

Studying the Differences: A Review on t-Test

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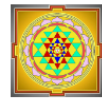
Abstract

A prime instance of a statistical test used to compare the means of two groups is the t-test. It is one of the statistical hypothesis tests that is most frequently employed in educational research. A statistical inference can be made using either parametric or non-parametric approaches. A statistical technique known as parametric techniques involves defining the probability distribution of probability variables and drawing conclusions about the distribution's parameters. This study makes an effort to compile all research projects undertaken in the field of educational research while considering the significance of the t-test in statistics.

Keywords: t-Test, Achievement Test, Intelligence, Internet Addiction, Academic Performance

Introduction

The means of two groups are compared using a statistical test called a t-test. This is one of the most popular statistical hypothesis tests in educational research. Parametric and non-



parametric techniques are the two main categories of statistical reasoning. To define the probability distribution of probability variables and draw conclusions about the distribution's parameters, one uses a statistical technique known as parametric techniques. Non-parametric approaches are used when the probability distribution cannot be defined. When the samples meet the criteria of independence, equal variance, and normality, t-tests, a particular sort of parametric test can be applied. Two categories of t-tests exist in educational research. When two variables are being compared that are unrelated to one another, the independent sample t-test can be used. When two variables are being compared that are dependent on one another, the paired t-test can be used. The reviews of t-tests used in the field of education are compiled in this work to study its importance and versatility regarding its applications.

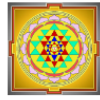
Literature Review

Saha, (2012) conducted a study "*A comparative study of environmental awareness among teacher trainees of West Bengal*". In this study the researcher found no difference in male-female, In-Service Male - deputed Female, Pre-service Male - fresher Female, and Govt. Aided college - private college but differences were found in In-Service - Pre-Service, and science - humanities teacher trainees on environmental awareness.

Sen, Mondal and Saha (2012) lead a study "*A comparative study of poor achievement in physics at the higher secondary level with respect to secondary level in Birbhum District*". In this study the researcher found difference exists among Secondary and Higher Secondary students in the basis of academic achievement of the students in physical science.

Mondal et al. (2012) conducted a study "*A cognizance on the decreasing rate of enrolment in govt-aided primary school in West Bengal*". In this research work the researcher explores no difference in urban parents - rural teachers but differences were found in urban - rural sample, urban teachers - rural teachers, urban parents - rural parents and urban teachers - rural parents on opinion regarding enrolment in Govt. Aided primary school.

Mondal and Saha (2012) carried out a study on "*Achievement difference in science at secondary level in Darjeeling district: A comparative study*". In this study the researcher stated that difference exists in urban-rural sample, urban-rural male, urban-rural female, urban male - rural female and urban female - rural male on achievement in science students under Secondary stage.



Sen and Samanta (2013) conducted a study *“A study on the effect of unit tests in secondary level schools of Birbhum District, West Bengal”*. In this study the investigator found a significant difference in different grades and subjects.

Sen and Kar (2014) organized a study *“Comparison between the achievements in unit tests and annual examinations: a study of seventh and eighth-grade students on science subjects”*. From this study the researchers reveal significant differences in unit test and annual examinations on the basis of mathematics, Physical Science and Life Science of class VII and VIII boys, girls and co-educational school.

Paramanik, Saha and Mondal (2014) accompanied a study *“Adjustment of secondary school students with respect to gender and residence”*. In this research work the researchers mention no difference in residence but differences were found in gender on adjustment ability.

Kar and Sen (2014) conducted a study *“Attitude of women towards higher education-a case study in Birbhum District of West Bengal”*. In this study the researchers found a difference in rural postgraduate women and urban postgraduate women in their attitude towards higher education.

Kar, Saha and Mondal (2014) conducted a study *“Measuring emotional intelligence of secondary school students in relation to gender and residence: An empirical study”*. In this research work researchers revealed no difference in gender but a difference was found in residence on emotional intelligence.

Kar, Saha and Mondal (2014) organized a study *“Attitude of university students towards e-learning in West Bengal”*. In this study the investigators found no difference in gender, residence and stream towards e-learning.

