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# Effect of Screen Media Technologies on Physical and Psychological Well Being in Middle Aged Adults

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## ABSTRACT

Screen media technologies (SMTs) has become an essential part of human life and almost everybody, irrespective of their age group, uses one or the other screen media technologies. Increased dependency on SMTs is raising concerns over their ill effect on the psychological health of its users. The present work aims to study the impact of social media usage and laptop/computer on psychological and physical health. This is a cross-sectional study of the middle management employees of a major Indian telecom organization. The analyses were carried out using structural equation modelling (SEM) approach. Results suggested that neck pain is directly related to cognitive stress, somatic stress, and laptop/computer usage. Cognitive stress was indirectly related to Instagram and WhatsApp use. Behavioural stress had no direct or indirect relationship with social media or laptop/computer use. Using a laptop/computer is found to be the most critical factor contributing to neck pain in Indian middle-aged adults working in an office environment.

## KEYWORDS

Behavioural Stress, Cognitive Stress, Middle Aged Adults, Neck Pain, Physical Well Being, Psychological Well Being, Somatic Stress, Structural Equation Modelling

## INTRODUCTION

Screen media technologies (SMTs), comprising smartphones, tablets, televisions, and laptops/computers, are widely used for work-related and personal requirements. These have a significant effect on every aspect of life, be it social, personal or work. People are spending more and more time on these technologies to communicate with friends and family and enjoy their leisure time besides using

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them in official work. The use of SMTs positively affects the individual as it makes communication easier and improves and enhance relationships while decreasing loneliness (Wood et al., 2016). At the same time, several research studies point out the ill effect of the overuse of these technologies. According to a report by McDool et al. (2016), an hour a day spent on social networks reduces the probability of being satisfied with life by approximately 14 percent. The survey conducted by the Royal Society for Public Health in 2017 (Status of Mind: Social media and young people's mental health) has shown both the positive and negative effects of the use of media technologies on health. The survey found the use of such technologies helping to improve self-awareness, self-identity, community building, emotional support, awareness to others, access to health-related information, real-world relationships, and reducing loneliness. Increased depression, anxiety, bullying, rise in concerns related to physical appearance, fear of missing out on things, and sleep disorders are reported to be the adverse effects on the other hand. Depression and anxiety are the most frequently reported adverse effects of smartphones and computer/laptop overuse in school and college-going students (Rozgonjuk et al., 2018; Jamir et al., 2019). Kross et al. (2013), Balakrishnan and Shamim (2013), and Beardsmore (2015) reported that the overuse of SMTs and social media has led to mental health problems, low self-esteem, anxiety, social and emotional difficulties among young college-going students aged from 21 to 25 years.

The constant urge to check smartphones for messages and notifications, posting almost everything on social media, comparing others' social media life with their own, binge-watching on laptops or television are some of the factors associated with technology addiction in college students (Stoller, 2013, Chan et al., 2014, Kushlev et al., 2016, Walton-Pattison et al., 2018). Addiction to these technologies affects not only the mental health but also the physical health of the users. Neck pain is one of the most reported ill-effects of these technologies' overuse. Berolo et al. (2011) and Gustaffson et al. (2017) reported that neck pain among university students and young adults is associated with time-spent texting on mobile phones. Similar were the findings but on the use of laptops/computers in office workers (Cho et al., 2012) and university students (Eksioglu et al., 2017 and James et al., 2018).

In some cases, the overuse and addiction of these technologies can cause severe damage to a person's social, psychological and physical wellbeing. The seriousness of this issue is garnering the attention of psychologists, sociologists, and other related researchers. Leading software and smartphone organizations have also acknowledged this problem. They have thus developed various software applications enabling users to monitor and control the amount of time they spend on their smartphones, laptops, and televisions (Dennison et al., 2013, Rooksby et al., 2016). However, this technology supported feature is not the total solution to the problem and cannot arrest the overuse of the technology causing damage to physical and mental health.

According to a study conducted by the Royal Society for Public Health (RSPH), around 51% of middle-aged adults use the internet for social media. Facebook, Instagram, and WhatsApp are the biggest and most used social media platforms globally. Facebook Messenger is the top mobile application by the number of downloads, and Facebook is second on the list. WhatsApp and Instagram are respectively listed as third and fifth in the list. The number of middle-aged Facebook users has almost doubled since 2012. All this data suggests that in the present scenario, not only children and young adults are using social media, but middle-aged adults are also spending a considerable amount of their time using social media.

In most of the research, the effect of social media (Strasburger et al., 2010, O'Keeffe and Clarke-Pearson, 2011, Kross et al., 2013, Beyens et al., 2016, Vannucci et al., 2017, Thomée et al., 2011, Cheever et al., 2014, Park and Park, 2014) on stress, sleep disorders, and various other social and psychological factors have been analyzed with a focus on children, young adults and university students. The effect of social media usage on stress in middle-aged adults is a comparatively less explored field. So, the objective of the present work is to study how the use of SMTs and social media impacts psychological well-being and neck pain in middle-aged adults working in a leading Indian telecom organization.

