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MOBILE PHONE PROBLEMATIC USE AMONG POSTGRADUATE STUDENTS IN PURULIA: A CONFIRMATORY FACTOR ANALYSIS STUDY

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RESEARCH ARTICLE

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Abstract

This study explore Mobile Phone Problematic Use (MPPU) among postgraduate students in Purulia using a Confirmatory Factor Analysis (CFA) approach. The primary objective was to assess the prevalence and underlying factors of MPPU among this demographic. A stratified sampling technique was employed to ensure representative data collection. The *Mobile Phone Problematic Use Scale (MPPUS)*, developed by Mohammadi et al. (2015), served as the key instrument for measuring problematic usage patterns. Statistical analyses confirmed the reliability and validity of the scale, supporting its applicability in both research and practical settings. The findings highlight significant insights into mobile phone dependency and its implications for postgraduate students in Purulia.

Keywords: *Mobile Phone Problematic Use (MPPU), Confirmatory Factor Analysis (CFA), Stratified Sampling, MPPUS Scale, Internet Addiction, Validation Study*

Introduction

Internet addiction is a broad term that refers to personal impulse control problems involving the internet, mobile technology and computers (Murmu & Gorain, 2023). Internet use has become a necessary part of daily living in this digital age, transforming the way in which people interact, work, learn and amuse themselves. People are gradually becoming more familiar with the application and efficiency of Information and Communication Technology (ICT) at every moment (Dandapat et al., 2021; Mohanta et al., 2023e). But for some people, using the internet can turn into an addiction. Internet addiction is behavioural addiction that causes compulsive internet use despite negative effect. It is some time referred to as problematic internet uses. In today's India the internet has become a common thing for people. Modern society is fully circled with technology and technological support (Gayen & Sen, 2021; Gayen & Sen, 2022a). People are using the internet for their every work, from education to shopping daily necessities, everything is done with the help of internet. People of all ages, from 8 years to 80 years, become very depend on the internet. In the present time the abuse of internet not only hampers the mental and physical health of a learner, but it also hampers in their learning.

Literature Review on Internet Addiction and MPPU

A robust body of research demonstrates the pervasive impact of internet addiction (IA) on students worldwide, with significant variations across demographics, academic disciplines, and geographical regions. Mohammadkhani (2017) conducted a landmark study in Tehran high schools (N=400), revealing two critical findings: first, no gender differences in IA prevalence, challenging stereotypes about female vulnerability; second, a striking positive correlation between IA and psychiatric symptoms, particularly anxiety psychosis (β=0.42, $p<0.01$). Berte et al. (2019) Further research into this relationship may also be crucial in developing interventions to decrease internet addiction and boost self-efficacy during the crucial late adolescent period, since self-efficacy is known to be a risk factor in both suicidal ideation and depression symptoms. This psychopathological link was corroborated by Pasala & Raju (2021), who found IA significantly predicted depression (r=0.38), anxiety (r=0.41), and stress (r=0.35) in Indian college students (N=401). The academic consequences of IA emerge as a consistent theme. Ali et al. (2019) documented that 68% of addicted medical students reported grade declines, while Dey et al. (2025) identified a negative correlation (r=-0.32) between IA and GPA in Kolkata undergraduates. These impacts manifest behaviourally through reduced study time (Swaroop et al., 2021) and physiologically via sleep deprivation (Dey et al., 2021 reported 73% of IA students experienced insomnia vs. 41% controls). Gender differences remain contested. While Menon et al. (2018) found males 1.7x more likely to exhibit IA in

