Knowledge towards HIV/AIDS among Universities Students in Taiwan – An Application of Item Responses Theory

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ABSTRACT—*The HIV/AIDS pandemic was one of the most important and crucial public health challenges facing governments and civil societies in the world. Adolescents were at the center of the pandemic in terms of transmission, impact, and potential for changing the attitudes and behaviors that underlie this disease. Therefore, AIDS prevention has become a priority all in the world.*

A structured questionnaire was designed. A total of 277 university students' feedbacks were collected. There were 236 female students and 41 male students. There were 135 students already taken health course and 142 students not take health course.

With result of the study, the knowledge of HIV/AIDS was no significant differences existed between male and female. Male students and females' knowledge of HIV/AIDS was not different. The knowledge of HIV/AIDS was significant difference existed between the taking health courses or no. These students who already take health courses get higher score than these students who not take health courses in knowledge towards HIV/AIDS. It could find that health courses were helpful in university students' knowledge towards HIV/AIDS.

Keywords—Knowledge of HIV, Health Education, Item Responses Theory (IRT)

1. INTRODUCTION

The HIV/AIDS epidemic was one of the most important and crucial public health risks facing governments and civil societies in the world. Adolescents were at the center of the pandemic in terms of transmission, impact, and potential for changing the attitudes and behaviors that underlie this disease. Therefore, HIV/AIDS prevention has become a priority all in the world.

The first HIV/AIDS case in Taiwan was reported in 1984. As of the end of 2013, the total number of HIV/AIDS cases had been accumulated to 26475. The number of HIV/AIDS infections began to outpouring since 2004 was due to a major increase of infection among injecting drug users. Faced with this serious situation, Taiwan Centers for Disease Control worked with other departments and dedicated a tremendous amount of effort and resources to introduce harm reduction programs. Total reported cases dropped in 2006, which was the first trend reversal since 1984. In 2008 and thereafter, the epidemic took a turn; infections mainly occurred through sexual encounter. In face of the rising HIV/AIDS epidemic, the most pressing course of action is the reinforcement of the health education campaign and intervention plans for the targeted population [1].

In terms of age, the largest number of infections in 2013 was in the 20-29 age group, accounting for 51.00% of all cases. The second largest group was the 30-39 age group, numbering 29.40% of all cases. Of Taiwanese nationals infected by HIV in 2013, 98% were males and 2% were females. The ratio of infected males to females was 42:1. An analysis of risk factors showed that in 2013, the highest proportion of HIV infections was a result of unsafe sexual transmission, with men who have sex with men accounting for 80% of all cases. The second largest proportion of infections was heterosexual contact, accounting for 12.00% [1].

Youth, who was in sexually active age, was under higher risk of contracting the HIV/AIDS. HIV-positive persons in the 15-24 age group account for 19.95% of the total number. Younger generations in Taiwan have become more and more open-minded about sex; most sexual intercourse between youngsters occurs without proper protection. According to data from the National Taiwan Normal University, only 30% of college students use condoms every time they have sex. The lack of awareness may trigger a disastrous outbreak among young adults.

In order to get data to guide future HIV/AIDS educational strategies, this study conducted a questionnaire survey among universities students in Taiwan. These students' knowledge about HIV/AIDS was assessed. The objectives of this study were to determine the Knowledge concerning HIV/AIDS of university students in Taiwan. This may had also an impact in the whole Taiwanese society through students.

1.1 The Knowledge of HIV/AIDS and Gender

Based on the sample of China, Li, Li, Wang, Shao, and Dou indicated that there was no significant difference in age, gender, marital status, and education [2]. Ford, Chamratrithirong, Apipornchaisakul, Panichapak, and Pinyosinwat point out that gender and marital status were not significantly related to AIDS knowledge in a Thailand study [3]. The hypothesis tested in Momoh, Asagwara, and Meriamu's study showed no significant difference between male and female students as a result of male gender roles [4].

