

Research Paper

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

Dr. Prasanta Gayen^{1*}

ABSTRACT

Due to the widespread use of smartphones and growing reliance on them for both personal and academic purposes, smartphone addiction has become a significant problem among post-graduate students in recent times. Thus, the present study aims to compare the difference between PG students of Purulia district of West Bengal regarding the present condition of different dimensions of smartphone addiction like daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance taking together as a branch in regard to gender and location. It is a Descriptive research following survey type study. The population of this study encompasses all the PG students studying in Purulia district of West Bengal. A sum of 140 PG students have been recognized as the sample for the study through a simple random sampling technique. “Smartphone Addiction Scale” by Kwon et al. (2013) is administered to collect the data. Mahalanobis Distance technique has been applied to find out the difference among the different dimensions of smartphone addiction. To analyze the data, SPSS version 26.0 is used. Result revealed no significant difference in dynamical nature of the dichotomous groups when six dependent variables i.e. six dimensions of smartphone addiction like daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance composed as a branch in regard to both gender and location.

Keywords: *smartphone addiction, daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, tolerance, Mahalanobis distance*

Smartphone addiction has emerged as a notable issue among post-graduate students, driven by the abundant occurrence of smartphones and the increased dependency on these devices for both academic and personal activities. Smartphones offer a wide range of possibilities beyond mere communication, including access to social media, educational resources, entertainment, and other applications that facilitate daily life. However, the excessive use of smartphones can result in various negative outcomes, including academic disturbance, less productivity, sleep disturbances, and hostile effects on mental health (Elhai et al., 2017; Cha & Seo, 2018). The addictive nature of smartphones is often accredited to the release of dopamine in the brain, particularly in response to social media notifications and instant messaging apps, which create a cycle of reward and reinforcement (Montag et al., 2015). As postgraduate students face academic pressures and

¹Assistant Professor, School of Education (SoE), Adamas University, Barasat, Kolkata, West Bengal, India

*Corresponding Author

Received: November 27, 2024; Revision Received: February 11, 2025; Accepted: February 16, 2025

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

expectations, they may turn to smartphones as a means of escape or social construction, which can ultimately adoptive dependence. This dependency is concerning, as studies have shown that smartphone overuse may result in lower academic performance, increased anxiety, and social isolation (Panova & Carbonell, 2018).

In current modern 21st century, educational research has touched another level. Various new statistical tools are being used by researchers such as Mahalanobis distance, t-tests, cluster analysis, correlation, Mann Whitney U test etc. Several studies have been found on Mahalanobis distance, such as Mahato and Sen (2021b), Das (2023), Ahmed et al. (2022), Sen and Pal (2020), Mohanta et al. (2023b; 2023c), Adhikari (2023a; 2023b), Sen et al. (2023c), Sen, Pal and Adhikari (2023) etc. Several studies have been found on correlation, such as Gayen, Sen and Adhikari (2023), Mahato and Das (2024), Das and Mahato (2024b), Sutradhar et al. (2023), Sutradhar and Sen (2022a; 2022b), Gayen and Sen (2021), Kar and Saha (2021a; 2021b), Mahato, Sen and Adhikari (2023), Mahato and Sen (2023b), Karim et al. (2024), Sen et al. (2023b), Adhikari, Mahato and Sen (2023), Panda and Sen (2020), Sutradhar and Sen (2021), Sen, Saha and Maji (2021), Saha (2013), Saha (2012b), Gayen (2024), Mahato, Das and Gayen (2024), Mahato, Gayen and Mahato (2023a; 2023b; 2023c), Das, Mahato and Gayen (2024), Das, Gayen and Sen (2023a), etc. Several studies have been found on Cluster analysis, such as Adhikari and Sen (2023a; 2023b), Das, Mahato and Sen (2023), Das and Mahato (2024a), Sen et al. (2023a), Mahato, Das and Sen (2024), Mohanta et al. (2023a; 2023d), Ansary et al. (2023), Adhikari et al. (2023a; 2023b), Gorain et al. (2022), Saha, Sen and Adhikari (2021) etc. Several studies have been done using t-tests such as, Ahmed et al. (2018), Adhikari et al. (2023c), Ahmed et al. (2024), Ghosh and Sen (2023; 2024), Gayen and Sen (2022), Mahato and Sen (2021a), Mondal et al. (2018), Mahato and Sen (2023a), Dandapat et al. (2021), Mondal and Saha (2023), Saha (2012a; 2021), Karmakar et al. (2016), Mahanti, Mondal and Saha (2016), Sen, Mondal and Saha (2013), Mondal and Saha (2013), Khan et al. (2023), Ansary, Ansary and Adhikari (2022), Khatun, Ansary and Adhikari (2022), Gayen et al. (2021), Rajak and Gayen (2022), Gayen and Sen (2023a; 2023b), Bag et al. (2021), Ansary, Saha and Gorain (2021), Das, Gayen and Sen (2023b) etc. Several studies have been found on Mann Whitney U Test, such as Halder et al. (2022), Sen et al. (2021a; 2021b), Saha and Adhikari (2021), Mahato et al. (2022) etc.

