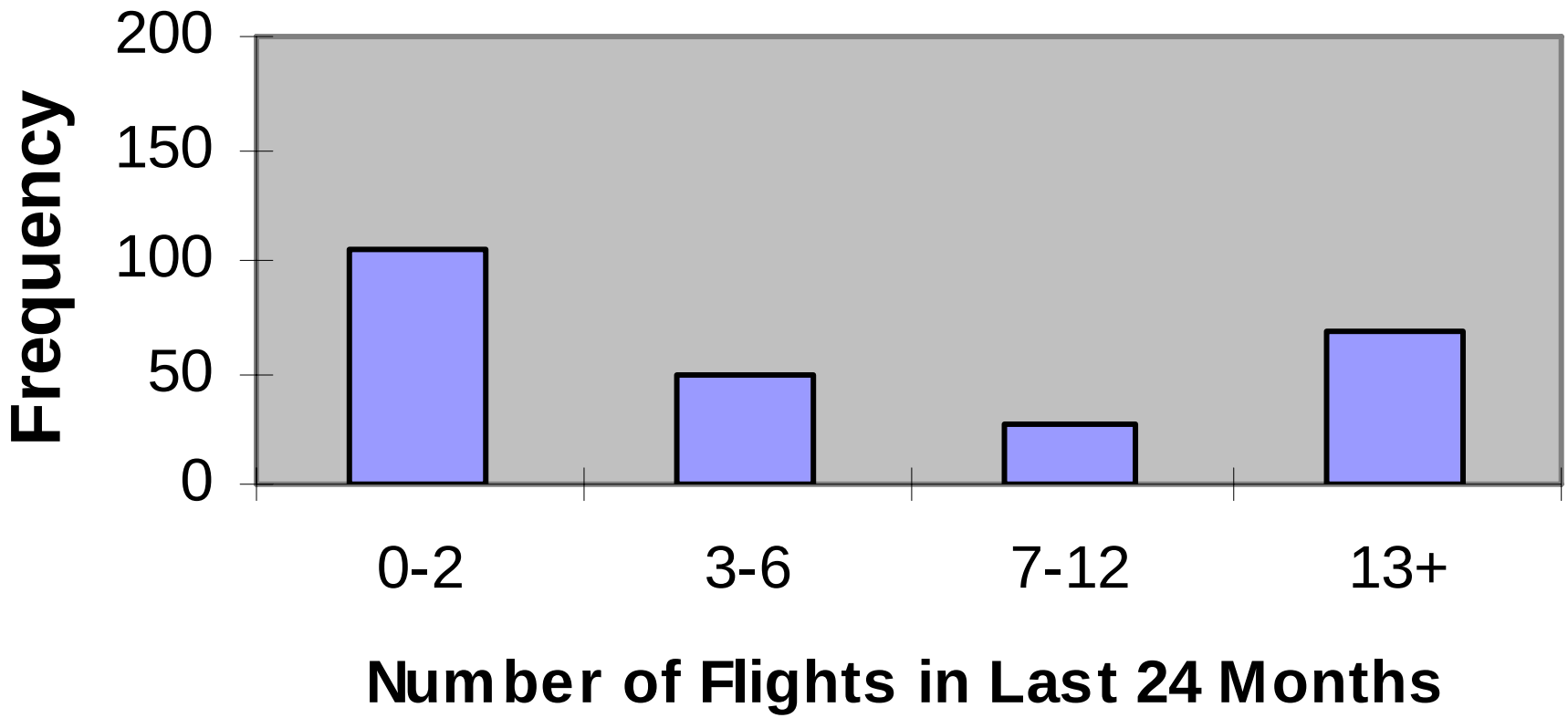
Subjects' Age Distribution



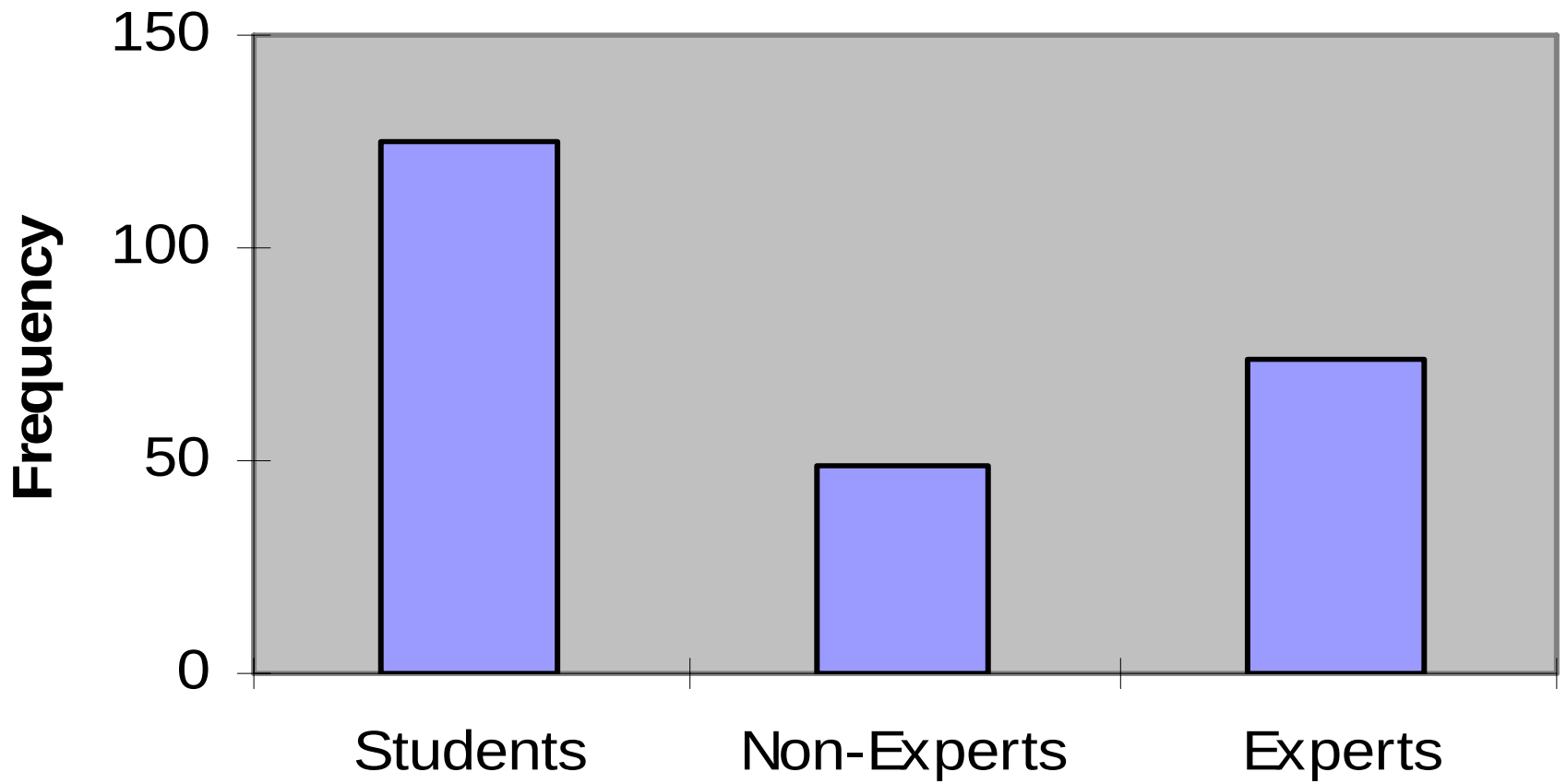
Subjects' Education Level