Naik, Dutta and Sutradhar (2015) conducted a study *“Mental health of Facebook addicted and non-addicted adolescent students: A study”*. In this study the investigator reveals the differences in somatic symptom dimension, anxiety or insomnia dimension, social dysfunction dimension, severe depression dimension and overall mental health between Facebook addicted and non-addicted adolescent students.

Mondal and Sutradhar (2015) administrated a study *“Effect of home environment on different dimensions of emotional maturity of adolescents”*. From this mentioned study the researchers explore the differences in the home environment on emotional

instability, emotional regression, social maladjustment, personal disintegration and lack of independence dimension of emotional maturity.

Naik and Sutradhar (2015) organized a research work *“Impact of emotional maturity on the personality of B.Ed. trainees: A study”*. In the research work researchers stated no difference exists in normal personality and slightly neurotic personality, slightly neurotic personality and moderately neurotic personality, and moderately neurotic personality and highly neurotic personality but differences found in normal personality and moderately neurotic personality, slightly neurotic personality and highly neurotic personality, normal personality and highly neurotic personality, and normal personality and neurotic personality on the basis of Emotional Maturity.

Naik, Bhattacharjee and Sutradhar (2015) carried out a study *“A comparative study of mental health among rural and urban adolescent students”*. From this research work researchers found a difference in rural and urban, rural boys and urban boys, rural girls and urban boys, and rural girls and urban girls but no difference in rural boys and urban girls students on the basis of mental health.

Kundu, Saha and Mondal (2015) accompanied a study *“Adjustment of undergraduate students in relation to their social intelligence”*. In this study the researchers explore no difference in gender and stream of study on adjustment ability.

Karmakar et al. (2016) lead a study *“Intelligence in relation to height and weight among secondary school students”*. In this study the researchers mention a difference found in gender and locality on the basis of IQ.

Mahanti, Mondal and Saha (2016) accompanied a study *“Internet dependency of undergraduate students: an empirical study”*. In this study the investigators mention no difference in residence but a difference exists in gender and stream on internet dependency.

Chatterjee, Mondal and Saha (2016) conducted a study *“Student attitudes towards using social media for educational purpose”*. In this study researchers found no significant difference in attitudes towards using social media with regards to gender, residence and UG-PG students.

Roy, Saha and Maji (2017) lead a study *“Measuring attitude towards inclusive education among B.Ed. students in Purulia District of West Bengal”*. In this study researchers found



no difference in demographic variables like gender, stream and residence regarding attitudes of Inclusive Education.

Mondal and Saha (2017) organized a research work *“Job satisfaction of secondary school teachers in relation to personality and emotional intelligence”*. In this research work the researcher stated differences found in job satisfaction with personality traits and job satisfaction with emotional intelligence.

Paul et al. (2017) carried out a study *“Creativity among secondary students in relation to gender and residence”*. In this work researchers revealed no difference in residence but in gender a difference was found and stated male students are more creative than female.

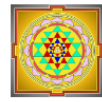
Gorain et al. (2018) carried out a study *“Social isolation in relation to Internet usage and stream of study of under graduate students”*. This study shows a difference between high users and low users of the Internet and no difference was found in humanities and science on the basis of social isolation.

Banerjee et al. (2018) accompanied a study *“Trends of achievement in mathematics: a study on higher secondary level students of Dhubri district of Assam, India”*. In this study the researchers explore a difference in achievement level but no difference was found in achievement between boys and girls and their achievement in mathematics between 11th and 12th grade.

Mondal et al. (2018) lead a study *“Internet affinity in relation to personality and gender”*. In this study the researchers found a difference exists according to the demographic variable gender and also shows that male students are more addicted to the Internet.

Sutradhar, (2019) conducted a research work *“Impact of emotional maturity on self-esteem of adolescents”*. In this research work the researcher found differences in emotional maturity and all dimensions like emotional instability, social maladjustment, personality disintegration, and lack of independence and no difference found in emotional regression dimension between lower self-esteem and higher self-esteem adolescents.