LITERATURE REVIEW

Kwon et al. (2013) identified personality traits, such as impulsivity and anxiety, as predictors of smartphone addiction, particularly in educational settings where students rely on devices for constant information access and social interactions. Excessive smartphone use can lead to social isolation, reducing face-to-face interactions, and deteriorating the quality of relationships. Studies like Bian and Leung (2015) indicate that excessive smartphone users may develop poorer social skills and suffer from increased loneliness, even though the smartphone is often intended as a tool for social connectivity. Research by Demirci, Akgönül, and Akpınar (2015) on smartphone addiction among students showed differences in usage patterns and addiction levels based on gender. A cross-sectional study by Hawi and Samaha (2016) on university students found significant correlations between smartphone addiction scores and levels of anxiety, with students using smartphones as a coping mechanism. Research by Elhai et al. (2017) shows that heavy smartphone use can lead to increased anxiety and depressive symptoms, as students often feel the pressure to be constantly connected, resulting in poor academic focus and reduced productivity. Universities have implemented various interventions to help students manage smartphone addiction, including digital detox programs and workshops on time management and

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

mindfulness. Programs that focus on self-regulation techniques and awareness about the consequences of excessive smartphone use are particularly effective, according to Tosun and Lajunen (2020).

Objectives of the Study

To compare different dimensions of smartphone addiction like daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance taking together as a branch for different group of PG students of Purulia district of West Bengal. And for this the objectives of the study are framed accordingly:

- To compare the difference between male and female PG students regarding the present condition of above mentioned variables.
- To compare the difference between PG students of urban and rural institutions regarding the present condition of above mentioned variables.

Hypotheses

For the present work, following hypotheses may be taken into consideration:

- **H₀₁:** There is no significant difference between male and female PG students on different dimensions of smartphone addiction taken together as a unit.
- **H₀₂:** There is no significant difference between urban and rural PG students on different dimensions of smartphone addiction taken together as a unit.

METHODOLOGY OF THE STUDY

Method: It is a Descriptive research following survey type study.

Population: The population of this study encompasses all the PG students studying in Purulia district of West Bengal.

Sample and Sampling Technique: A sum of 140 PG students have been recognized as the sample for the study through a simple random sampling technique.

Tools used: “*Smartphone Addiction Scale*” by Kwon et al. (2013) is administered to collect the data.

Statistic used: Mahalanobis Distance technique has been applied to find out the difference among the different dimensions of smartphone addiction. To analyze the data, SPSS version 26.0 is used.

Mahalanobis Distance may be demarcated as

$$\Delta^2 = (A - B)^T \zeta^{-1} (A - B)$$

Where A and B are the column vectors representing means of each variable for two groups and ζ is pooled covariance matrix of two groups of data.