Relevant to the objective of the research study, data were collected using a questionnaire, and the Structural Equation Modelling (SEM) approach is used for analyses. Section 2 of the paper describes the research methodology. Section 3 discusses the theoretical foundation and the hypotheses proposed to be tested. Section 4 presents the data analysis, while Section 5 results and discussion. Section 6 contains the conclusion and the scope for future work.

## RESEARCH METHODOLOGY

This paper attempts to study the impact of time spent on Facebook, Instagram, WhatsApp, and laptop/computer on behavioural stress, somatic stress, cognitive stress, and neck pain in middle-aged Indian adults. Figure 1, in the form of a flow chart, summarises the research methodology adopted in the present work. Based on the hypotheses, the data were collected using a questionnaire followed by the development of a model, as shown in Figure 2. Exploratory factor analysis, reliability analysis, and confirmatory factor analysis were performed after collecting data. SEM approach was used to identify the final model and the effect of exogenous variables on endogenous variables.

### Development of the Path Analysis Model

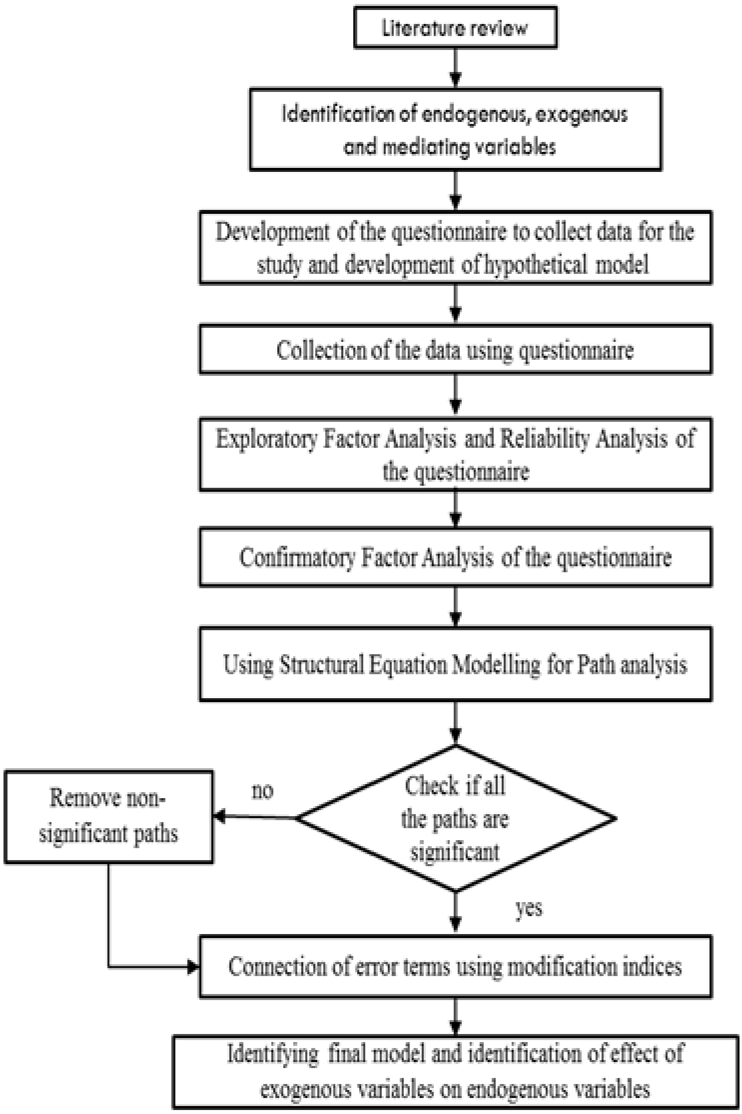
The path analysis model was developed on the assumption that is based on the assumption that time spent on Facebook, Instagram, WhatsApp, and laptop/computer affect psychological stress and neck pain. Relationship between facbook, WhatsApp and Instagram usage and its effect on mental and psychological health have been studied extensilvely in recent times. Most of the studies have collectively suggested that spending a significant amount of time on these social media platforms can have a damaging effect on psychological well-being and can also increasing the risk of experiencing psychological stress, depression, and anxiety due to various reasons. Kross et al. (2013), Balakrishnan and Shamim (2013), Beardsmore (2015) and Karim et al. (2023) reported the effect of facbook, WhatsApp and Instagram usage on the psychological stress. Similarly, Gupta et al. (2022), Al-Naami et al. (2023) and Pirnes et al. (2023) suggested that increased time spent on social media platforms was associated with neck pain. Also, frequency of checking notifications on phone has been reported to be a factor associated with psychological stress and neck pain in few studies. Santl et al. (2022) and Della Vedova et al. (2022) reported frequency of checking notifications on phone to be associated with psychological stress. Similarly, Ravulakollu et al. (2022) and Ghaly (2022) reported the relationship between frequency of checking notifications on phone and neck pain.