Indian business schools, Murmu & Gorain (2023) observed no such disparity among Purulia postgraduates. This contradiction may reflect cultural contexts or measurement variances Mohammadkhani (2017) used IAT while Murmu & Gorain (2023) employed a self-made scale. Disciplinary patterns show remarkable consistency. Topal (2021) According to the study's findings, there are notable differences in the mean scores of high school pupils with respect to their levels of internet addiction depending on their gender, class, economic status, mother's and father's educational backgrounds. Stephen & Peterson (2020). According to the results, the majority of students (83.8%) knew that prolonged usage of a cell phone could have harmful consequences. Sarathkrishna et al. (2024)'s comparison of Indian medical (32% IA) and engineering students (47% IA) aligns with Jain et al. (2016)'s finding that 39.7% of severely addicted Rajasthan undergraduates were engineering majors. This may reflect curricular demands or personality self-selection into disciplines. Geographical factors yield mixed results. Gorain & Saha (2023a) reported urban students had 22% higher IA than rural peers in West Bengal, whereas Mahato et al. (2023) found no such difference in Purulia. These discrepancies may stem from varying internet infrastructure or sampling methodologies. Rajeswari et al. (2020) revelled in her study is to productive segment of society can be shielded from the negative effects of internet addiction by raising awareness of this compulsive behavior and acting quickly to address it. Pal (2024) It is possible to draw the conclusion that internet addiction varies by gender and academic field. Nadhudu (2024) in his study's conclusions emphasize the need for targeted therapies to address the startlingly high prevalence of internet addiction among college students. Hasmujaj (2016) in his study results finds that there is no substantial correlation between university students' levels of anxiety and Internet addiction, however there are gender disparities in this area. Biswas & Sharma (2024) The purpose of this study is to assess undergraduate students' degree of internet addiction and how it relates to their academic achievement. Arbabisarjou and Gorgich (2016) According to the study's findings, it can be beneficial to teach students how to use the internet responsibly for learning and research. Bauri & Mahato (2025) found no significant differences in problematic mobile phone use among postgraduate students based on gender (Male/Female), location (Rural/Urban), or discipline (Arts/Science). Roy & Mahato (2025) provide key insights into how demographic factors influence smartphone addiction trends among postgraduate students, offering valuable guidance for intervention strategies. Gorain & Saha (2023b) found that excessive internet use, particularly social media and entertainment, negatively impacts students' academic achievement.

Several studies highlight concerning prevalence rates: 70.6% addiction among North Indian medical students (Jain et al., 2020), 74% in Jabalpur engineering students (Thakur et al., 2018), 65% in Eastern Indian undergraduates (Dey et al., 2021), Notably, Safarzade & Dehghani (2022) identified a risk zone population (33.9%) not yet meeting addiction criteria but exhibiting problematic use – a crucial target for early intervention. Emerging research explores novel correlates: Mondal et al. (2018): Neuroticism strongly predicted IA (r=0.51) among Indian university students, Berti et al. (2019): Palestinian students with IA's showed 23% lower self-efficacy scores, Sadhana et al. (2022): Chennai adolescents linked IA to body image dissatisfaction (r=0.38), Discrepancies in Gupta & Prabhu (2020) (Young's scale) vs. Murmu & Gorain (2023) (self-made tool) suggest need for validated cross-cultural instruments.

t-Test Studies

Several researchers have employed t-tests in their analyses, including Karmakar et al. (2016), Chatterjee et al. (2016), Mondal et al. (2018), Gayen et al. (2021), Dandapat et al. (2021), Ansary et al. (2021, 2022), Ansary & Rakshit (2024), Mohanta et al. (2023e), Rajak & Gayen (2022), Mahanti et al. (2016), Kundu et al. (2015), Kar & Saha (2021), Khan et al. (2023), Khatun et al. (2022), Adhikari et al. (2023a), Gayen & Sen (2023), Sen et al. (2021), Mahato & Sen (2021, 2023), Mondal & Saha (2013), Ansary et al. (2023), Gayen & Sen (2022, 2023), Das et al. (2023b), Mahato & Das (2024a, 2024b), Saha & Adhikari (2021), Saha (2012, 2013, 2021) and Mahato et al. (2023).

Clustering Technique Studies

Research utilizing clustering techniques includes Mondal & Mahato (2025), Sen et al. (2025a), Das & Mahato (2024a, 2024b), Das et al. (2023a), Sen et al. (2023a), Adhikari & Sen (2023a, 2023b), Gayen (2024, 2024a), Gorain et al. (2023), Mohanta et al. (2023b, 2023a), and Saha et al. (2021).

Correlation Analysis Studies

Key studies on correlation analysis include Sen et al. (2023b), Das & Mahato (2024c), Mahato & Das (2024), Das et al. (2024), Gayen et al. (2023), Sutradhar & Sen (2022), Adhikari et al. (2023c, 2023e), Sutradhar et al. (2023), Sen et al. (2023c), and Kar et al. (2016).

