Chi-Square Article Critique

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Chi-Square Overview

- **Is there a relationship between two categorical variables?**

H_o: There is no relationship between two categorical variables

H_a: There is a relationship

- To test the null→ we compare the observed counts with the expected counts
- If the observed counts are far from the expected counts, we have evidence against the null

Chi-Square Test

- Is the overall test for detecting relationships between two categorical variables
- Is the test statistic that makes the comparison of if the observed difference is statistically significant (observed vs. expected counts)

- $X^2 = \sum \frac{(\text{observed count} - \text{expected count})^2}{\text{expected count}}$

Nutritional knowledge, food habits and health attitude of Chinese university students

- **Objective:** The purpose of this study was to obtain a preliminary understanding of the relative level of BMI distribution of Chinese university students and to determine their nutritional knowledge and body-shape perceptions
- **Research Design:**
- Cross-sectional study
- Sample size: 540 students aged 19-24 years-old
- Sample characteristics: Medical students from Beijing University (135 men and 150 women) in northern China and Kunming Medical College (95 men and 160 women) in southern China

Methods

- Sample was administered a self-reported questionnaire
- Self-reported height and weight measurements were used to calculate BMI
- Informed consent was obtained from all participants
- Response rate: 96% (512/540)

- <u>Statistical Analysis Methods:</u>

1. t-test to measure parametric variables
2. Chi-square analyses were conducted for non-parametric variables

- p-value <0.05 was considered statistically significant

Statistical Analysis

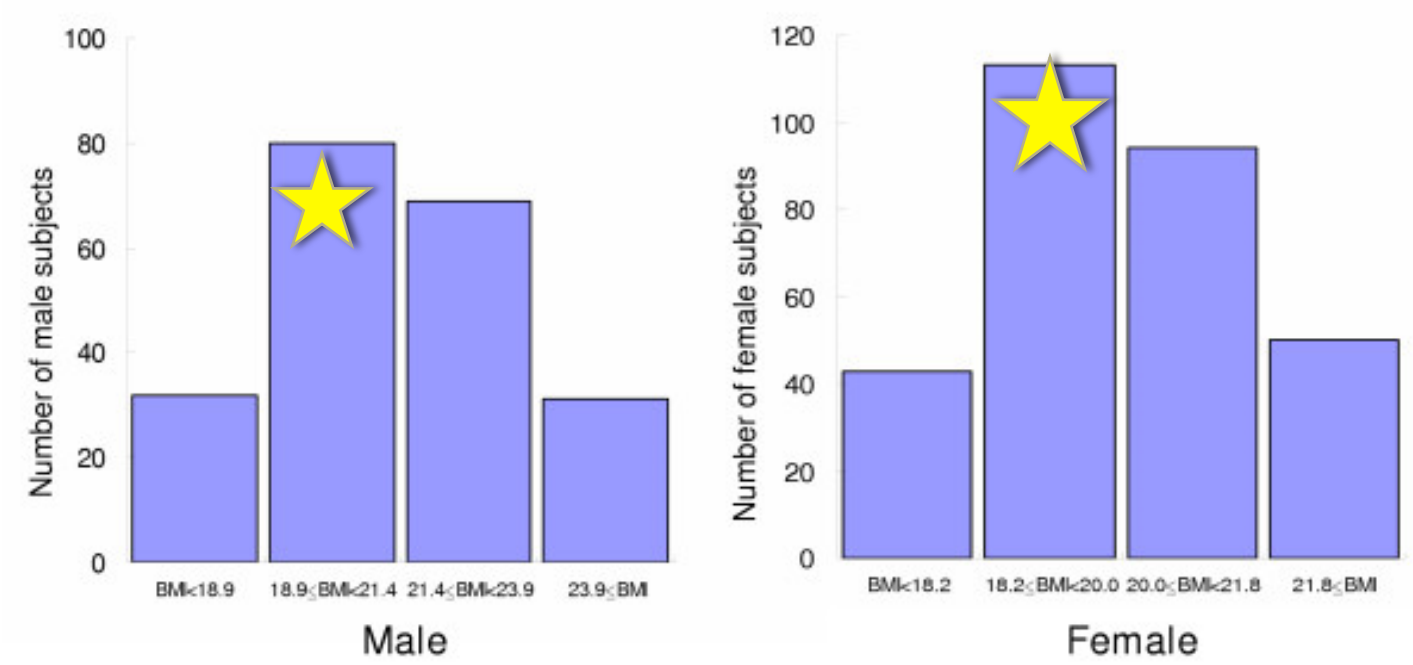
- **Independent t-test**
- Tests the significance of the difference between the means of two Independent Samples (males and females)
- Independent variable: gender (nominal)
- Dependent variables: age, weight, height, BMI (ordinal)

