ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 10| Issue: 10| October 2024|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2024: 8.402 || ISI Value: 1.188

GENDER DIFFERENCES IN CYBERSECURITY COMPETENCE, AWARENESS, AND RESPONSE - COMPARATIVE STUDY AMONG FORENSIC SCIENCE STUDENTS IN BENGALURU

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ABSTRACT

This study examines gender differences in cybersecurity competence, awareness, and response among forensic science students in Bengaluru. A questionnaire assessing various aspects of cybersecurity knowledge and practices was administered to 14 male and 14 female students. Using R software, independent t-tests were conducted to compare mean scores between genders. The results indicated no statistically significant differences, suggesting that gender may not be a determining factor in cybersecurity proficiency within this demographic. These findings highlight the importance of inclusive educational strategies in cybersecurity training for forensic science students.

KEYWORDS: *Cybersecurity, Gender, Forensic Science Education, Statistical Analysis in R*

INTRODUCTION

The role of gender in cybersecurity competence has been a subject of debate. Some studies suggest that males are more engaged with technology due to societal influences, potentially leading to higher cybersecurity competence among male students (McGill&Thompson, 2021). However, other research indicates that when provided with equal educational opportunities, females perform on par with males in computer and information technology tasks (Gebhardt et al., 2019).

Students pursuing forensic science need to be proficient in cybersecurity to handle digital evidence effectively, defend against online threats, and respond to cybercrimes. These abilities enhance their capacity to protect confidential information, uphold the credibility of investigations, and adapt to the increasing influence of technology in contemporary forensic work.Gender variations in forensic science students' cybersecurity knowledge, competency, and response are important because they may indicate differences in male and female students' skill and readiness.

The aim of this paper is to examine these variations and determine how they affect students' ability to manage cybersecurity issues in forensic work. By being aware of these differences, resources, training, and educational programs can be adjusted so that both sexes are equally prepared to handle cybersecurity challenges. This realization may result in more diverse and productive learning environments, ultimately advancing the discipline of digital forensics.

METHODOLOGY

The study involved 28 forensic science students from Bengaluru, comprising 14 males and 14 females. Participants were selected based on their enrolment in forensic science programs and their willingness to participate in the study.A structured questionnaire was developed to assess participants' cybersecurity competence, awareness, and response strategies. The questionnaire included five items rated on a Likert scale from 1 to 5, with higher scores indicating greater competence or awareness. The questionnaire is provided in Appendix B.Participants were asked to complete the questionnaire anonymously.Responses were coded and analysed using R software. Mean scores for each participant were calculated. Independent t-tests were performed to determine if there were significant differences between male and female participants.The R code used for data analysis is included in Appendix A.

In this study, we conducted both a one-tailed and a two-tailed independent t-test using R software:

- **One-Tailed t-Test**: This test assesses whether the mean score of one group (females) is significantly greater than that of another group (males). The null hypothesis (H_0) states that the mean score of female students is less than or equal to that of male students. The alternative hypothesis (H_1) posits that the mean score of female students is greater than that of male students.
- **Two-Tailed t-Test**: This test assesses whether there is any significant difference between the means of the two groups, regardless of direction. The null hypothesis (H_0) states that there is no difference between the mean scores of male and female students. The alternative hypothesis (H_1) suggests that there is a significant difference between the mean scores.

RESULTS

The independent t-tests were performed using R, and the outputs are presented below as generated by the software.

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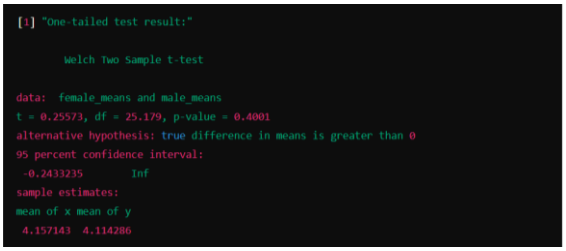


Fig. 1: One-Tailed Independent t-Test

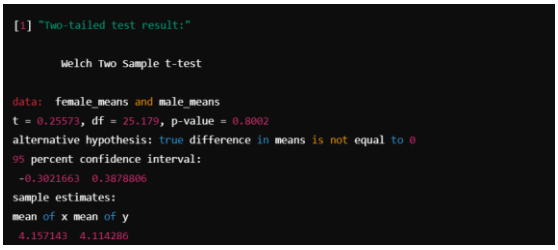


Fig. 2: Two-Tailed Independent t-Test

One-Tailed Independent t-Test Output

- t-statistic: 0.25573
- Degrees of Freedom (df): 25.179
- Alternative Hypothesis: true
- Mean of Females (x): 4.157143
- Mean of Males (y): 4.11428
- 95% Confidence Interval: (-0.2433235, Inf) — It includes zero, indicating that the difference is not significant.
- p-value: 0.4001 — Since this is greater than 0.05, we fail to reject the null hypothesis.