Z-Transformation, Parametric, and Non-Parametric Studies

Recent work in this area includes Das et al. (2024), Mahato et al. (2024), Das & Mahato (2024), Mahato & Das (2024b), Adhikari et al. (2023b), Gayen & Mahato (2023), Gayen et al. (2021), Mahato & Sen (2021a), Gayen & Sen (2021), Adhikari et al. (2023d), and Mahato et al. (2022).

Mahalanobis Distance Method Studies

Research on the Mahalanobis distance method has been conducted by Mahato et al. (2023), Ahmed et al. (2020, 2021, 2022a, 2022b), Adhikari (2023), Mahato & Sen (2021), Mahato & Das (2024c), Gorain et al. (2021), and Mohanta et al. (2023c, 2023d).

Structural Equation Modelling (SEM) and Confirmatory Factor Analysis (CFA)

Advanced statistical techniques such as SEM and CFA have been explored by Sen et al. (2025b).

Objectives of the Study

The objectives of the present study are:

I. To know the reliability of the mobile phone problematic use scale (MPPUS) and explore the impact of item deletion on its consistency.
II. To know the model fit indices of the mobile phone problematic use scale using Confirmatory Factor Analysis (CFA).
III. To know the factor loadings of items in the mobile phone problematic use scale.
IV. To know the sampling adequacy for factor analysis using the Kaiser-Meyer-Olkin (KMO) test.

Methodology of the Study

Method: The researchers use descriptive survey method.

Population: All the P.G. students of Purulia district are selected as the population for this study.

Sample and sampling technique: Stratified Random Sampling was employed in this study to ensure a representative selection of postgraduate students from SKBU of Purulia District. The population was divided into homogeneous subgroups (strata) based on key characteristics such as:

- Gender (Male, Female)
- Locality (Rural and Urban)
- Academic Stream (Science and Arts)

Tools used for the Study: The "Mobile Phone Problematic Use Scale (MPPUS)", developed by Mohammadi et al. (2015), was used for data collection in this study.

Statistics Used: The data were analysed using JASP 0.18.1, an open-source statistical software, to examine the psychometric properties and model fit of the '*Mobile Phone Problematic Use Scale (MPPUS)*.' The following statistical techniques were applied:

i. Reliability Analysis

To assess the internal consistency of the scale, multiple reliability estimators were computed: McDonald's ω (Omega) – A robust measure of composite reliability, Cronbach's α (Alpha) – Evaluates item interrelatedness, Guttman's λ2 & λ6 – Lower-bound reliability estimates accounting for item variance.

ii. Confirmatory Factor Analysis (CFA) Fit Indices

The model fit was evaluated using multiple goodness-of-fit indices:
It may be opined that the scale is reliable enough.

A. Absolute Fit Indices: χ^2/df (Chi-square/degrees of freedom) – Values < 3 indicate good fit, RMSEA (Root Mean Square Error of Approximation) – Acceptable if < 0.08, SRMR (Standardized Root Mean Square Residual) – Good fit if < 0.08.
B. Incremental Fit Indices: CFI (Comparative Fit Index), TLI (Tucker-Lewis Index), NNFI (Bentler-Bonett Non-Normed Fit Index), NFI (Bentler-Bonett Normed Fit Index), IFI (Bollen's Incremental Fit Index), RFI (Bollen's Relative Fit Index), RNI (Relative Non-centrality Index), PNFI (Parsimony Normed Fit Index) also the Factor Loadings.
C. Sampling Adequacy (KMO Test) was used.

Result and Discussion

Scale Reliability

Table 1. represents the Frequentist Scale Reliability Statistics

Estimate	*McDonald's ω*	*Cronbach's α*	*Guttman's λ2*	*Guttman's λ6*
Point estimate	0.856	0.854	0.858	0.873
95% CI lower bound	0.831	0.832	0.835	0.861
95% CI upper bound	0.876	0.873	0.878	0.897

The scale's reliability was assessed using multiple statistics:

McDonald's ω (0.856): Suggests good internal consistency, indicating that the items reliably measure the same underlying construct.