Not the same as above studies, in Abiodun, Sotunsa, Ani, and Jaiyesimi's study, there was a significant difference in knowledge of HIV/AIDS by gender where male students had better knowledge about HIV/AIDS than females [5]. Mwamwenda also point out that the gender difference on level of knowledge and misconceptions was statistically significant [6]. Oppong and Oti-Boadi' study suppose that there was an inconsistent level of AIDS knowledge with significant gender [7].

2.2 The Knowledge of HIV/AIDS and Health Education

Effective education and knowledge are tools that offer hope to overcome resistance and barriers such as students' attitudes of HIV/AIDS [9]. In Peltzer, Mngqundaniso, and Petros' study [8], health education was significantly improved students' HIV/AIDS knowledge. In Magnani, MacIntyre, Karim, Brown, Hutchinson, Kaufmanb, Rutenburgc, Hallmand, Maye, and Dallimoref's study [10], school-based life skills education appears capable of communicating key information and helping youth develop skills relevant to reducing HIV risk.

2. MATERIAL AND METHODS

The framework of this study was as Figure 1. This study applied Item Responses Theory to understand students' knowledge of HIV/AIDS. An independent samples t-test to determine whether or not there was a significant difference between the students' gender and taking health course or not.

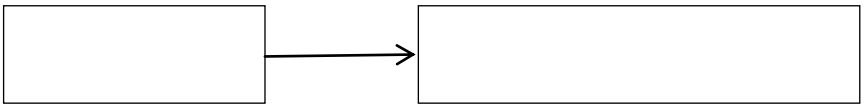

Figure 1: Research Framework

2.1 Survey procedure and strategy

The data was collected in Oriental Institute of Technology in Taiwan in September 2004. The research team directly collected data in schools. Students were assured that all information given on the form was confidential. Therefore, they completed the questionnaire privately in the classrooms.

2.2 Study instrument

The research was conducted through use of the questionnaires in Medah's study [11]. An anonymous questionnaire was for students on the knowledge on HIV/AIDS. The questionnaires were developed based on the literature review and the conceptual framework. The literature review provided insights on what to emphasize in the questionnaire. Some questions were taken from previous researches and adapted to match our conceptual framework.

The 25 questionnaires were as follow:

(1) HIV means Human Immunodeficiency Virus.
(2) AIDS means Active Infectious Disease Surveillance.
(3) AIDS is a threat for Taiwanese.
(4) Most of the people who transmit the AIDS virus look unhealthy.
(5) STI (Sexual Transmitted Infection) infected people are at risk for contracting AIDS virus.
(6) Anal intercourse is high risk for transmitting the AIDS virus.
(7) Oral intercourse carries risk for AIDS virus transmission.
(8) AIDS virus may be transmitted through mosquitoes bites.
(9) HIV- positive mothers may transmit the virus to her child.

(10) Sharing the same public facilities (toilets, dormitory, restaurant etc.) with AIDS infected student exposes to AIDS virus.
(11) A person can be exposed to the AIDS virus in one sexual contact.
(12) Keeping in good physical condition is the best way to prevent exposure to the AIDS virus.
(13) It is unwise to touch a person with AIDS.
(14) Condoms make intercourse completely safe.
(15) When people become sexually exclusive with one another, they no longer need to follow "safe sex" guidelines.
(16) HIV can be detected by blood text.
(17) Most people who have been exposed to the AIDS virus quickly show symptoms of serious illness.
(18) By reducing the number of different sexual partners and using condom, you are effectively protected from AIDS.
(19) Female-to-male transmission of the AIDS virus has not been transmitted.
(20) Sharing toothbrushes and razors can transmit the AIDS virus.
(21) AIDS causes death.
(22) The chances of contracting AIDS can be significantly reduced by using a condom.
(23) Condom may be used several times.
(24) The chances of contracting AIDS are low by having sex with only one partner.
(25) I can get AIDS even if I am only having sex with one partner.