Ahmed et al. (2020) carried out a study *“Academic achievement in mathematics among rural and urban students: a study on secondary and higher secondary level students”*. In this study the researchers found differences among boys - girls students belonging to a rural school and urban school, rural school boys - urban school boys, rural school girls - urban



school girls, rural school boys - rural school girls and urban school boys - urban school girls of tenth grade but these results are not significant in case of 12th grade students.

Ahmed et al. (2020) administrated a study *“Academic achievement of the Students in Mathematics: a gender-wise study on secondary and higher secondary level”*. From this study the researchers mention no difference in gender attitude towards the mathematics of secondary level students but differences were found in higher secondary level students.

Saha, (2021) administrated a study *“Attitude towards yoga practice among college students with regard to gender, residence and stream of study”*. In this study the researcher found no difference in gender and arts-Science but differences were found in residence and arts-Commerce and Science and Commerce on yoga practice.

Ansary, Saha and Gorain (2021) conducted a study *“A study on achievement motivation of undergraduate students”*. In this study, the researcher finds no difference according to students’ gender and residence, in the basis of achievement motivation.

Bag et al. (2021) administrated a study *“The attitude of university students towards co-curricular activity: a comparative study”*. In this study the researchers found no difference in gender but the difference exists in residence and streams demographic variables. Especially rural and arts students are more positive in their attitude towards co-curricular activities.

Dandapat et al. (2021) accompanied a study *“Attitude of secondary school teachers towards using ICT in English classroom of Purulia district”*. The researchers in this study, showed that no difference in gender, residence, training and age differences regarding the attitude of secondary school teachers towards using ICT in English classroom.

Gayen et al. (2021) lead a study *“Attitude towards English as a language and medium of instruction: a study in secondary school students in Cooch Behar district of West Bengal”*. In this study the researchers reveal no difference in gender and residence on English as a language but a difference exists in gender on English as a medium of instruction.

Mahato and Sen (2021) carried out a study *“Academic stress, self-efficacy and anxiety: a study on Mathematics of higher secondary level students in Purulia District of West Bengal, India”*. From this research work the researcher found no difference in gender in academic stress and self-efficacy but a difference exists in anxiety in mathematics, no difference in residence on academic stress, self-efficacy and anxiety in mathematics, no difference in the stream on academic stress and self-efficacy but a difference exists in anxiety

in mathematics, no difference in the class (XI & XII) on self-efficacy and anxiety but a difference exists in academic stress, and no difference in the Family Type (Joint & Nuclear) on self-efficacy but a difference exists in academic stress.

Roy and Saha (2022) carried out a study *“Achievement motivation of post-graduate level students: An analytical study”*. In this research work the researchers explored no difference in gender, residence and stream on Achievement Motivation.

Rajak and Gayen (2022) administrated a study *“A Study of the interests in Mathematics of secondary level students of West Bengal”*. In this study the investigators found no difference in gender and residence on interests in Mathematics.

Ansary, Ansary and Adhikari (2022) conducted a study *“Attitude towards social adjustment among the undergraduate students of Purulia district”*. In this study the researchers mentioned that no difference in gender and residence on the basis of social adjustment.

Khatun, Ansary and Adhikari (2022) organized a study *“Attitude towards yoga education among undergraduate students”*. From this research work, the researchers found no difference in gender, residence and stream in the attitude toward Yoga Education.

Roy and Saha (2023) accompanied a study *“Exploring the self-concept of post-graduate level students: a critical study”*. In this study the researchers found no difference in gender and stream but a difference found in residence to the attitude of Self-Concept.

Mahato, Gayen and Mahato (2023) organize a study *“Relationship between academic resilience and internet addiction of undergraduate students of Purulia district of West Bengal: A study”*. In this study the researchers found no difference in gender and residence on academic resilience.

Mahato and Sen (2023) conducted a research work *“A study of contexts knowledge (CK1), technological pedagogical content knowledge (TPCK) and attitude towards creative teaching (ACT) among the pre-service Mathematics trainee teachers in West Bengal, India”*. In this study, the researchers explore no difference in gender and residence on Attitude towards Creative Teaching or the Pre-Service Mathematics Trainee Teachers in Rarh Region of West Bengal.