Mahalanobis Distance $\Delta = [(A - B)^T \zeta^{-1} (A - B)]^{\frac{1}{2}}$

Pooled Covariance Matrix

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

$$\zeta = [N_1\zeta_1 + N_2\zeta_2] / N$$

Where ζ_1 and ζ_2 be the Covariance Matrices, N_1 and N_2 be the sample size for first and second group respectively and

$$N = N_1 + N_2$$

RESULTS AND DISCUSSIONS

In Table 1, 2 & 3, following codes are used to represent six different dimensions of Organizational Climate:

1. Smartphone Addiction=A
2. Daily-life disturbances=B
3. Positive anticipation=C
4. Withdrawal=D
5. Cyberspace-oriented relationship=E
6. Overuse=F
7. Tolerance=G

Table 1: Descriptive statistics for different group of PG students

<i>Male PG Students (N=45)</i>							
Dependent Variable	A	B	C	D	E	F	G
Mean	112.62	19.78	20.84	12.22	12.93	25.07	21.78
<i>Female PG Students (N=95)</i>							
Dependent Variable	A	B	C	D	E	F	G
Mean	106.38	18.67	19.67	11.13	11.18	23.76	21.97
<i>Urban PG Students (N=46)</i>							
Dependent Variable	A	B	C	D	E	F	G
Mean	111.70	19.37	21.63	12.26	12.35	23.78	22.30
<i>Rural PG Students (N=94)</i>							
Dependent Variable	A	B	C	D	E	F	G
Mean	106.77	18.86	19.28	11.10	11.45	24.37	21.71

Table 1 represents the descriptive statistics required for calculating Mahalanobis Distance. Different groups have been compared to test the hypotheses H₀₁ and H₀₂ by calculating Mahalanobis Distance.

Table 2: Pooled variance-covariance matrix for male and female PG students

	A	B	C	D	E	F	G
A	23.3338	0.2390	0.4129	2.1434	0.4208	4.8949	31.4448
B	0.2390	29.3985	7.9353	0.7271	11.0301	7.9088	57.2388
C	0.4129	7.9353	15.8514	5.5693	9.4474	2.2571	41.4734
D	2.1434	0.7271	5.5693	14.9713	10.2663	6.6416	40.3189
E	0.4208	11.0301	9.4474	10.2663	42.9545	11.2442	85.3634
F	4.8949	7.9088	2.2571	6.6416	11.2442	31.4121	64.3586
G	31.4448	57.2388	41.4734	40.3189	85.3634	64.3586	320.1979

Table 2 denotes pooled variance-covariance matrix for dichotomous variable gender (male and female). And from this table both positive and negative covariance are noted.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

Table 3: Pooled variance-covariance matrix for urban and rural PG students

	A	B	C	D	E	F	G
A	23.5373	0.2765	0.5393	2.4587	0.8227	4.7861	32.4206
B	0.2765	28.4559	7.6000	0.6985	11.6670	7.5228	56.2208
C	0.5393	7.6000	15.7935	5.7461	9.8943	2.0395	41.6127
D	2.4587	0.6985	5.7461	15.4444	10.8554	6.4267	41.6297
E	0.8227	11.6670	9.8943	10.8554	43.2226	11.2541	87.7161
F	4.7861	7.5228	2.0395	6.4267	11.2541	31.3321	63.3613
G	32.4206	56.2208	41.6127	41.6297	87.7161	63.3613	322.9613

Table 3 denotes pooled variance-covariance matrix for dichotomous variable location of institution (urban and rural). And from this table both positive and negative covariance are noted.

Mahalanobis Distance is supposed to compare two or more variables as a unit of variables. Here the unit is daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance. Mahalanobis Distance is characterized by a number as measure of distance. It is possible to conclude that there is a significant difference between two sets of multiple variables if the Mahalanobis Distance is greater than 1. It goes without saying that if Mahalanobis Distance is less than 1, it may be regarded as insignificant.

Table 4: Mahalanobis Distance for dependent variables: daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance

Independent Variables	Male vs Female	Urban vs rural
Mahalanobis Distance	0.877	0.638

Table 4 signifies the Mahalanobis Distance between dichotomous variables. Values of Mahalanobis Distance listed in table 4 state that the differences are insignificant. So, there is no significant difference in dynamical nature of the dichotomous groups when six dependent variables i.e. daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance composed as a branch. So, H_01 and H_02 are accepted.