Effect of the time spent using a laptop/computer has been studied extensilvely and has been established as an important risk factor in predicting psychological stress neck pain among various study population working in differet occupational settings. Mody et al. (2022) and DM et al. (2023) reported the a significant effect of laptop usage on psychological stress. Similarly, Umar et al., (2022) and Argus and Pääsuke (2023) also reported its effect on neck pain.

Based on the objective of the study and literature following hypotheses were taken for this research study:

Hypothesis 1: Time spent using Facebook has a significant effect on psychological stress.
Hypothesis 2: Time spent using Instagram has a significant effect on psychological stress.
Hypothesis 3: Time spent using WhatsApp has a significant effect on psychological stress.
Hypothesis 4: Time spent using Laptop/Computer has a significant effect on psychological stress.
Hypothesis 5: The frequency of checking notifications on the phone has a significant effect on psychological stress.
Hypothesis 6: Time spent using Facebook has a significant effect on neck pain.
Hypothesis 7: Time spent using Instagram has a significant effect on neck pain.
Hypothesis 8: Time spent using WhatsApp has a significant effect on neck pain.
Hypothesis 9: Time spent using Laptop/Computer has a significant effect on neck pain.

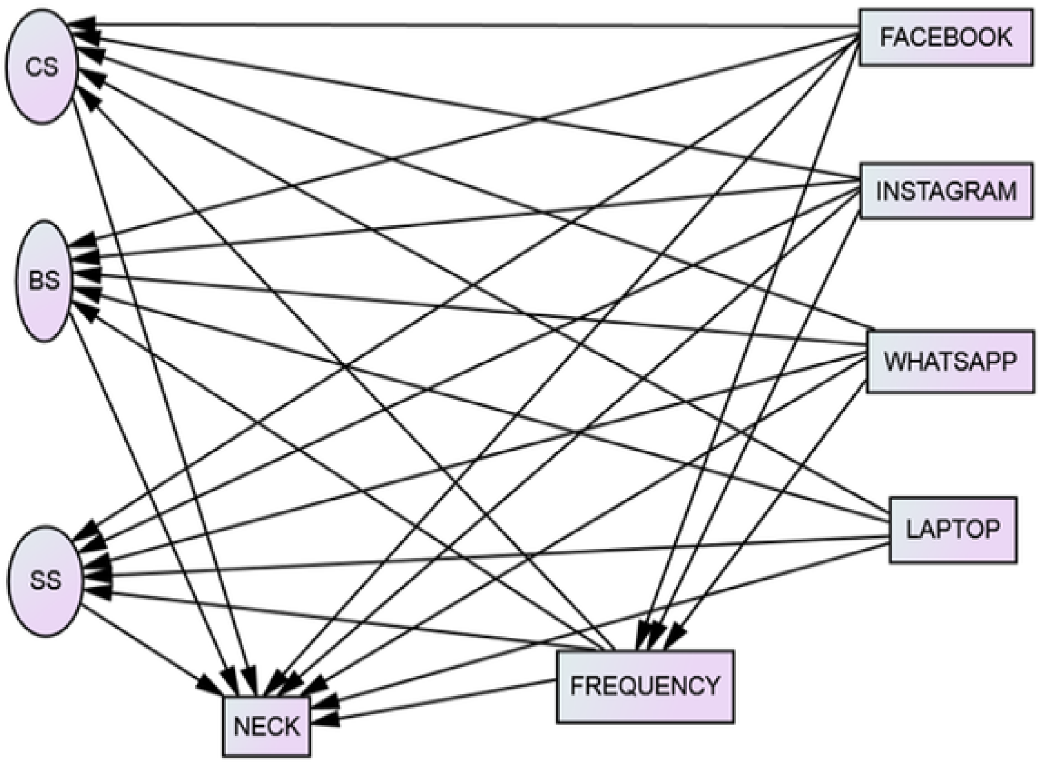
**Figure 1. Flow chart of research methodology**




Hypothesis 10:The frequency of checking notification on phone has a significant effect on neck pain.

The model shown in Figure 2 shows that time spent using Facebook, WhatsApp and Instagram are exogenous variables. At the same time, behavioural stress, somatic stress, cognitive stress and neck pain are endogenous variables, and the frequency of checking notifications on the phone is mediating variable. In the SEM approach, an endogenous variable is the one whose value is determined or influenced by one or more exogenous variables taken to be independent. Thus an exogenous variable is defined as the one whose value is not affected by other variables in the model. The chosen mediating variable (frequency of checking notifications on the phone) is the one that relates exogenous and endogenous variables. The significance of direct, indirect, and the total effect of exogenous variables on endogenous variables were determined using this model. The direct effect is an exogenous variable

Figure 2. Hypothetical path analysis model




directly has on an endogenous variable. An indirect effect is an effect that an exogenous variable has on an endogenous variable through some mediating variables. For example, Facebook's effect on cognitive stress (CS) directly is the direct effect, but the frequency of checking the notification on the phone is an indirect effect. The addition of direct and indirect effects is the total effect.