Mahato, Gayen and Mahato (2023) accompanied a study *“Relationship between self-efficacy and m-learning of undergraduate students of Purulia district of West Bengal”*. From this research work the researchers found no difference in gender and residence on Self-efficacy and M-learning.

Ansary, Gorain and Saha (2023) directed a research work *“Attitude towards value-oriented education among undergraduate students”*. From this research work the researchers found no difference in gender and locality on the attitude toward value-oriented education.

Ahmed et al. (2023) conducted a study *“Academic performance in Mathematics between tribal and non-tribal students in Bodoland territorial region (BTR) of Assam State, India: a study of senior Secondary Level”*. In this study the researchers found a difference among students from tribal and non-tribal communities together with their gender of class X as well as class XII.

Khan et al. (2023) organized a study *“Cyber Schooling: a study on the higher education learners”*. The researchers found no difference in gender and residence but the difference exists in the stream regarding attitudes of cyber schooling

Conclusion

Using the t-test, one can assess the significance of two groups and identify the differences between them that are statistically significant. It is an inferential statistics variant that is typically applied to datasets with a normal distribution but of unknown variances. The t-value is a form of test statistic used in hypothesis testing that is obtained from a sample and enables one to compare the sample with a null hypothesis, or a hypothesis where there is no discernible difference between the populations one has chosen. Depending on the data at hand and the type of analysis required, there are several techniques to t-test, and there are particular data values needed to correctly calculate a t-test. In the area of educational research, this test-taking strategy is very interesting.

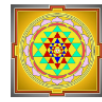
References

1. Ahmed, E. A., Banerjee, M., Sen, S., & Chatterjee, P. (2020). Academic achievement in mathematics among rural and urban students: a study on secondary and higher secondary level students. *International Journal of Multidisciplinary Research and Development*, 7(8), 178-182.

2. Ahmed, E. A., Banerjee, M., Sen, S., & Chatterjee, P. (2023). Academic performance in Mathematics between Tribal and Non-Tribal students in Bodoland territorial region (BTR) of Assam state, India: A Study of Senior Secondary Level. *Mathematical Forum*, 30(2023), 1-12.
3. Ahmed, E.A., Banerjee, M., Sen., S. & Chatterjee, P. (2020). Academic Achievement of the students in Mathematics: a gender-wise study on secondary and higher secondary level. *International Journal of Multidisciplinary Educational Research*, 9[7(8)], 138-184.
4. Ansary, K., Gorain, S. C., & Saha, B. (2023). Attitude towards value-oriented education among undergraduate students. *International Journal of Advanced Education and Research*, 8(1), 17-19.
5. Ansary, K., Saha, B., & Gorain, S. C. (2021). A study on achievement motivation of undergraduate students. *International Journal of Multidisciplinary Educational Research*, 10[9(7)], 118-121. DOI: <http://ijmer.in.doi./2021/10.09.142>
6. Ansary, S., Ansary, K., & Adhikari, A. (2022). Attitude towards social adjustment among the undergraduate students of Purulia District. *EPRA International Journal of Research and Development (IJRD)*, 7(12), 21-26. DOI: <https://doi.org/10.36713/epra11930>
7. Bag, K., Gayen, P., Alam, S., & Gorain, S. C. (2021). The attitude of university students towards co-curricular activity: a comparative study. *International Journal of Advance Research, Ideas and Innovations in Technology*, 7(1), 223-226.
8. Banerjee, M., Sen, S., Chatterjee, P., & Ahmed, E. A. (2018). Trends of achievement in mathematics: a study on higher secondary level students of Dhubri district of Assam, India. *Journal of Education & Development*, 8(16), 61-79.
9. Chatterjee, R., Mondal, B.C., & Saha, B. (2016). Student attitudes towards using social media for educational purpose. *European Academic Research*, 4(6), 5365-5376.
10. Dandapat, M., Paramanik, S. C., Gayen, P., & Gorain, S. C. (2021). Attitude of secondary school teachers towards using ICT in English classroom of Purulia district. *International Journal of Research and Analytical Reviews (IJRAR)*, 8(1), 583-590.
11. Gayen, P., Dandapat, M., Das, C., & Ansary, K. (2021). Attitude towards English as a language and medium of instruction: a study in secondary school students in Cooch Behar district of West Bengal. *International Journal of Research and Analytical Reviews (IJRAR)*, 8(1), 120-124.
12. Gorain, S. C., Mondal, A., Ansary, K., & Saha, B. (2018). Social isolation in relation to internet usage and stream of study of under graduate students. *American Journal of Educational Research*, 6(4), 361-364. DOI:10.12691/education-6-4-10
13. Kar, D., Saha, B., & Mondal, B.C. (2014). Attitude of university students towards e-learning in West Bengal. *American Journal of Educational Research*, 2(8), 669-673. DOI:10.12691/education-2-8-16
14. Kar, D., Saha, B., & Mondal, B.C. (2014). Measuring emotional intelligence of secondary school students in relation to gender and residence: an empirical study. *American Journal of Educational Research*, 2(4), 193-196. DOI:10.12691/education-2-4-3