CONCLUSION

Smartphone addiction among students has become one of the most essential aspects in today's society where technology and technological devices have devoured the education system wholly. In this study, a set of dependent variables (daily-life disturbances, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance) have been measured using Mahalanobis distance to compare the difference in different dimensions of smartphone addiction of PG students of Purulia district of West Bengal in regard to gender (male and female) and location (urban and rural) but no significant difference have been observed among them.

REFERENCES

Adhikari, A. (2023a). Application of Mahalanobis distance in education and educational psychology: A mini review. *Innovare Journal of Education*, 11(4), 5-7.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Adhikari, A. (2023b). Socio-educational perspectives: A study on human adjustment. *EPRA International Journal of Research and Development (IJRD)*, 8(1), 97-101. DOI: <https://doi.org/10.36713/epra12233>
- Adhikari, A., & Sen, S. (2023a). Cluster analysis on institutional commitment and organizational climate. *International Journal of Research Publication and Reviews*, 4(5), 4974-4988.
- Adhikari, A., & Sen, S. (2023b). Recent trends of cluster analysis in education. *International Research Journal of Modernization in Engineering Technology and Science*, 5(8), 1858-1861.
- Adhikari, A., Gayen, P., Mahato, R. C., Pal, I., & Sen, S. (2023a). Multi-dimensional data analysis in education: Accumulation and comparison among variables. *International Journal of Research Publication and Reviews*, 4(5), 2243-2245.
- Adhikari, A., Gayen, P., Sutradhar, A., & Sen, S. (2023b). A measure for measure: Statistics in Education. *International Journal of Research Publication and Reviews*, 4(5), 4239-4243.
- Adhikari, A., Gorain, S. C., Gayen, P., Pal, I., & Sen, S. (2023c). Studying the differences: A review on t- test. *International Research Journal of Education and Technology*, 5(5), 338-349.
- Adhikari, A., Mahato, R. C., & Sen, S. (2023). Anxiety, depression, stress, general self-efficacy and specific self-efficacy: Comparison among science and social science students. *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, 4(1), 382-389.
- Ahmed, E. A., Karim, M. R., Banerjee, M., & Sen, S. (2022). Comparison of scholastic attainment in English and Math amongst other studies at the higher secondary level: A study using Mahalanobis distance. *Educational Administration: Theory and Practice*, 28(4), 1-13.
- Ahmed, E.A., Banerjee, M., Sen, S., & Chatterjee, P. (2018). Trends of achievement in Mathematics: A study on higher secondary level students of Dhubri district of Assam, India. *Journal of Education and Development*, 8(16), 61-79.
- Ahmed, E.A., Karim, M.R., Banerjee, M., Sen, S., Banu, S., & Warda, W.U. (2024). Higher secondary students' performance in Math, English, and other science subjects in pre-covid 19 and during covid 19 pandemic: A comparative study using Mahalanobis distance. *Theory and Practice in Language Studies*, 14(3), 854-865. (MD)
- Ansary, K., Ansary, S., Adhikari, A., & Sen, S. (2023). Clustering technique for analysing attitude towards value-oriented education among undergraduate students. *International journal of research publication and reviews*, 4(5), 5576-5584.
- 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.
- 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>
- Bag, K., Gayen, P., Alam, S.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.
- Bian, M., & Leung, L. (2015). Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. *Social Science Computer Review*, 33(1), 61-79.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Cha, S.S., & Seo, B.K. (2018). Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. *Health Psychology Open*, 5(1), 1-8. <https://doi.org/10.1177/2055102918755046>
- 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.
- Das, B. (2023). Application of Mahalanobis distance as a measure of lifestyle of health and sustainability and its components. *The Social Science Review: A Multidisciplinary Journal*, 1(1), 44-52.
- Das, B., & Mahato, S. (2024a). Analysing positive mental health among students in Purulia district, West Bengal, using clustering techniques. *The Social Science Review: A Multidisciplinary Journal*, 2(3), 12-26.
- Das, B., & Mahato, S. (2024b). Lifestyle of health and sustainability: Comparison of correlations between rural-urban students in Purulia district, West Bengal using Fisher Z-Transformation. *The Social Science Review: A Multidisciplinary Journal*, 2(3), 229-240.
- Das, B., Gayen, P., & Sen, S. (2023a). Lifestyle of health and sustainability (LOHAS): A comparative study on undergraduate students. *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, 3(1), 32-44.
- Das, B., Gayen, P., & Sen, S. (2023b). Lifestyle of health and sustainability (LOHAS) of undergraduate students of Purulia district of West Bengal. *EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO)*, 10(8), 13-19.