2.3 Statistical analysis

The data were analyzed using the R 3.1.1. The data were assessed by Item Responses Theory (IRT). Item response theory, also formally called latent trait theory, is an important theory of modern measurement. It represents the relationship of observable behavior and unobservable latent traits by mathematical functions. There are two essential concepts contained in IRT. First, abilities, also called latent traits, can be forecasted and explained by an examinee's response on item parameters. Second, the probability of response can be correctly described by item characteristic function, which shows the probability of response of an item correctly on each trait. When applying the item response theory, there are four assumptions that must be satisfied: unidimensionality, local independence, nonspeedness, and know-correct [12].

Under item response theory, the standard mathematical model for the item characteristic curve is the cumulative form of the logistic function. It defines a family of curves having the general shape of the item characteristic curves shown in the first chapter. The logistic function was first derived in 1844 and has been widely used in the biological sciences to model the growth of plants and animals from birth to maturity. It was first used as a model for the item characteristic curve in the late 1950s and, because of its simplicity, has become the preferred model. The equation for the two-parameter logistic model is given in equation 1 below.

$$P(\theta) = \frac{1}{1+e^{-L}} = \frac{1}{1+e^{-a(\theta-b)}} \qquad (1)$$

where:
e is the constant 2.718
b is the difficulty parameter
a is the discrimination parameter1
L = a(θ - b) is the logistic deviate (logit)
θ is an ability level.

The difficulty parameter, denoted by b, is defined as the point on the ability scale at which the probability of correct response to the item is .5. The theoretical range of the values of this parameter is $-\infty \leqq b \leqq +\infty$. However, typical values have the range $-3 \leqq b \leqq +3$.

Due to the S shape of the item characteristic curve, the slope of the curve changes as a function of the ability level and reaches a maximum value when the ability level equals the item's difficulty. However, a usable definition is that this parameter is proportional to the slope of the item characteristic curve at θ = b. The actual slope at θ = b is a/4, but considering a to be the slope at b is an acceptable approximation that makes interpretation of the parameter easier in practice. The theoretical range of the values of this parameter is $-\infty \leqq a \leqq +\infty$, but the usual range seen in practice is -2.80 to +2.80.

The next model of interest was first published by the Danish mathematician Georg Rasch in the 1960s. Rasch approached the analysis of test data from a probability theory point of view. Although he started from a very different frame of reference, the resultant item characteristic curve model was a logistic model. Under this model, the discrimination parameter of the two-parameter logistic model is fixed at a value of a = 1.0 for all items; only the difficulty parameter can take on different values. Because of this, the Rasch model is often referred to as the one-parameter logistic model. The equation for the Rasch model is given by the following:

$$P(\theta) = \frac{1}{1 + e^{-1(\theta - b)}} \qquad (2)$$

where:
b is the difficulty parameter and θ is the ability level.

It should be noted that a discrimination parameter was used in equation 2, but because it always has a value of 1.0, it usually is not shown in the formula.

One of the facts of life in testing is that examinees will get items correct by guessing. Thus, the probability of correct response includes a small component that is due to guessing. Neither of the two previous item characteristic curve models took the guessing phenomenon into consideration. Birnbaum modified the two-parameter logistic model to include a parameter that represents the contribution of guessing to the probability of correct response [13]. Unfortunately, in so doing, some of the nice mathematical properties of the logistic function were lost. Nevertheless the resulting model has become known as the three-parameter logistic model, even though it technically is no longer a logistic model. The equation for the three-parameter model is:

$$P(\theta) = c + (1 - c)\frac{1}{1 + e^{-a(\theta - b)}} \qquad (3)$$

where:
b is the difficulty parameter
a is the discrimination parameter
c is the guessing parameter and
θ is the ability level

The parameter c is the probability of getting the item correct by guessing alone. It is important to note that by definition, the value of c does not vary as a function of the ability level. Thus, the lowest and highest ability examinees have the same probability of getting the item correct by guessing. The parameter c has a theoretical range of $0 \leqq c \leqq 1.0$.

3. RESULTS

A total of 277 university students' feedbacks were collected. There were 236 female students (85.20%) and 41 male students (14.80%). There were 135 students (48.74%) already take health course and 142 students (51.26%) not take health course.