Variable	Total n=512	Male n=212	Female N= 300
Age (y)	20.4 ± 1.9	20.3 ± 1.7	20.4 ± 2.0
Weight (kg)	56.9 ± 9.2	63.7 ± 8.8	52.1 ± 5.9
Height (cm)	165.8 ± 7.8	172.3 ± 5.5	161.2 ± 5.6
BMI (kg/m^2)	20.6 ± 2.2	21.4 ± 2.5	20.0 ± 1.8

Table displays the characteristics of the participants

* **According to World Health Organization BMI classifications:**
- 97.1% of students were classified into the underweight or normal weight categories
- 2.5% of students were overweight (BMI>25)
- 0.4% of students were obese (BMI>30)

BMI distribution of Chinese university students



- The BMI of male and female students was categorized into 4 groups for each gender

Statistical Analysis
Chi-Square Test I

- Independent variable: gender (nominal)
- Dependent variable: lifestyle practices (ordinal)

- The lifestyle practices were compared by gender and the significant differences between sexes were determined by the Chi-square analysis

Lifestyle Practices By Gender

- Do you eat meals regularly?
- Do you always take breakfast?
- How many times do you eat meals except snacks?
- How often to you eat snacks?
- How often do you eat green, red, or yellow colored vegetables
- How often do you eat fruits?
- How often do you eat fried food?
- How often do you drink alcohol?
- How often do you eat with friends and family?
- Please state your smoking history
- What type of food do you think you should eat to have a balanced nutrition?

Chi-square analysis: Lifestyle practices by gender

Questions	Levels	Total (%)	Male (%)	Female(%)	p values
Do you always take breakfast	daily	387 (75.9)	141 (66.8)	246 (82.3)	
	three or four times per week	56 (11)	29 (13.7)	27 (9)	p<0.0006
	once or twice per week	29 (5.7)	18 (8.5)	11 (3.7)	
	rarely	38 (7.4)	23 (10.9)	15 (5)	
How often do you take snacks apart from regular meals	daily	117 (23.1)	24 (11.5)	93 (31.3)	
	three or four times per week	80 (15.8)	19 (9.1)	61 (20.5)	
	once or twice per week	148 (29.2)	58 (27.8)	90 (30.3)	p<0.0001
	rarely	161 (31.8)	108 (51.7)	53 (17.8)	
How often do you eat fruits	daily	166 (32.5)	56 (26.4)	110 (36.8)	
	three or four times per week	86 (16.8)	15 (7.1)	71 (23.7)	
	once or twice per week	138 (27.0)	54 (25.5)	84 (28.1)	p<0.0001
	rarely	120 (23.5)	87 (41.0)	33 (11.1)	
How often do you take alcohol	daily	4 (0.8)	2 (1.0)	2 (0.7)	
	two or three times per week	23 (4.6)	17 (8.1)	6 (2.1)	p<0.006
	rarely	473 (94.6)	191 (91.0)	282 (97.3)	
How often do you eat with friends and family	daily	86 (17)	25 (12)	61 (20.6)	
	three or four times per week	92 (18.2)	41 (19.6)	51 (17.2)	p<0.01
	once or twice per week	165 (32.7)	63 (30.1)	102 (34.5)	
Please state your smoking history	current smoker	36 (7.0)	29 (10.3)	7 (0.7)	
	ex-smoker	16 (3.1)	14 (4.5)	2 (2.3)	p<0.0001
	never smoke	459 (89.8)	169 (85.2)	290 (97.0)	

Statistical Analysis
Chi-Square Test II

- Independent variable: BMI (ordinal)
- Dependent variable: body shape perceptions (nominal/ordinal)

- The body shape perceptions were compared among BMI categories in males and females

Body Shape Perception and Health Consciousness

- Have you ever tried to be on a diet?
- Do you want to be slim and beautiful?
- How often to you eat snacks?
- In general, how health conscious are you?
- Do you think you should change your dietary habits?

Chi-square analysis: Body shape perception and health consciousness of Chinese students

Males:

Questions	Levels	Total (%)	<18.9 (%)	18.9-21.4 (%)	21.4-23.9 (%)	≥23.9 (%)	p values
Have you ever tried to be on a diet	Yes	27 (12.7)	1 (3.1)	3 (3.8)	8 (11.6)	15 (48.4)	P<0.0001
	No	185 (87.3)	31 (96.9)	77 (96.3)	61 (88.4)	16 (51.6)	

Females:

Questions	Levels	Total (%)	<18.2 (%)	18.2-20.0 (%)	20.0-21.8 (%)	≥21.8 (%)	p values
Have you ever tried to be on a diet	Yes	89 (29.8)	4 (9.3)	28 (25.0)	35 (37.2)	22 (44.0)	P<0.0006
	No	210 (70.2)	39 (90.7)	84 (75.0)	59 (62.8)	28 (56.0)	