## Study Design

The focus of the present research study is to establish a model of psychological stress and neck pain for middle-aged Indian adults and test the goodness-of-fit of the model for hypothesized paths. 137 middle-aged Indian adults, currently employed by a major Indian telecom organization, participated in the survey. According to Boomsma (1982, 1985) sample size of 100 is sufficient for Structural Equation Modelling. Similarly Bentler and Chou (1987) suggested 5 observation per indicator is suffiecient for Structural Equation Modelling. So the sample size used in the present study is sufficient for the analysis. Also, during the exploratory factor analysis the sufficiency of data is also being checked using KMO test. The mean age of the sample was 47.6 years; ranging from 35 to 55. About 94% were male, and 6% were female. All the participants worked as senior executives in their organization located in different parts of India.

## Data Collection

A self-reported questionnaire was used for this purpose. The questionnaire was divided into three sections: the first section had questions related to stress, the second section consisted of questions related to the use of social media and laptop/computer, and the third section had questions related to neck pain. Table 1 shows the categorical details of the questionnaire. All the participants were informed about the scope of the study and were asked to fill in the questionnaire. The responses through questionnaires were kept anonymous to get authentic information from the participants. Respondents voluntarily agreed to participate in the survey and submitted their responses through the questionnaire.

### Measurements

For measuring the stress modified Copenhagen Psychosocial Questionnaire (COPSOQ) that measures psychological stress on three separate dimension behavioural stress, somatic stress and cognitive was used. The questions were scored on a 5-point Likert scale varying from 0 to 4. Here, 0 represented "never/hardly-ever" while four as "always". Higher scores indicate that the respondent has experienced more stress.

The frequency of checking the notification on the phone was measured using a single question about how frequently the respondents check notifications on their phones. The response was collected on a 5 point Likert scale from 1 showing "whenever needed" to 5 after regular intervals.

For the time spent using Facebook, Instagram, WhatsApp, and laptop/computer, individual questions were used to find how much average time they spent daily using these.

For measuring neck pain, Stanford pain-rating scale was used. Stanford's pain-rating scale is a 10 point pain-rating scale, where 0 represents "no pain" and 10 represents "unbearable pain." Participants were asked to rate their neck pain in the past four weeks on this scale.

### Testing for the Validity of the Questionnaire and the Path Analysis Model

In the present work, questionnaires available from the literature and the one designed have been used. Before using them for drawing meaningful information from the related hypotheses, it is natural to test the reliability and validity of these questionnaires. For similar reasons, it becomes important to determine the correctness of the Path Analysis Model (Figure 2), particularly to identify the non-significant paths that can be removed from the model. To analyze the collected data, IBM SPSS (version 21.0) and AMOS (Trial version 21.0 from IBM Corp., Armonk, NY, USA) were used.

## RELIABILITY ANALYSIS

The reliability of the questionnaire was tested using Cronbach's $\alpha$ test. For $\geq 0.7$, the questionnaire is reliable (Nunnally, 1978). Using the data, as mentioned in Section 3.2, the value of Cronbach's $\alpha$ for behavioural stress, somatic stress, and cognitive stress questionnaire was computed as shown in Table 2. Since $\alpha$ values for the three types of stresses are above 0.7, the questionnaire is reliable.

**Table 1. Categorical details of the questionnaire**

| Section | Measured Variable | Explanation |
|---|---|---|
| **Stress** | Behavioural stress | Changes in behaviour, feeling left out or lonely, changes in drinking, eating, or smoking behaviours, etc. |
| | Somatic stress | Palpitations, dizziness, headache, gastrointestinal problems etc. |
| | Cognitive stress | poor concentration, difficulty in remembering things, etc. |
| **Social media and phone usage** | Facebook | Average daily time-spent |
| | Whatsapp | |
| | Instagram | |
| | Notifications on phone | Frequency of checking notifications on the phone |
| | Laptop/computer | Average daily time-spent |
| **Neck-pain** | Neck-pain | — |

**Table 2. Cronbach's $\alpha$ values for stresses**

| | Cronbach's $\alpha$ |
|---|---|
| **Behavioural stress** | 0.834 |
| **Somatic stress** | 0.858 |
| **Cognitive stress** | 0.859 |

## EXPLORATORY FACTOR ANALYSIS

Exploratory Factor Analysis (EFA) was carried out to determine the significance of the included questions in deriving the meaningful information and to check the sufficiency of the input data. Kaiser-Meyer-Olkin (KMO) test is conducted for the questionnaire to measure the impact in terms of behavioural, somatic and cognitive stresses. KMO test is the measure of sampling adequacy. KMO value between 0.8 and 1 indicates that the sample size is adequate (Cerny & Kaiser, 1977). Using the data of 137 samples, the KMO test was conducted, and the test values were found to be higher than 0.8 (Table 3). Thus the test proves the adequacy of the adopted sampling.