- Das, B., Mahato, S., & Gayen, P. (2024). Lifestyles of health and sustainability (LOHAS): Differentiating relationships in regard to stream of study. *The Social Science Review: A Multidisciplinary Journal*, 2(1), 1-13.
- Das, B., Mahato, S., & Sen, S. (2023). Clustering Technique for analyzing lifestyle of health and sustainability of undergraduate students. *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, 3(1), 207-221.
- Demirci, K., Akgönül, M., & Akpınar, A. (2015). Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *Journal of Behavioral Addictions*, 4(2), 85-92.
- Elhai, J. D., Levine, J. C., Dvorak, R. D., & Hall, B. J. (2017). Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. *Computers in Human Behavior*, 63, 509-516. <https://doi.org/10.1016/j.chb.2016.05.079>
- García-Santillán, A., & Espinosa-Ramos, E. (2021). Addiction to the smartphone in high school students: How it's in daily life? *Contemporary Educational Technology*, 13(2), 1-14. <https://doi.org/10.30935/cedtech/9609>
- Gayen, P. (2024). Academic resilience & m-learning of undergraduate students: A correlational study. *Indian Journal of Multidisciplinary Research*, 1, 35-39.
- Gayen, P., & Mahato, R. C. (2023). Smartphone addiction of postgraduate students of Sidho-Kanho-Birsha University, Purulia. *The Social Science Review: A Multidisciplinary Journal*, 1(1), 38-43.
- Gayen, P., & Sen, S. (2021). Prevalence of anxiety, depression and stress among postgraduate students during COVID-19 situation: A study on postgraduate students. *International Journal for Innovative Research in Multidisciplinary Field*, 7(9), 172-178.
- Gayen, P., & Sen, S. (2022). Evolution of technological pedagogical and content knowledge (TPACK). In S. Sen and B. Saha (Ed.), *Education in transition: Mirroring 21st century* (pp. 41-51). Crescent Publishing Corporation.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Gayen, P., & Sen, S. (2023a). A study on interest in teaching of pre-service language trainee teachers of Bankura and Purulia district of West Bengal. *International Journal of Multidisciplinary Educational Research*, 12[7(1)], 79-83.
- Gayen, P., & Sen, S. (2023b). A study on technological pedagogical and content knowledge (TPACK) of pre-service language trainee teachers of Bankura and Purulia district of West Bengal. *International Journal of Creative Research Thoughts (IJCRT)*, 11(4), h735-h739.
- 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.
- Gayen, P., Sen, S., & Adhikari, A. (2023). Relationship between organizational climate and institutional commitment of secondary school teachers of West Bengal. *International Journal of Scientific Research and Engineering Development*, 6(3), 426-436.
- Ghosh, A., & Sen, S. (2023). Relationship between different components of English writing skill. *International Journal of Research and Review*, 10(10), 463-471.
- Ghosh, A., & Sen, S. (2024). District wise comparative study of English writing skill of Bengali medium secondary school students of West Bengal. *The International Journal of Indian Psychology*, 12(2), 3143-3158. DOI: 10.25215/1202.276 (t-test)
- Gorain, S. C., Saha, B., Maji, S., & Sen, S. (2022). A study on relationship and cluster analysis among internet dependency, social isolation and personality. *International Journal of Research Publication and Reviews*, 3(1), 884-888.
- Haldar, P., Roy, S., Gorain, S.C., Adhikari, A., & Saha, B. (2022). Measuring attitude towards sustainable development among trainee teachers in Purulia district of West Bengal. *American Journal of Educational Research*, 10(12), 682-696. DOI: 10.12691/education-10-12-5
- Hanna, K.T., & Wigmore, I. (June, 2024). Smartphone addiction (cellphone addiction). *TechTarget*. Retrieved from <https://www.techtarget.com/whatis/definition/smartphone-addiction-cell-phone-addiction>
- Hawi, N. S., & Samaha, M. (2016). The relations among social media addiction, self-esteem, and satisfaction with life. *Social Science Computer Review*, 34(5), 576-586.
- Jabeen, U., Sarvat, H., & Hashmi, N. (2021). Smartphone addiction and family communication in adults. *Humanities & Social Sciences Reviews*, 9(3), 1288-1294. DOI: 10.18510/hssr.2021.93127
- Kar, D., & Saha, B. (2021a). A study of relationship between leadership style and emotional intelligence of undergraduate students. *International Journal of Research and Analytical Reviews (IJRAR)*, 8(2), 13-15.
- Kar, D., & Saha, B. (2021b). Leadership style and adjustment ability among undergraduate students: A correlational study. *International Journal of Creative Research Thoughts (IJCRT)*, 9(9), d148-d151.
- Karim, M.R., Adhikari, A., Saha, B., & Sen, S. (2024). Influence of literature and colonialism in the informal learning of Raja Ravi Varma. *Synesis*, 16(1), 370-377.
- 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.
- 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 Sciences*, 4(1), 1-10. DOI: 10.47310/iarjhss.2023.v04i01.001