Table 1: Data Summarize

Variable		Frequency	Percent (%)
Gender	Male	41	14.80
	Female	236	85.20
Health Courses	Yes	135	48.74
	No	142	51.26
Total		277	100.00

3.1 The Item Difficulty Parameter and the Item Discrimination Parameter

The item difficulty parameter (the b in equation 2) was as Table 2, and the frequency was as Figure 2. The maximum was 1.87, the minimum was -4.86, and the average was -1.90. The item discrimination parameter (the a in equation 2) was as Table 2. The maximum was 2.38, the minimum was -.53, and the average was .88.

Table 2: The Item Difficulty Parameter and the Item Discrimination Parameter

Item	Item DifficultyParameter		The Item Discrimination Parameter
	xsi	se.xsi	b
01	-2.30	.19	.99
02	-2.40	.20	1.02
03	-.07	.12	.34
04	-1.37	.15	.70
05	1.87	.17	-.53
06	-2.34	.19	1.10
07	-1.16	.14	.47
08	-.49	.12	-.06

09	-2.01	.18	.62
10	-1.80	.17	.50
11	-3.93	.29	1.72
12	-.58	.13	.40
13	-2.39	.20	.81
14	-1.17	.14	.60
15	-3.39	.24	1.73
16	-2.63	.22	.91
17	-1.95	.18	.71
18	-2.97	.22	1.57
19	-4.57	.30	2.38
20	-.96	.14	.46
21	1.47	.15	-.43
22	-3.00	.22	1.66
23	-4.86	.35	2.07
24	-.85	.13	.46
25	-3.71	.26	1.85

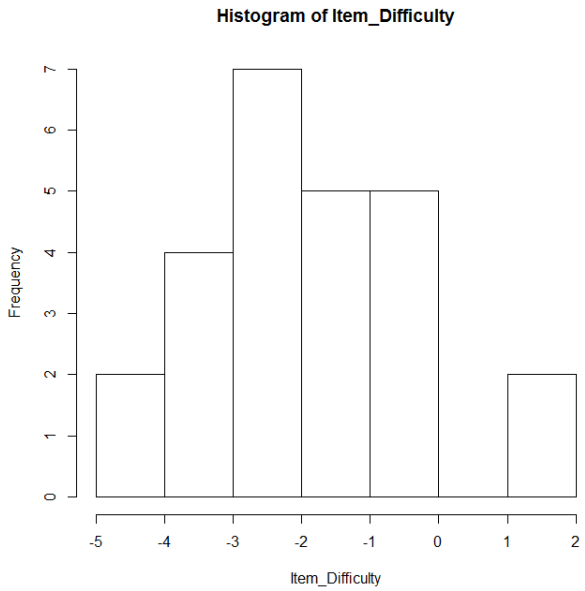

Figure 2: The Histogram of Item Difficulty

The Knowledge of HIV/AIDS among universities students in this study was calculate with equation 2. The EAP Reliability was .60.

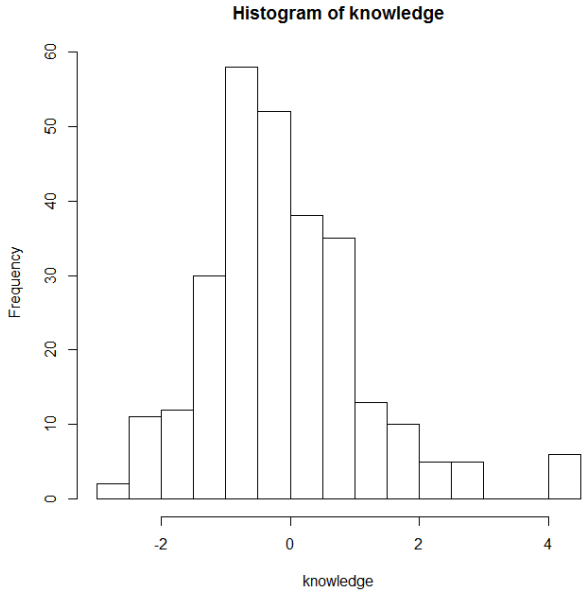

Figure 3: The Histogram of Knowledge

3.2 The knowledge of HIV/AIDS and Gender

An independent samples t-test determined in the knowledge of HIV/AIDS that no significant differences existed between the genders (as Table 3). The t-value is .48, and p-value is .63.