Subjects' Flight History

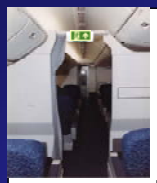


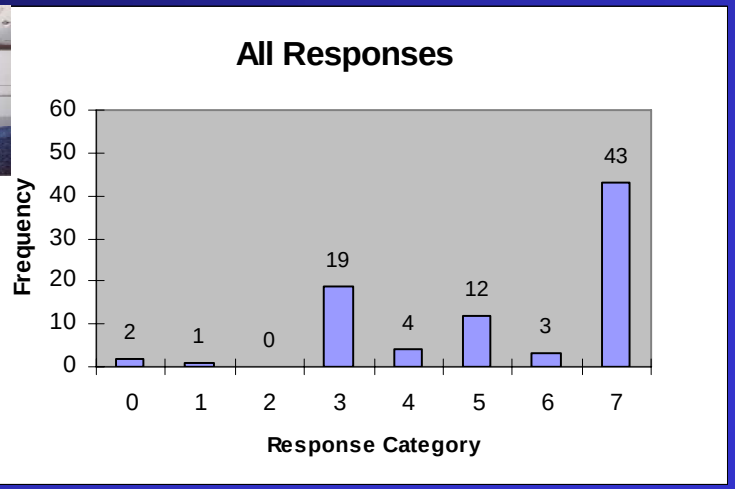
Subjects' Expertise Level