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- 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>
- Know, M., Lee, J., Won, W., Park, J., Min, J., Hahn, C., Gu, X., Choi, J., & Kim, D. (2013). Development and validation of smartphone addiction scale (SAS). *PLOSOne*, 8(2), 1-7. <https://doi.org/10.1371/journal.pone.0056936>
- Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013). The smartphone addiction scale: Development and validation of a short version for adolescents. *PLoS ONE*, 8(12), e83558.
- 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 Science*, 12(2), 171-174.
- Mahato, A., Gayen, P., & Mahato, R. C. (2023a). Relationship between cognitive failure and internet addiction of higher secondary students of Purulia district of West Bengal: A study. *Innovare Journal of Education*, 11(3), 15-19.
- Mahato, D., Gayen, P., & Mahato, R.C. (2023b). 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>
- Mahato, D., Gorain, S.C., Roy, S., & Adhikari, A. (2022). Introspecting flipped classroom: A survey on higher education students. *Galore International Journal of Applied Sciences & Humanities*, 6(4), 56-69. DOI: <https://doi.org/10.52403/gijash.20221009>
- Mahato, M., Gayen, P., & Mahato, R. C. (2023c). 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.
- Mahato, R. C., & Sen, S. (2021a). 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.
- Mahato, R. C., & Sen, S. (2021b). Application of Mahalanobis distance to determine the dynamical nature of academic stress, self-efficacy in mathematics and anxiety in mathematics. *International journal of advances in engineering and management (IJAEM)*, 3(5), 1398-1401.
- Mahato, R. C., & Sen, S. (2023a). A study of contexts knowledge (CK1), technological pedagogical content knowledge (TPCK) and attitudes 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.
- Mahato, R. C., & Sen, S. (2023b). Relationship among Contexts Knowledge (CK1), technological pedagogical content knowledge (TPCK) and attitude towards creative teaching for pre-service trainee teachers: A study on Mathematics method subject. *International Journal of Creative Research Thoughts*, 11(4), d301-d314.
- Mahato, R. C., Sen, S., & Adhikari, A. (2023). A study of DASS-21 and the self-efficacy scale on post-graduate students. *International Journal of Research Publication and Reviews*, 4(6), 4249-4255.
- Mahato, S., & Das, B. (2024). Mental well-being among students with respect to gender, institution and residence: Insight from Purulia district, West Bengal. *The Social Science Review A Multidisciplinary Journal*, 2(2), 164-175.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Mahato, S., Das, B., & Gayen, P. (2024). Achievement on language subjects of secondary school students: Differentiating relationships in regard to gender and type of institute. *The Social Science Review: A Multidisciplinary Journal*, 2(1), 78-86.
- Mahato, S., Das, B., & Gayen, P. (2024). Achievement on language subjects of secondary school students: Differentiating relationships in regard to gender and type of institute. *The Social Science Review: A Multidisciplinary Journal*, 2(1), 78-86.
- Mahato, S., Das, B., & Sen, S. (2024). Test of changing status in achievement on language subjects for class vii student: A study by Mahalanobis distance. *International Journal of Research Publication and Reviews*, 4(10), 1540-1545.
- Mohanta, R., Adhikari, A., Pal, I., & Sen, S. (2023a). Introspecting institutional commitment using cluster analysis. *International Research Journal of Education and Technology*, 5(4), 198-217.
- Mohanta, R., Gayen, P., Pal, I., Mahato, R. C., & Sen, S. (2023b). Comparison among different dimensions of organizational climate of secondary school teachers of West Bengal by Mahalanobis distance. *EPR International Journal of Research and Development (IJRD)*, 8(4), 129-133.
- Mohanta, R., Gayen, P., Pal, I., Sutradhar, A., & Sen, S. (2023c). Comparison among different dimensions of institutional commitment of secondary school teachers of West Bengal by Mahalanobis distance. *International research journal of modernization in engineering technology and science*, 5(4), 4088-4093.
- Mohanta, R., Sen, S., Adhikari, A., & Pal, I. (2023d). Perceptual environment: A study on organizational climate using cluster analysis. *International Journal of Research Publication and Reviews*, 4(4). 1336-1346.
- 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