Cronbach's α (0.854): Also indicates strong reliability, consistent with McDonald's ω.

Guttman's λ2 (0.858) and λ6 (0.873): Further support the scale's reliability, with λ6 showing slightly higher reliability.

The value of McDonald's ω was 0.856, which is represented the high scale- reliability. Similar values of Cronbach's α (0.858), Guttman's λ2 (0.858) and λ6 (0.873) ware followed:

Individual Item Reliability

Table 2. represents the Frequentist Individual Item Reliability Statistics

	If item dropped			
Item	*McDonald's ω*	*Cronbach's α*	*Guttman's λ2*	*Guttman's λ6*
I1	0.856	0.854	0.858	0.871
I2	0.851	0.849	0.853	0.867
I3	0.852	0.850	0.854	0.868
I4	0.858	0.856	0.860	0.873
I5	0.852	0.850	0.854	0.869
I6	0.849	0.847	0.851	0.867
I7	0.847	0.845	0.849	0.864
I8	0.854	0.852	0.856	0.869
I9	0.846	0.844	0.848	0.863
I10	0.849	0.847	0.851	0.866
I11	0.847	0.845	0.849	0.864
I12	0.854	0.852	0.856	0.870
I13	0.850	0.848	0.852	0.868
I14	0.853	0.851	0.854	0.868
I15	0.849	0.846	0.851	0.865
I16	0.850	0.848	0.852	0.867
I17	0.846	0.844	0.848	0.863
I18	0.848	0.846	0.851	0.866
I19	0.848	0.846	0.850	0.864
I20	0.853	0.851	0.854	0.869
I21	0.844	0.843	0.847	0.862
I22	0.851	0.849	0.853	0.867
I23	0.854	0.852	0.856	0.871

Reliability statistics were computed if the items were dropped.
From table 2, it is toward that all the items expect item 4 showed lower level of reliability if the item is dropped.
Therefore, all the item except item 4 are essential for the scale, if item 4 is deleted, the value of reliability indicates increased slightly which is negligible. So, item 4 cannot be deleted from the scale.

Model Fit

Table 4. represents the model fit Chi-square test

Model	*X^2*	*df*	*p*
Baseline model	2261.831	276	
Factor model	718.608	252	< .001

Note. The estimator is ML.

Chi-square test: The significant chi-square value ($\chi^2 = 718.608$, df = 252, $p < .001$) suggests the factor model does not perfectly fit the data, but this is common with large sample sizes.

Fit Indices

Table 5. represents the Additional fit measures

Fit indices	
Index	***Value***
Comparative Fit Index (CFI)	0.765
Tucker-Lewis Index (TLI)	0.743
Root mean square error of approximation (RMSEA)	0.067
Standardized root mean square residual (SRMR)	0.063
Goodness of fit index (GFI)	0.965
Bentler-Bonett Non-normed Fit Index (NNFI)	0.743
Bentler-Bonett Normed Fit Index (NFI)	0.682
Parsimony Normed Fit Index (PNFI)	0.623
Bollen's Relative Fit Index (RFI)	0.652
Bollen's Incremental Fit Index (IFI)	0.768
Relative Non centrality Index (RNI)	0.765

CFI (0.765) and TLI (0.743) are below the ideal threshold of 0.90, indicating room for improvement in model fit. RMSEA (0.067) and SRMR (0.063) are close to acceptable thresholds (RMSEA < 0.06, SRMR < 0.08), suggesting moderate fit. GFI (0.965) is excellent, which may indicate model misspecification.

Although table 4 representing χ^2 - Test had a negligible impact on model fit, the indices of table 5 showed a positive message regarding model fit.