Bartlett sphericity test has been conducted to determine the significance of the various questions that have been used to measure the impact on behavioural, somatic, and cognitive stresses. The test involves the determination of Pearson's correlation coefficients among the questions on particular stress. The null hypothesis takes the correlation matrix not to be an identity matrix. A small Bartlett sphericity test value (less than 0.005), measuring the significance level, indicates that the correlation matrix is not an identity matrix and will be indicative of a significant correlation between various factors. Under this situation, it will be worthwhile to run a meaningful EFA. Computed Bartlett's test value was found to be less than 0.005 for each set of questions on behavioural, somatic and cognitive stresses. It shows that the collected data using the related questionnaire are good enough to run a meaningful EFA.

The relevance of the questions related to a particular type of stress was further analyzed to identify the significance of their contribution in measuring the corresponding stress. The cut-offs used for factor loadings are the same as Comrey and Lee (1992) suggested, with the values given in Table 4. Using these cut-off values, Table 5 will show that the factor loadings BS1, BS2, BS3, BS4 and BS5 for behavioural stress, SS1, SS2, SS3, SS4, SS5, SS6 and SS7 somatic stress, and CS1, CS2, CS3 and CS4 for cognitive stress are significant. Accordingly, only these questions are retained in the Path Analysis Model for further analyses (Figure 3).

### Checking for Independence of the Considered Stress Types

In the present work, it has been assumed that the three types of – Behavioural stress, Somatic stress and Cognitive stress – are independent of each other and that there is no relationship between them. For this purpose, Confirmatory Factor Analysis (CFA) has been carried out that involves four tests – CMIN/DF (Q, $\chi 2$/df), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Root Mean Square Error of Approximation (RMSEA).

**Table 3. Computed KMO test value**

| Type of Stress | KMO Test Statistic |
|---|---|
| Behavioural stress | 0.817 |
| Somatic stress | 0.894 |
| Cognitive stress | 0.817 |

Table 4. Cut-offs for factor loadings for exploratory factor analysis

| Cut-Offs for Factor Loadings | |
|---|---|
| 0.32 | Poor |
| 0.45 | Fair |
| 0.55 | Good |
| 0.63 | Very good |
| 0.71 | Excellent |

Table 5. Factor loading for stress questionnaire

| Behavioral Stress | | Somatic Stress | | Cognitive Stress | |
|---|---|---|---|---|---|
| BS1 | 0.785 | SS1 | 0.695 | CS1 | 0.785 |
| BS2 | 0.808 | SS2 | 0.719 | CS2 | 0.801 |
| BS3 | 0.596 | SS3 | 0.756 | CS3 | 0.755 |
| BS4 | 0.685 | SS4 | 0.780 | CS4 | 0.770 |
| BS5 | 0.707 | SS5 | 0.830 | | |
| | | SS6 | 0.563 | | |
| | | SS7 | 0.547 | | |

In order to perform the CFA test, knowing the distributional characteristics of the data is essential. Since the data appeared to follow the univariate normal distribution, a univariate normality test was conducted, and the same results are shown in Table 6. Since the skewness for the variables ranged between 0.230 and 1.96, and kurtosis ranged between -1.13 and 3.98, the conditions for univariate normal distribution (Byrne, 2016) were found to be satisfied as the respective absolute values of skewness and kurtosis did not exceed 3 and 10.

Taking the data to follow the univariate normal distribution, CFA was performed to check the construct validity of the questionnaire. Values of CMIN/DF($\chi 2$/df), RMSEA, TLI, and CFI (Table 7) were within the recommended range (Hu and Bentler, 1999). Thus the model was appropriate for Structural Equation Modelling (Table 7).

After confirmatory factor analysis, the model was tested for goodness-of-fit to check if the data fits the proposed Path Analysis Model. The proposed model had CMIN/DF($\chi 2$/df) = 1.342, RMSEA = .050, GFI = 0.856, TLI = 0.926, and CFI = 0.940 (given in Table 10), which suggested that the model was the appropriate fit.

## Revision of the Proposed Path Analysis Model

The path analysis model of Figure 2 may have certain weak linkages between various causes and effects. Since weak linkages do not play any significant role in judging the impact of an exogenous variable on an endogenous variable, they can be removed to simplify the Path Analysis Model. To check this, significance value ($p$), critical ratio ($t$) and the direct effect of exogenous variables on endogenous variables ($B$) were calculated for all the 26 paths (Figure 2). Paths with a value of $p > 0.007$ and critical ratio (t) between -1.96 and +1.96 were considered non-significant paths. Accordingly, 20 out of 26 paths were found to be non-significant (Table 8). Based on this result, the model shown in Figure 2 was modified by showing all the non-significant paths by the dotted lines in Figure 3.