15. Kar, S. & Sen, S. (2014). Attitude of women towards higher education-a case study in Birbhum District of West Bengal. *Golden Research Thoughts*, 4(3). 1-8.
16. Karmakar, T., Paul, A., Mondal, A., & Saha, B. (2016). Intelligence in relation to height and weight among secondary school students. *American Journal of Educational Research*, 4(16), 1145-1148. DOI:10.12691/education-4-16-4
17. Khan, S., Roy, S., Gorain, S. C., & Adhikari, A. (2023). Cyber schooling: a study on the higher education learners. *IAR Journal of Humanities and Social Science* 4(1), 1-10. DOI: 10.47310/iarjhss.2023.v04i01.001
18. Khatun, S., Ansary, K., & Adhikari, A. (2022). Attitude towards yoga education among undergraduate students. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 8(12), 9-13. DOI: <https://doi.org/10.36713/epra11931>
19. Kundu, M., Saha, B., & Mondal, B.C. (2015). Adjustment of undergraduate students in relation to their social intelligence. *American Journal of Educational Research*, 3(11), 1398-1401. DOI: 10.12691/education-3-11-8
20. Mahanti, J., Mondal, B.C., & Saha, B. (2016). Internet dependency of undergraduate students: an empirical study. *American International Journal of Research in Humanities, Arts and Social Sciences*, 15(2), 171-174.
21. Mahato, D., Gayen, P., & Mahato, R.C. (2023). Relationship between academic resilience and internet addiction of undergraduate students of Purulia district of West Bengal: A study. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 9(3), 103-106. <https://doi.org/10.36713/epra12603>
22. Mahato, M., Gayen, P., & Mahato, R. C. (2023). Relationship between self-efficacy and m-learning of undergraduate students of Purulia district of West Bengal. *International Journal of Research Publication and Reviews*, 4(4), 3219-3222.
23. Mahato, R. C., & Sen, S. (2021). Academic stress, self-efficacy and anxiety: A study on Mathematics of higher secondary level students in Purulia District of West Bengal, India. *International Journal of Creative Research Thoughts (IJCRT)*, 9(5), c969-c980.
24. Mahato, R. C., & Sen, S. (2023). A study of contexts knowledge (CK1), technological pedagogical content knowledge (TPCK) and attitude towards creative teaching (ACT) among the pre-service Mathematics trainee teachers in West Bengal, India. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 10(4), h35-h43.
25. Mondal, A. & Saha, B. (2017). Job satisfaction of secondary school teachers in relation to personality and emotional intelligence. *American Journal of Educational Research*, 5(10), 1097-1101. DOI:10.12691/education-5-10-11.
26. Mondal, A., Ansary, K., Gorain, S. C., & Saha, B. (2018). Internet affinity in relation to personality and gender. *American International Journal of Research in Humanities, Arts and Social Sciences*, 22(1), 11-15.