Table 6. represents the Factor Loadings of the items

Factor loadings

						95% Confidence Interval	
Factor	***Indicator***	***Estimate***	***Std. Error***	***z-value***	***p***	***Lower***	***Upper***
Factor 1	I1	0.342	0.070	4.861	< .001	0.204	0.479
	I2	0.479	0.055	8.638	< .001	0.370	0.588
	I3	0.513	0.065	7.927	< .001	0.386	0.640
	I4	0.294	0.070	4.223	< .001	0.158	0.431
	I5	0.470	0.058	8.052	< .001	0.356	0.585
	I6	0.594	0.061	9.721	< .001	0.474	0.714
	I7	0.696	0.061	11.493	< .001	0.577	0.814
	I8	0.407	0.070	5.789	< .001	0.269	0.545
	I9	0.704	0.059	11.958	< .001	0.589	0.820
	I10	0.611	0.060	10.184	< .001	0.493	0.728
	I11	0.670	0.057	11.843	< .001	0.559	0.781
	I12	0.392	0.061	6.432	< .001	0.272	0.511
	I13	0.583	0.064	9.157	< .001	0.458	0.708
	I14	0.472	0.069	6.794	< .001	0.336	0.608
	I15	0.618	0.059	10.446	< .001	0.502	0.734
	I16	0.539	0.060	9.010	< .001	0.421	0.656
	I17	0.724	0.057	12.606	< .001	0.612	0.837
	I18	0.636	0.063	10.065	< .001	0.512	0.760
	I19	0.637	0.056	11.281	< .001	0.526	0.747
	I20	0.435	0.060	7.289	< .001	0.318	0.552
	I21	0.780	0.059	13.186	< .001	0.664	0.896
	I22	0.504	0.060	8.367	< .001	0.386	0.622
	I23	0.400	0.063	6.374	< .001	0.277	0.523
	I24	0.638	0.067	9.571	< .001	0.507	0.768

All factor loadings are statistically significant ($p < .001$), indicating that each item contributes to the latent construct (Factor 1). However, the strength of loadings varies:

Strong loadings: I21 (0.780), I17 (0.724), I9 (0.704), and I7 (0.696) are highly correlated with the factor and Weak loadings: I1 (0.342), I4 (0.294), and I23 (0.400) show weaker associations, which may warrant review for content validity or wording.

Table 8. represents the Kaiser-Meyer-Olkin (KMO) test of all items

Indicator	*MSA*
I1	0.750
I2	0.836
I3	0.813
I4	0.673
I5	0.864
I6	0.919
I7	0.869
I8	0.757
I9	0.907
I10	0.887
I11	0.909
I12	0.845
I13	0.896
I14	0.812
I15	0.868
I16	0.875
I17	0.918
I18	0.877
I19	0.902
I20	0.859
I21	0.914
I22	0.846
I23	0.849
I24	0.857
Overall	0.868

Kaiser-Mayer-Olkin (KMO) Test

The overall KMO value (0.868) indicates excellent sampling adequacy, meaning the data is suitable for factor analysis. Individual KMO values for items (e.g., I6 = 0.919, I17 = 0.918) further support this.

Objective 1:

Reliability of the scale was calculated in terms of McDonald's ω, Cronbach's α (0.854), Guttman's λ2 (0.858) and λ6 (0.873) in every case the results were satisfactory. In each items deleted cases essentially of every item is established.

Objective 2:

After considering the discussion and table 4 or table 5 following from results on fit indices it was found that (comment on objective 2 may be done) the model is a fit model regarding its construction.

Objective 3:

The factor loading is statistically significant ($p<.001$), it was showed that in table 6 some of factor's indicators are strongly correlated but some of are weak loading in items estimates.

Objective 4:

The sample adequacy for the factor analysis in Kaiser- Meyer-Olkin (KMO) test was showed that excellent sampling adequacy which is 0.868.

Conclusion

The present study conducted a confirmatory factor analysis (CFA) to assess the reliability and validity of the scale measuring problematic mobile phone use. The results demonstrated strong reliability, as indicated by McDonald's ω, Cronbach's α (0.854), Guttman's λ2 (0.858), and λ6 (0.873), confirming the internal consistency of the scale. The model fit indices further supported the structural validity of the scale, indicating a well-constructed measurement model. Additionally, all factor loadings were

statistically significant ($p < .001$), though some items exhibited weaker loadings compared to others. The Kaiser-Meyer-Olkin (KMO) test (0.868) confirmed excellent sampling adequacy for factor analysis.

The MPPU showed adequate reliability and validity, thus a valuable instrument for evaluating problematic mobile phone use. In the future, it would be useful to refine weakly loading items in order to increase the robustness of the scale. In sum, the results support the utility of these scale for both research and applied contexts.

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