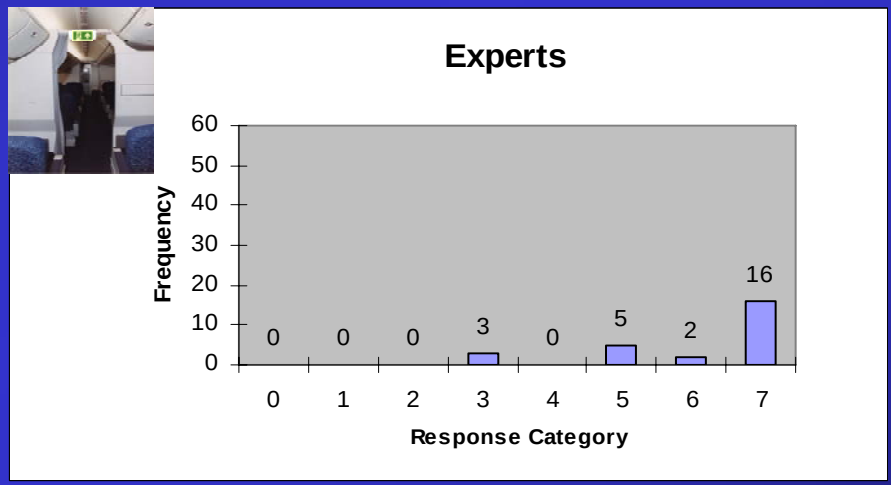


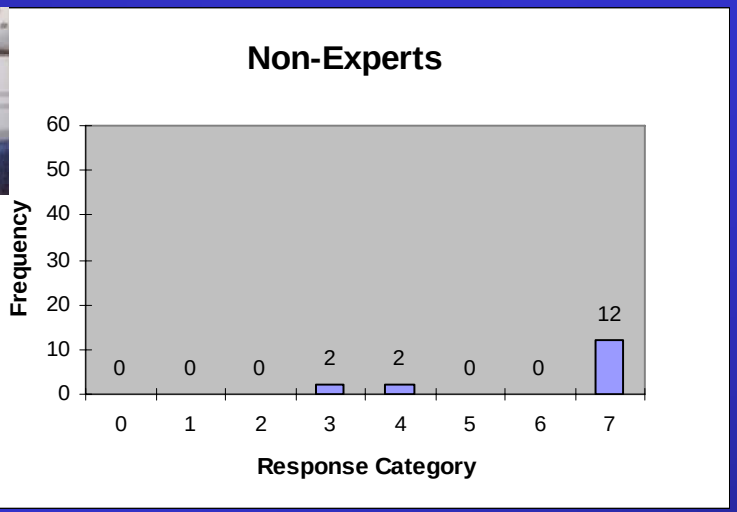
Expertise Effects

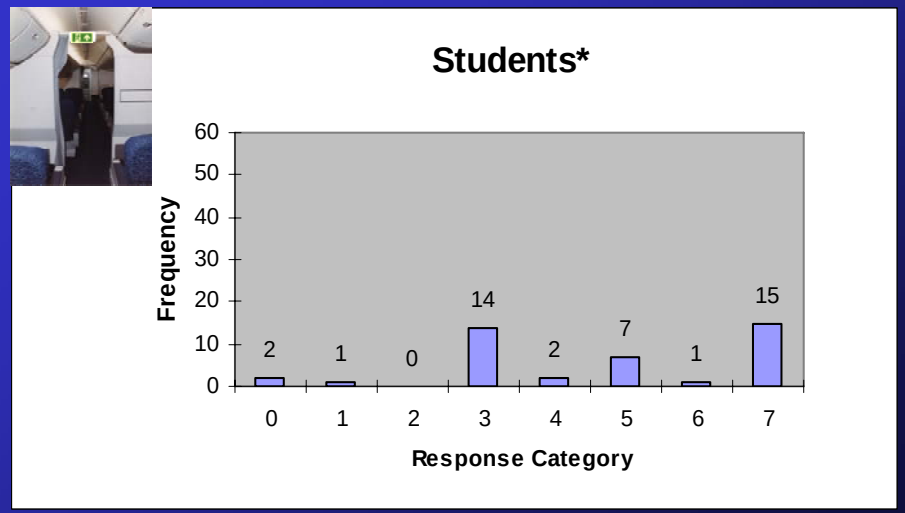
(p = .01)











Expertise Effects

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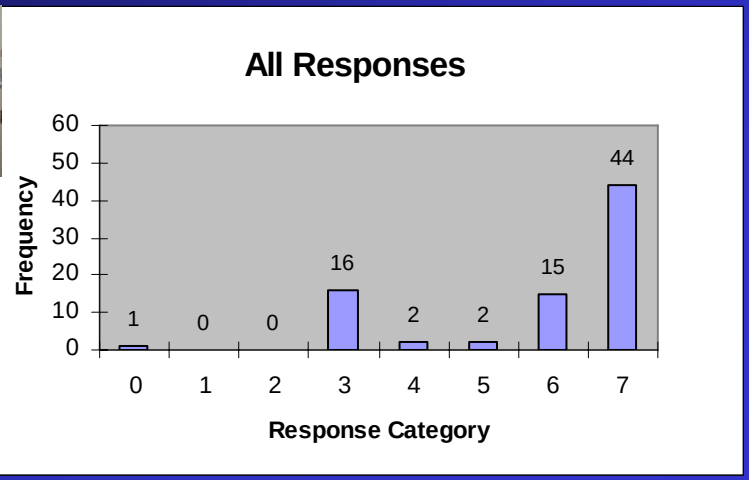