**Table 6. Descriptive statistics and normality test of measured variables**

| Variable | Skew | Kurtosis | Variable | Skew | kurtosis |
|---|---|---|---|---|---|
| INSTAGRAM | 1.960 | 3.982 | SS2 | 1.615 | 1.359 |
| LAPTOP | 0.253 | -0.357 | SS3 | 1.415 | 0.588 |
| WHATSAPP | 1.791 | 3.338 | SS4 | 1.927 | 3.185 |
| FACEBOOK | 0.938 | 0.467 | SS5 | 1.401 | 0.804 |
| FREQUENCY | 0.351 | -1.137 | SS6 | 1.045 | 0.463 |
| NECK | 0.230 | -0.775 | SS7 | 0.841 | -0.572 |
| CS1 | 0.408 | -0.334 | BS1 | 0.869 | -0.001 |
| CS2 | 0.368 | -0.907 | BS2 | 1.044 | 0.379 |
| CS3 | 0.356 | -0.535 | BS3 | 0.999 | 0.315 |
| CS4 | 0.595 | -0.229 | BS4 | 1.510 | 2.256 |
| SS1 | 1.000 | 0.178 | BS5 | 1.230 | 1.163 |

**Table 7. Results of confirmatory factor analysis**

| | CMIN/DF($\chi$2/df) | RMSEA | TLI | CFI |
|---|---|---|---|---|
| **Significance value (Hu and Bentler, 1999)** | < 3.000 | < 0.070 | > 0.900 | > 0.900 |
| **Confirmatory factor analysis** | 1.185 | 0.037 | 0.976 | 0.980 |

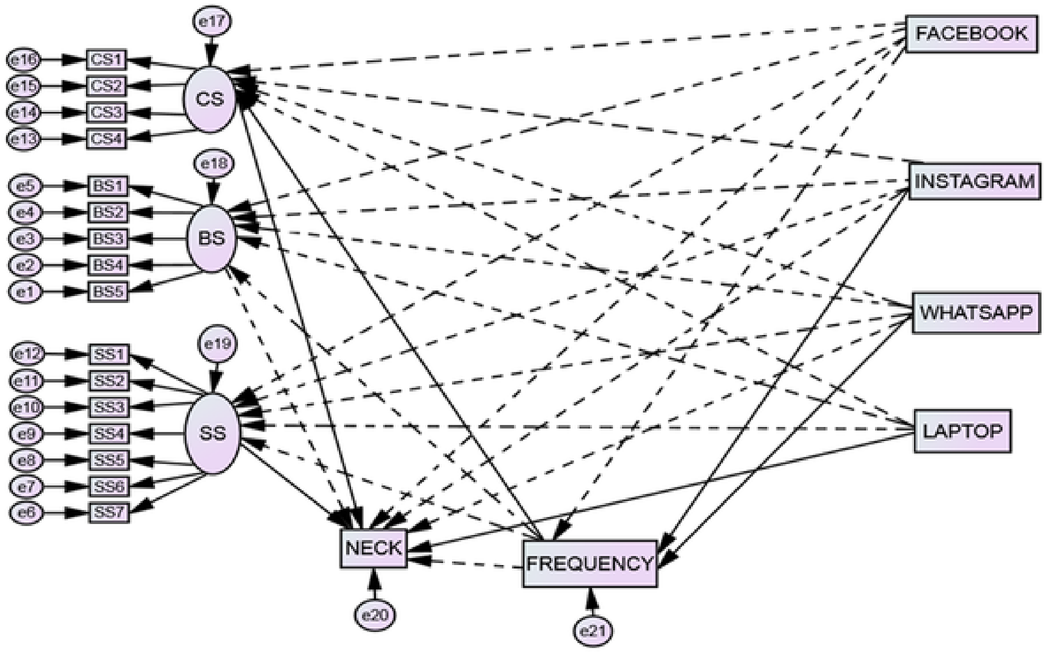
When two indicator variables are influenced by another variable not used in the study, there sometimes is a correlation between the variables that can not be explained by the model. In that case, error correlations are used to achieve a better model fit (Fornell, 1983). For this purpose, the error term is correlated using the Modification Index (MI). These indices are the values to identify the error terms that need to be correlated to improve the model fit. For this purpose, AMOS (Trial version 21.0 from IBM Corp., Armonk, NY, USA) was used to determine MI values for the questions related to a stress type (Figure 3). For example, the MI values for five questions (Figure 3) related to behavioural stress were considered. In the present work, error terms were retained for a minimum MI value of 4.000. Based on this, significant MI values were found only for three pairs: between "SS6" and "SS2" (MI = 4.002), between "SS6" and "SS4" (MI = 4.321), and between "BS3" and "BS1" (MI = 5.023).

After removing the non-significant paths and including error term correlations with MI values, a modified Path Analysis Model was obtained. The same is shown in figure 4.

### *Testing of the Final Model and Estimation of Path Coefficients*

After removing the non-significant paths and correlating the error terms, the goodness-of-fit of the modified model was tested. The value of goodness-of-fit coefficients is shown in Table 9. It can be seen from Table 9 that the modified model has improved goodness-of-fit over the initial model. Because of this, selected as the final model.