Table 3: The Data Summary of the Knowledge of HIV/AIDS and Gender

	N	Mean	S.D.	t-value	p-value
Male	41	-.18	1.40	.48	.63
Female	236	-.07	1.20		
Total	277				

3.3 The Knowledge of HIV/AIDS and Health Education

An independent sample t-test determined in the knowledge of HIV/AIDS that significant difference existed between the taking health courses or no (as Table 3). The t-value is -2.06, and p-value is .04. It could find that the knowledge of these students who take health courses (.07) was higher than the knowledge of these students who not take health courses (-.24). The Probability between with Health Knowledge and without Health Knowledge was as Figure 4.

Table 4: The Data Summary of the Knowledge of HIV/AIDS and Health Education

	N	Mean	S.D.	t-value	p-value
Yes	135	.07	1.26	-2.06	.04
No	142	-.24	1.18		
Total	277				

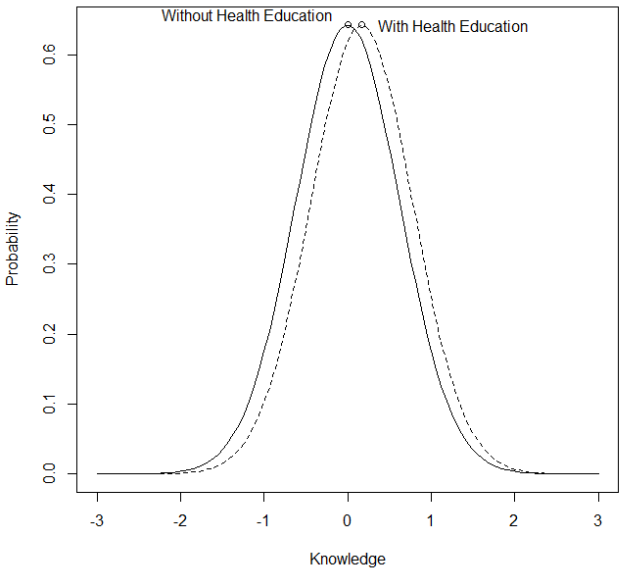

Figure 4: The Probability between with Health Knowledge and without Health Knowledge

4. DISCUSSION AND CONCLUSION

4.1 Knowledge towards HIV/AIDS among university students in Taiwan

This study assessed the knowledge of Taiwanese university students regarding HIV/AIDS. The knowledge of HIV/AIDS was no significant differences existed between male and female. The same as Li, Li, Wang, Shao, and Dou [2], Ford, Chamratrithirong, Apipornchaisakul, Panichapak, and Pinyosinwat [3], Momoh, Asagwara, and Meriamu [4] 's study. Male students and females' knowledge of HIV/AIDS was not different. The knowledge of HIV/AIDS was significant difference existed between the taking health education or no. These students who already take health education get higher score than these students who not take health education in knowledge towards HIV/AIDS. It could find that health education were helpful in university students' knowledge towards HIV/AIDS. The same as Peltzer, Mngqundaniso, and Petros' study [8].

4.2 Study constraints

This study was not able to collect the data in all universities on its own. This may have influenced the students' acceptance to fill in the questionnaire resulting in a very high response rate. Besides, because of the self-report nature of the questionnaire, the honesty of respondents' answers should be questioned. However, the questionnaire was anonymous and only informed consent students participated to study, which should have encouraged accurate and fair disclosure.

4.3 Recommendations

According to our findings, students should be instructed about all aspects of HIV/AIDS at university so that they can be well equipped with HIV/AIDS knowledge before getting into sexual life.

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