Two-Tailed Independent t-Test Output

- t-statistic: 0.25573
- Degrees of Freedom (df): 25.179
- Alternative Hypothesis: true
- Mean of Females (x): 4.157143
- Mean of Males (y): 4.114286
- Confidence Interval: (-0.3021663, 0.3878806) — This interval contains zero, supporting the conclusion that there is no significant difference between the two means.
- p-value: 0.8002 — Again, greater than 0.05, so we fail to reject the null hypothesis.

DISCUSSION

For both the one-tailed and two-tailed tests, the p-values exceed the conventional alpha level of 0.05. This indicates that we fail to reject the null hypothesis in both cases. There is no statistically significant difference between male and female participants in terms of cybersecurity competence, awareness, and response.

CONCLUSION

The study concludes that there are no significant gender differences in cybersecurity competence, awareness, and response among forensic science students in Bengaluru. By ensuring equal access to resources and training, educational programs can prepare all students to handle cybersecurity challenges effectively, which is crucial in the field of digital forensics.

REFERENCES

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Appendix A: R Code Used for Data Analysis

```
# Data for females and males
females <- list(
c(4, 4, 4, 4, 4),
c(3, 5, 5, 4, 4),
c(3, 5, 5, 4, 4),
c(5, 5, 5, 5, 5),
c(4, 4, 5, 4, 5),
c(3, 4, 5, 4, 3),
c(4, 5, 5, 4, 5),
c(4, 5, 5, 4, 2),
c(3, 5, 5, 4, 4),
c(4, 5, 5, 4, 3),
c(4, 5, 4, 4, 4),
c(3, 5, 5, 5, 4),
c(3, 4, 4, 4, 3),
c(3, 4, 4, 3, 3)
)
```

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```
males <- list(
c(3, 4, 4, 4, 4),
c(4, 4, 4, 4, 4),
c(5, 5, 5, 5, 5),
c(4, 5, 4, 5, 4),
c(3, 5, 4, 3, 3),
c(4, 5, 5, 4, 4),
c(4, 5, 4, 5, 4),
c(4, 5, 4, 5, 4),
c(5, 5, 5, 3, 4),
c(3, 3, 3, 5, 3),
c(4, 5, 4, 4, 5),
c(3, 4, 4, 2, 3),
c(4, 4, 4, 5, 4),
c(3, 5, 4, 4, 4)
)

# Compute the mean score for each participant
female_means<- sapply(females, mean)
male_means<- sapply(males, mean)

# Perform independent t-tests
# One-tailed test (H1: female mean > male mean)
t_test_one_tailed<- t.test(female_means, male_means, alternative = "greater")

# Two-tailed test (H1: female mean != male mean)
t_test_two_tailed<- t.test(female_means, male_means, alternative = "two.sided")

# Output results
print("One-tailed test result:")
print(t_test_one_tailed)

print("Two-tailed test result:")
print(t_test_two_tailed)
```

Appendix B: Questionnaire

1. What is your gender?

Male Female Prefer not to say

2. On a scale of 1 to 5, how would you rate your skills in identifying and mitigating cybersecurity threats? (1 being very poor and 5 being excellent)

1 2 3 4 5

3. How familiar are you with the following cybersecurity threats? Rate each on a scale from 1 to 5. (1 being not at all familiar and 5 being very familiar)

Phishing	1	2	3	4	5
Malware	1	2	3	4	5
Ransomware	1	2	3	4	5
Social Engineering	1	2	3	4	5

4. On a scale of 1 to 5, how concerned are you about your online privacy? (1 being not concerned at all and 5 being extremely concerned)

1 2 3 4 5

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5. How often do you update your privacy settings on social media? Rate on a scale from 1 to 5. (1 being never and 5 being very frequently)
1 2 3 4 5

6. If you discovered a security breach in your personal email account, how confident are you in your ability to handle it effectively? Rate your confidence on a scale of 1 to 5. (1 being not confident at all and 5 being extremely confident)
1 2 3 4 5