- 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.
- Mondal, N., & Saha, B. (2013). Achievement difference in science at secondary level in Darjeeling district: A comparative study. *International Journal of Scientific Research*, 2(2), 85-86.
- Montag, C., Lachmann, B., Herrlich, M., & Zweig, K. (2015). Addictive features of social media/messenger platforms and freemium games against the background of psychological and economic theories. *International Journal of Environmental Research and Public Health*, 12(10), 10815-10831. <https://doi.org/10.3390/ijerph121010815>
- Panda, T., & Sen, S. (2020). A comparative study on teachers' perception on learning disability between B.Ed. and D.El.Ed. trained teachers. *International Journal of All Research Education and Scientific Methods (IJARESM)*, 8(12), 1769-1774.
- Pandya, C. N., Christian, D. S., & Patel, M. M. (2021). A cross-sectional study on smartphone addiction among late adolescents and young adults (aged 15 to 24 years) of Ahmedabad city, Gujarat, India. *Journal of Evidence-Based Medicine and Healthcare*, 8(9), 491-496. DOI:10.18410/jebmr/202196
- Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions*, 7(2), 252-259. <https://doi.org/10.1556/2006.7.2018.49>
- 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.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Saha, B. (2012a). A comparative study of environmental awareness among teacher trainees of West Bengal. *Indian Streams Research Journal*, 2(9), 1-5.
- Saha, B. (2012b). Creativity in relation to socio-economic status in secondary school students in West Bengal. *Indian Journal of Applied Research*, 2(2), 60-61.
- Saha, B. (2013). Creativity in relation to environmental awareness in Birbhum district: An analytical study. *IJSR-International Journal of Scientific Research*, 2(8), 106-107.
- 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 Sciences*, 2(5), 25-29. DOI: 10.47310/iarjhss.v02i05.004
- Saha, B., & Adhikari, A. (2021). Measuring social relationship of undergraduate college students of West Bengal. *Education India Journal*, 10(4), 261-269.
- Saha, B., Sen, S., & Adhikari, A. (2021). Analysis of attitude towards yoga among college students using clustering techniques. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 7(9), 308-314. DOI: <https://doi.org/10.36713/epura8552>
- Sen, B., Mondal, N., & Saha, B. (2013). 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.
- Sen, S., & Pal, I. (2020). Mahalanobis distance: A study on achievement of science and mathematics. *International journal of creative research thoughts (IJCRT)*, 8(7), 2542-2547.
- Sen, S., Adhikari, A., Ansary, K., Roy, S., & Pal, I. (2023a). Clustering technique for analyzing leadership style of the head of the institutions. *International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)*, 3(3), 220-228. DOI: 10.48175/IJARSCT-9806
- Sen, S., Gayen, P., Mahato, R.C., & Adhikari, A. (2023b). A correlational study on organisational climate and institutional commitment of secondary school teachers. *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, 5(12), 152-155.
- Sen, S., Gayen, P., Pal, I., Sutradhar, A., Ansary, K., Mahato, R. C., & Adhikari, A. (2023c). Comparison among different leadership styles of head of the institution of West Bengal by Mahalanobis distance. *International journal of modernization in engineering technology and science*, 5(4), 5005-5010.
- Sen, S., Mandi, A., Dhara, B., Ansary, F., Mandi, M., Murmu, M.B., & Gayen, P. (2021a). General self-efficacy and specific self-efficacy of postgraduate students in the COVID-19 pandemic: A study. *International Journal of Research Publication and Reviews*, 2(9), 531-536.
- Sen, S., Pal, I., & Adhikari, A. (2023). Comparison among Self-Efficacy, Depression, Anxiety and Stress of Postgraduate Students by Mahalanobis Distance. *International Journal of Advanced Education and Research*, 8(1), 85-88.
- Sen, S., Saha, B., & Maji, S. (2021). Social networks and its effects on learning community. In *Social Media: Leisure, Health and Education* (Ed.) (pp. 170-177). New Delhi Publishers.
- Sen, S., Sau, P., Mahato, S., Satpati, S., Afreen, T., & Gayen, P. (2021b). Depression, anxiety and stress of postgraduate students during covid-19 pandemic: A study on postgraduate students of Sidho-Kanho-Birsha University, Purulia, West Bengal, India. *International Journal of Research Publication and Reviews*, 2(9), 586-591.

Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance

- Singh, R., & Kumari, V. (2021). Loneliness and smartphone addiction among youths: A correlation study. *Indian Journal of Applied Research*, 11(3), 51-53. DOI: 10.36106/ijar
- Singh, R., & Kumari, V. (2021). Loneliness and smartphone addiction among youths: A correlation study. *Indian Journal of Applied Research*, 11(3), 51-53. DOI: 10.36106/ijar
- Sutradhar, A., & Sen, S. (2021). A study on college teachers about teaching during Covid-19 pandemic. *The International Journal of Indian Psychology*, 9(3), 1107-1115. DOI: 10.25215/0903.102
- Sutradhar, A., & Sen, S. (2022a). Effect of Different dimensions of emotional maturity on academic achievement of B. Ed. trainees—A study. *International Journal of Research Publication and Reviews*, 3(11), 1237-1247.
- Sutradhar, A., & Sen, S. (2022b). Emotional maturity and study habits of B. Ed. trainees—A correlational study. *International Journal of Multidisciplinary Research and Development*, 9(12), 77-83.
- Sutradhar, A., Adhikari, A., Sutradhar, S. M., & Sen, S. (2023). Use of correlational analysis in educational research. *International research journal of Education and Technology*, 5(5), 731-737.
- Tosun, N., & Lajunen, T. (2020). A study of digital addiction and coping strategies among university students. *Cyberpsychology, Behavior, and Social Networking*, 23(6), 382-390.
- Vyas, D., Patel, B., Janki, D., Rathod, D., Mansuri, F., Parmar, H., & Vishwa, S. (2021). Effect of smartphone addiction among school going children (8-12 years) during covid-19 pandemic. *Journal of Emerging Technologies and Innovative Research*, 8(10), e61-e71

Acknowledgment

The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Gayen, P. (2025). Comparing Different Dimensions of Smartphone Addiction of PG Students by Mahalanobis Distance. *International Journal of Indian Psychology*, 13(1), 1070-1081. DIP:18.01.101.20251301, DOI:10.25215/1301.101