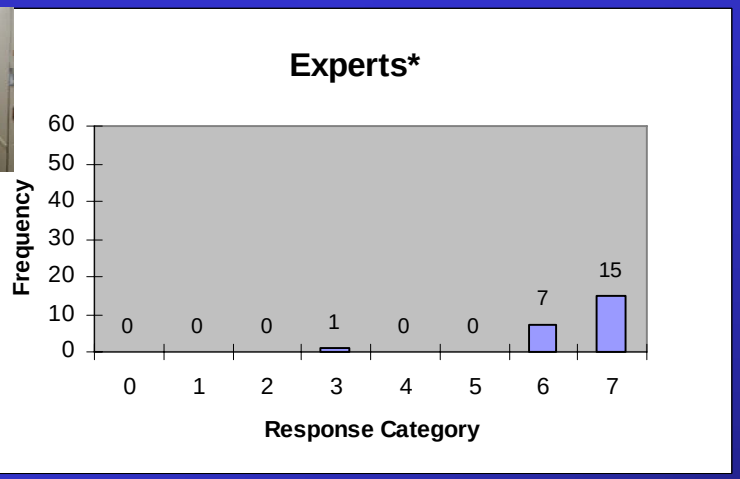

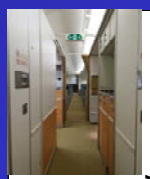

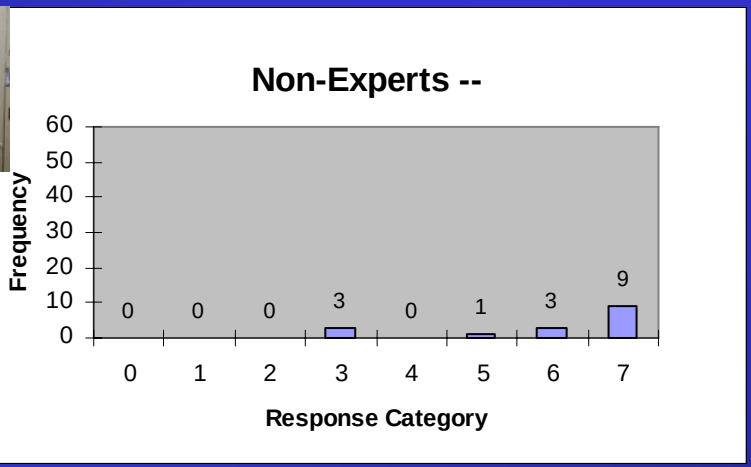

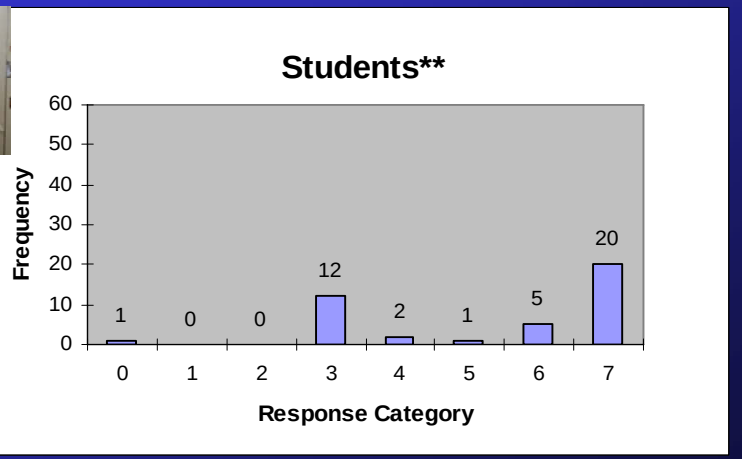

Expertise Effects

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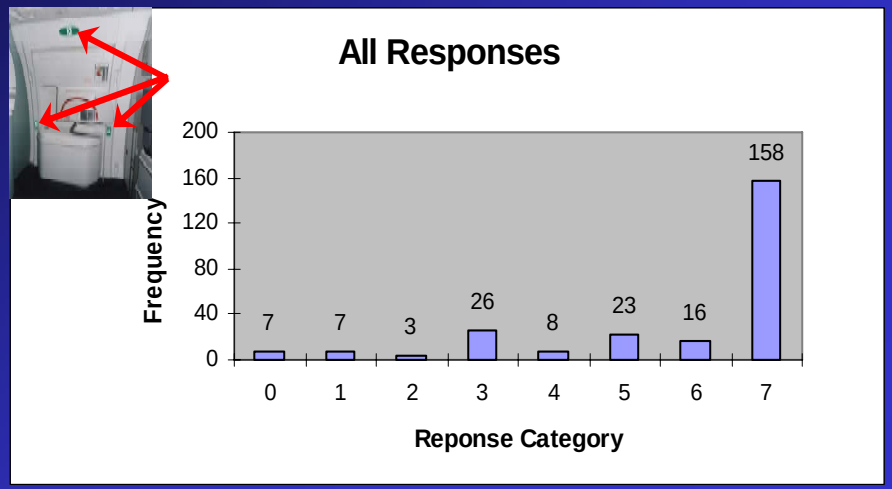