**Figure 3. Non significant paths in the model**




## RESULTS AND DISCUSSION

After identifying the final model, the effect of exogenous variables on endogenous variables was determined. Table 10 shows direct, indirect, and total effects in the final model in terms of correlation coefficients. It is clear from Table 10 that the direct effect due to Instagram and Whatsapp was 0.33 and 0.30 respectively on the frequency of checking notifications on the phone, thus partially accepting the hypothesis 5. The direct effect due to the frequency of checking notifications on the phone on the cognitive stress was 0.26. As Instagram and Whatsapp had a significant effect on the frequency of checking notifications on the phone, the frequency of checking notifications on the phone had a significant effect on cognitive stress, i.e., Instagram and Whatsapp both had an indirect effect on cognitive stress. It can also be seen from Table 10 that the indirect effect due to Instagram and Whatsapp on cognitive stress was 0.09 and 0.08, respectively. On the other hand, there was no direct and indirect effect of Instagram and Whatsapp on behavioral and somatic stress. So, hypothesis 2 and 3 were partially accepted. Also, Facebook had no direct or indirect effect on either considered stress, thus rejecting the hypothesis 1.

Similar results were reported by Selfhout et al. (2009), who also found that the time spent on Instagram and WhatsApp did not affect stress in young adults. Jelenchick et al. (2013) had also found no significant relationship between Facebook use and stress in older adolescents.

Time spent on social media (Facebook, Instagram, and Whatsapp) was found to have no significant relationship with neck pain. The indirect effect due to Instagram and neck pain were found to be 0.02 for both, while Facebook was found not to affect neck pain. So, the hypothesis 6, 7 and 8 were rejected and 10 was accepted. The present study's finding was not the same as the findings of Gustafsson et al. (2017). While time spent on social media (Facebook, Instagram, and Whatsapp) was found to have no significant relationship with neck pain, the time spent on laptops/computers significantly affected the neck pain. The direct effect of the time spent on laptop/computer on neck pain was 0.61, thus accepting the hypothesis 9. However, no indirect effect on any stresses was found.

**Table 8: Non-significant paths in the model**

| Path | | | *B* | *t* Value | *P* |
|---|---|---|---|---|---|
| FREQUENCY | ← | FACEBOOK | -0.08 | -1.000 | 0.317 |
| CS | ← | FACEBOOK | 0.05 | 0.489 | 0.625 |
| BS | ← | FACEBOOK | 0.00 | -0.019 | 0.985 |
| SS | ← | FACEBOOK | 0.08 | 0.790 | 0.430 |
| CS | ← | INSTAGRAM | 0.00 | -0.041 | 0.967 |
| BS | ← | INSTAGRAM | -0.08 | -0.802 | 0.423 |
| SS | ← | INSTAGRAM | 0.05 | 0.513 | 0.608 |
| CS | ← | WHATSAPP | 0.15 | 1.523 | 0.128 |
| BS | ← | WHATSAPP | 0.02 | 0.177 | 0.859 |
| SS | ← | WHATSAPP | 0.03 | 0.294 | 0.769 |
| BS | ← | FREQUENCY | -0.03 | -0.286 | 0.775 |
| SS | ← | FREQUENCY | 0.05 | 0.512 | 0.609 |
| CS | ← | LAPTOP | 0.07 | 0.738 | 0.461 |
| BS | ← | LAPTOP | 0.12 | 1.323 | 0.186 |
| SS | ← | LAPTOP | 0.09 | 0.996 | 0.319 |
| NECK | ← | FACEBOOK | 0.04 | 0.593 | 0.553 |
| NECK | ← | INSTAGRAM | 0.10 | 1.417 | 0.156 |
| NECK | ← | WHATSAPP | 0.90 | 1.367 | 0.172 |
| NECK | ← | BS | -0.07 | -0.978 | 0.328 |
| NECK | ← | FREQUENCY | -0.07 | -0.988 | 0.323 |

**Table 9. Fit index**

| | CMIN/DF($\chi$2/df) | RMSEA | TLI | CFI |
|---|---|---|---|---|
| **significance value (Hu and Bentler, 1999)** | < 3.000 | < 0.070 | > 0.900 | > 0.900 |
| **Initial Model** | 1.342 | 0.050 | 0.926 | 0.940 |
| **Modified model** | 1.238 | 0.042 | 0.948 | 0.954 |

Similar were the findings of Gerr et al. (2004). IJmker et al. (2007), in their study on office workers, had found the time spent on a computer to be one of the physical risk factors affecting the neck and upper extremity pains.

In brief, the results suggest that for middle-aged Indian adults, time spent on Facebook has no effect on stress, but Instagram and Whatsapp have an indirect effect on cognitive stress. Time spent on Laptop/Computer does not affect any of the stresses but directly affects the neck pain.