27. Mondal, N., & Saha, B. (2012). Achievement difference in science at secondary level in Darjeeling District: a comparative study. *International Journal of Scientific Research*, 2(2), 85–86. <https://doi.org/10.15373/22778179/feb2013/31>
28. Mondal, N., Mondal, S., Saha, C., & Saha, B. (2012). A cognizance on the decreasing rate of enrolment in govt-aided primary school in West Bengal. *International Journal of Scientific Research*, 3(8), 64–69. <https://doi.org/10.15373/22778179/august2014/22>
29. Mondal, S., & Sutradhar, A. (2015). Effect of home environment on different dimensions of emotional maturity of adolescents. *The International Journal of Indian Psychology*, 2(4), 6-13.
30. Naik, P. K., & Sutradhar, A. (2015). Impact of emotional maturity on personality of B.Ed. trainees: a study. *Asian Academic Research Journal of Social Science & Humanities*, 2(1), 1-10.
31. Naik, P. K., Bhattacharjee, P., & Sutradhar, A. (2015). A Comparative study of mental health among rural and urban adolescent students. *International Journal of Recent Research in Social Sciences and Humanities*, 2(2), 143-145.
32. Naik, P. K., Dutta, A. N., & Sutradhar, A. (2015). Mental health of facebook addicted and non-addicted adolescent students-a study. *Journal of International Academic Research for Multidisciplinary*, 3(5), 352-358.
33. Paramanik, J., Saha, B., & Mondal, B.C. (2014). Adjustment of secondary school students with respect to gender and residence. *American Journal of Educational Research*, 2(12), 1138-1143. DOI:10.12691/education-2-12-2
34. Paul, A., Karmakar, T., Mondal, A., & Saha, B. (2017). Creativity among secondary students in relation to gender and residence. *International Journal of Informative & Futuristic Research*, 4(5), 6197-6199.
35. Rajak, P., & Gayen, P., (2022). A study of the interests in Mathematics of secondary level students of West Bengal. *International Journal of Research Publication and Reviews*, 3(6), 132-135.
36. Roy, S. & Saha, B. (2022). Achievement motivation of post graduate level students: an analytical study. *Galore International Journal of Applied Sciences and Humanities*, 6(4), 51-55. DOI: <https://doi.org/10.52403/gijash.20221008>
37. Roy, S. & Saha, B. (2023). Exploring the self-concept of post graduate level students: a critical study. *International Journal of Research and Review*, 10(1), 372-377. DOI: <https://doi.org/10.52403/ijrr.20230141>
38. Roy, S., Saha, B. & Maji, S. (2017). Measuring attitude towards inclusive education among B.Ed. students in Purulia District of West Bengal. *Conflux Journal of Education*, 5(7), 37-43.
39. Saha, B. (2012). A comparative study of environmental awareness among teacher trainees of West Bengal. *Indian Streams Research Journal*, 2(9), 1-5.
40. Saha, B. (2021). Attitude towards yoga practice among college students with regard to gender, residence and stream of study. *IAR Journal of Humanities and Social Science*, 2(5), 25-29.



41. Sen, B., Mondal, N., & Saha, B. (2012). A comparative study of poor achievement in physics at the higher secondary level with respect to secondary level in Birbhum District. *International Journal of Scientific Research*, 2(4), 66–67. <https://doi.org/10.15373/22778179/apr2013/26>
42. Sen, S. & Kar, S. (2014). Comparison between the achievements in unit tests and annual examinations: a study of seventh and eighth-grade students on science subjects. *Indian Streams Research Journal*, 4(7), 1-5.
43. Sen, S., & Samanta, T. K. (2013). A study on the effect of unit tests in secondary level schools of Birbhum District, West Bengal. *SIKSHACHINTAN*, 7, 21-24.
44. Sutradhar, A. (2019). *Impact of Emotional Maturity on Self-Esteem of Adolescents- A Research Study*, Lambert Academic Publishing.