Chi-square analysis: Body shape perception and health consciousness of Chinese students

Females:

Question	Levels	Total (%)	<18.2 (%)	18.2-20.0 (%)	20.0-21.8 (%)	≥21.8 (%)	p values
In general, how conscious you are of the	I want to learn more	143 (48.3)	29 (69.0)	46 (41.1)	41 (44.6)	27 (54.0)	p<0.03
	I want to learn in the future	118 (39.9)	8 (19.0)	53 (47.3)	39 (42.4)	18 (36.0)	
	I am not interested in but better to	28 (9.5)	5 (11.9)	11 (9.8)	7 (7.6)	5 (10.0)	
	I am not interested in this	7 (2.4)	0 (0.0)	2 (1.8)	5 (5.4)	0 (0.0)	

Author's Conclusions

- The majority of students were classified into the normal BMI group, with the prevalence of BMI >30 being very low in this sample
- A majority of students regularly eat three times/day and 80% of students eat vegetables and fruit twice/day

- Body figure perception was significantly different between female and male students
- Female students had a greater desire to be thin than male students
- 65% of female students with a BMI<20 (normal weight range) indicated a desire to be thin
- The promotion of healthy weight management practices should be taken into consideration when developing health education programs for students

Strengths

- Large sample size (n=540)
- Authors traveled to China to investigate dietary habits of the Chinese to facilitate the questionnaire design
- Questionnaire consisted of questions that were effective to enable researchers to draw conclusions regarding dietary habits of the students
- Informed consent was obtained from all participants
- Comparing lifestyle practices by gender

Weaknesses

- Height and weight measurements were self-reported by subjects
- Questionnaire was also self-reported
- No mention of any inclusion/exclusion criteria for the sample (restrictive eaters or major?)
- No justification for the use of statistical tests
- Information presented in the abstract portion had 'no connection'

- There was never a clear connection made 'comparing the Chinese university students to other Asian populations'

- Only a brief mention of results from a previous study examining Japanese students

Limitations

- BMI was being used as an association or predictor for habits, but was never mentioned in the 'methods'
- By 'clumping' subject's BMIs into 4 BMI categories information was lost that could have enhanced results
- By just looking at the results you don't know the subject's actual BMI's
- No justification for the BMI categories used to group participants

4 categories used:

Males:

<18.9, 18.9-21.4, 21.4-23.9, >23.9

Females:

<18.5, 18.2-20.0, 20.0-21.8, >21.8

• Classification	• BMI(kg/m2)	
•	• Principal cut-off points	• Additional cut-off points
• **Underweight**	• **<18.50**	• **<18.50**
• Severe thinness	• <16.00	• <16.00
• Moderate thinness	• 16.00 - 16.99	• 16.00 - 16.99
• Mild thinness	• 17.00 - 18.49	• 17.00 - 18.49
• **Normal range**	• **18.50 - 24.99**	• **18.50 - 22.99**
		• **23.00 - 24.99**
• **Overweight**	• **≥25.00**	• **≥25.00**
• Pre-obese	• 25.00 - 29.99	• 25.00 - 27.49
		• 27.50 - 29.99
• **Obese**	• **≥30.00**	• **≥30.00**
• Obese class I	• 30.00 - 34.99	• 30.00 - 32.49
		• 32.50 - 34.99
• Obese class II	• 35.00 - 39.99	• 35.00 - 37.49
		• 37.50 - 39.99
• Obese class III	• ≥40.00	• ≥40.00

The International Classification of adult underweight, overweight and obesity according to BMI (adapted from WHO 1995, 2000, 2004)

Practice Implications

Improvement of policies and programs:

- Universities and colleges represent a final opportunity for nutritional education of a large number of students

- Findings suggest the need for strategies designed to improve competence in the area of nutrition (health and weight management for students)

- Public demand for health and nutritional information should be taken into account when implementing strategies aimed at improving the well-being of individuals (51% of students showed a desire to learn about healthy diets)

- In order to compare obesity prevalence between ethnic groups, BMI cut-off points for different ethnic groups should be taken into account

- Asian populations are reported to have a higher body fat (%) at a lower BMI compared to Caucasians
- The WHO expert consultation reported that BMI in Asian populations is related to disease at a lower level

Further Research

- Comparing health, nutritional knowledge and dietary behavior across different ethnic student populations
- Create a longitudinal study (2+ data collections) and follow-up with the subjects to detect any changes in their BMI's, food habits or health attitudes
- Can impose a 'treatment' for future research such as a nutrition education program in order to create a control and intervention group

- Multiple logistic regression (variables from ordinal to dichotomous, yes/no)
- Independent t- test (BMI variable quantitative instead of categorical)