## CONCLUSION

The present research study established a model to study the effects of time spent on social media and laptop/computer on stress and neck pain in middle-aged working Indian adults. The model was used

Figure 4. Final path analysis model

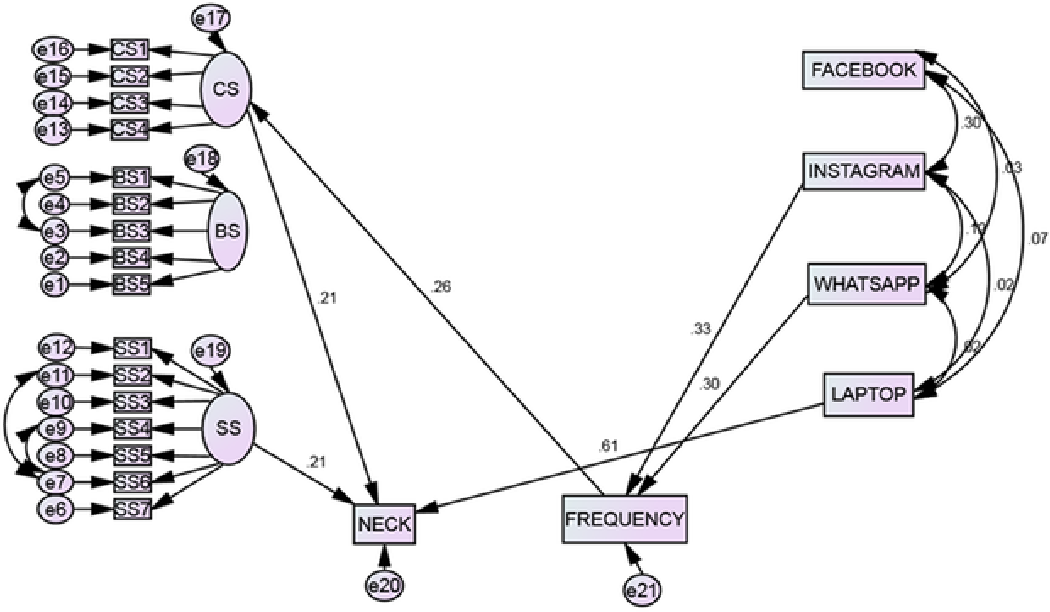



Table 10. Standardized direct, indirect, and total effects for hypothetical model

| Endogenous Variables | Exogenous Variables | Direct Effect (Significance Value) | Indirect Effect (Significance Value) | Total Effect (Significance Value) |
|---|---|---|---|---|
| Frequency of checking notifications on phone | Instagram | 0.33 (< 0.001) | insignificant | 0.33 (< 0.001) |
| | Whatsapp | 0.30 (< 0.001) | insignificant | 0.30 (< 0.001) |
| Cognitive Stress | Frequency | 0.26 (= 0.006) | insignificant | 0.26 (= 0.006) |
| | Instagram | insignificant | 0.09 (< 0.001) | 0.09 (< 0.001) |
| | Whatsapp | insignificant | 0.08 (< 0.001) | 0.08 (< 0.001) |
| Neck-pain | Instagram | insignificant | 0.02 (< 0.001) | 0.02 (< 0.001) |
| | Whatsapp | insignificant | 0.02 (< 0.001) | 0.02 (< 0.001) |
| | Frequency | insignificant | 0.06 (=0.006) | 0.06 (= 0.006) |
| | Cognitive Stress | 0.21 (= 0.005) | insignificant | 0.21 (= 0.005) |
| | Somatic Stress | 0.21 (= 0.007) | insignificant | 0.21 (= 0.007) |
| | Laptop | 0.61 (< 0.001) | insignificant | 0.61 (< 0.001) |

to study the following: i) effect of time spent on Facebook, Instagram, and WhatsApp on behavioural stress, cognitive stress, and somatic stress directly and also indirectly by using the frequency of checking the notification on the phone as mediating variable and also on neck-pain using behavioural stress, cognitive stress, somatic stress, and frequency of checking notification as mediating variables, and ii) effect of time-spent on using laptop/computer on behavioural stress, cognitive stress, and somatic stress and also on neck-pain directly and indirectly by using behavioural stress, cognitive stress, and somatic stress as mediating variables.

There were 26 paths in the model, out of which 20 were non-significant. In the final model, the effect on cognitive stress due to Instagram and Whatsapp was 0.09 and 0.08, respectively, using the frequency of checking the notification on the phone as a mediator. The effect on the neck pain due to time-spent on laptop/computer was 0.6 and due to Instagram and Whatsapp was 0.02 and 0.02 respectively using the frequency of checking the notification on the phone, cognitive stress, and somatic stress as mediators.

It was hypothesized that the time spent using Facebook significantly affects behavioural stress, cognitive stress, somatic stress, directly and indirectly, using the frequency of checking notifications on the phone as a mediator variable. However, it was found that time spent using Facebook has no significant effect on behavioural stress, cognitive stress, and somatic stress either directly or indirectly.

Findings suggest that laptop/computer usage is the most critical factor affecting neck pain. In contrast, social media usage does not significantly affect stress and neck pain in the study. A more detailed analysis of social media usage in terms of time duration, type of use, their effect on daily life can shed more light on its effect on stress. One of the reasons that can contradict results with many previous studies is the study population, as most of the previous work has been on teenage adults or children. In contrast, the current study explored social media effects on middle-aged working adults.

The present cross-sectional study on middle-aged Indian adults could not confirm time-dependent differences in the relationships and effects of factors influencing stress and neck pain. As future work, an effort can be made to conduct longitudinal studies to confirm these aspects. Studies can also be carried out to confirm the effects of social media usage and laptops on stress and neck pain.

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