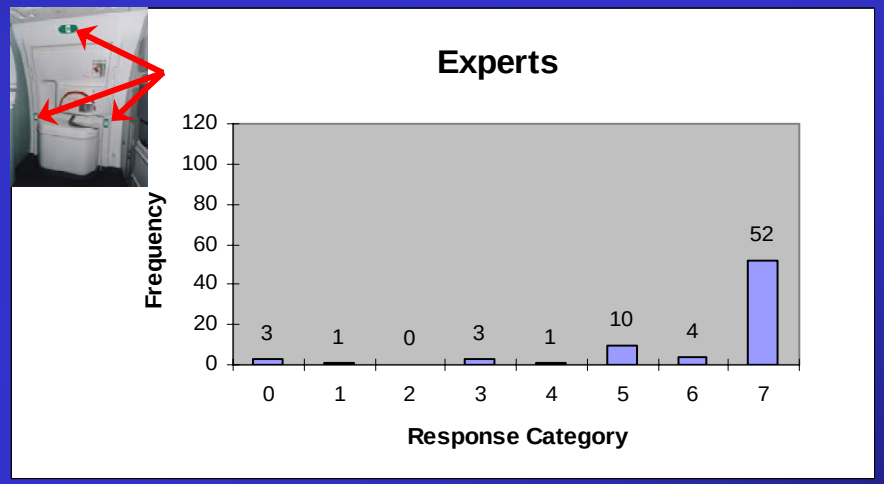

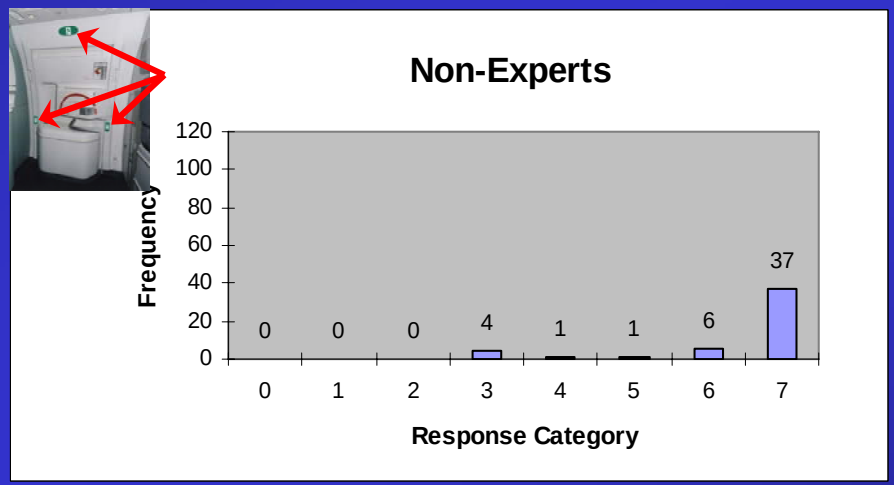

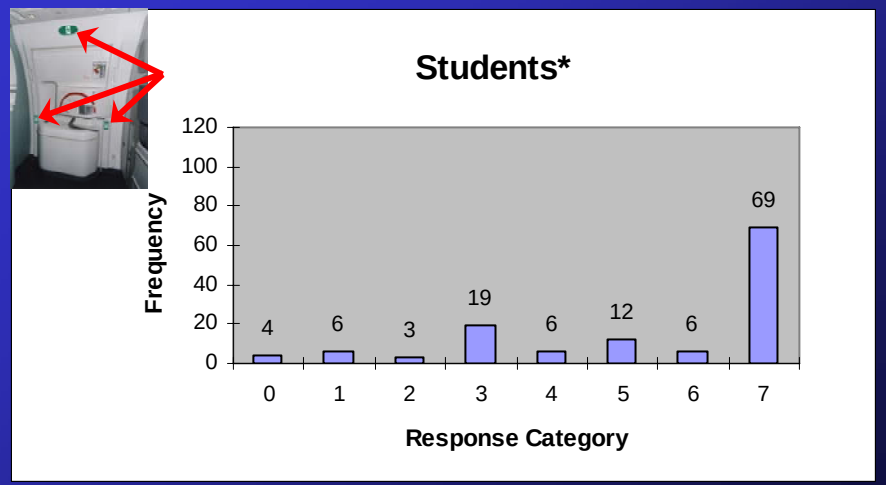

Demographics-Based Conclusions

- Inter-Correlations Existed Among All Demographic Variables
- Symbolic Exit Sign Comprehension Scores Were Positively Associated with All Demographic Variables, Particularly with Cabin Safety Expertise
- Increasing Age, Education, and (Especially) Flight History Produced Apparent Increases in “Cabin Safety Expertise”
- Trained Cabin Safety Experts Generally Showed Greater Comprehension of Symbolic Signs

Demographics-Based Conclusions

- The Results Indicate That the Cabin Safety Expertise Effects are Based on “Familiarity” with the Cabin Interior Environment
- The Results Also Suggest That Improvements in Comprehension Related to Context Are Explained by That Increased Familiarity
- Selection of Compensating Factors to Establish an Equivalent Level of Safety to the Traditional **EXIT** Sign Should be Based on the Degree to Which Such Factors Can Improve the Familiarity of Symbolic Exit Signs
- Such Factors Would Include Special Briefings, Training, and Repeated Exposure, Especially in Multiple Contexts

SeaTac Transit Station