Tec Empresarial
P-ISSN: 1659-2395; E-ISSN: 1659-3359

MEDIATION EFFECT OF USES AND GRATIFICATION AND COGNITIVE DISTORTION ON SOCIAL MEDIA USAGE AND MENTAL HEALTH

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Abstract

The use of social media has become a part of youngsters' lifestyle today. To examine the usage of social media and the impact of its use and gratification on mental health, previous studies extensively applied the uses and gratification theory. Such studies, overlooked the independent role of cognitive process and social media gratification with respect to the social media usage and the mental health. Filling that gap, the current study has combined the uses and gratification theory (U&G) and stimuli-organism-response (S-O-R) theory in its earnest attempt to create a theoretical backdrop about the impact of social media usage on mental health through motives of social media usage (MSMU) and cognitive distortion. Proposing a structural model that has examined the causal relationship using structured equation modelling methodon data received from 660 Indian participants. The results revealed that total time spent on social media (TTSSM) and passive usage was most crucial factor influencing mental health. Additionally, it was also found that some

combination of cognitive distortion and MSMU mediates the relationship between TTSSM and active-passive usage and mental health. The current study results are strong enough to intervene parents, educationist and health practitioners to counsel young people for social media usage.

Keywords: social media; depression; life satisfaction; mental health; uses and gratification theory; S-O-R theory

1.1 Introduction

Social media forums, today, are being extensively used as one of the most in-demand platforms for social behaviors, especially by the youth. 'Social media' is an array of social networks that are internet-based used for verbal and/or visual interaction (Carr and Hayes, 2015). Users can create individual public and/or private accounts on social media platforms (e.g., Facebook, Instagram, Snapchat, and others) (Kuss et al 2011a, 2011b). Users can use social media for a variety of purposes (e.g., communicating with real-life friends, finding new people based on a common interest, chatting, mailing, sharing or making photographs / videos, blogging, dating, playing games, gambling (Allen et al 2014). Globally, 4.20 billion (53.6%) users were active by January 2021 (Chaffey, 2021). In India 448 million users were active on social media and 78 million (21%) users were increased during 2020-2021 (Kemp, 2021). In pandemic there was a surge noticed in online and digital activities. Around 43% users increase their time spend on social media (Global Webindex, 2020).

Studies on social media have shown mixed results as far as its impact is concerned, making it a 'double-edged sword'. While some studies showcased social media as helping the users by enabling them to express themselves and getting social support (Deters &Mehl, 2013; Lilley et al., 2014), others revealed a link between psychological problems and the social media (McCrae et.al., 2017; Marino et.al.,2018). Patton and Borschmann (2017), posited that youngsters' mental health is a premier health concern - one that leads to societal and economic burden all over the world. Corroborating the aforesaid fact with the latest numbers, the National Institute of Mental Health (2021) shared that as against the adults in the age bracket of 26-49 (25%), and 50 years or more (14.1%), the prevalence of mental illness in young adults between 18 to 25 was the highest (29.4%).

While there has been an increase in the research on social media and mental health over time, the results of studies have largely been inconsistent. Some studies reported positive association between social media usage and mental health (Ellison et al., 2007; Grieve et al.,2013), some of the studies reported opposite (Fox and Moreland, 2015; Kross et al., 2013; Sagioglou and Greitemeyer, 2014), while one study reported no relation (Marwick and Boyd, 2014).Also, mental health was found to be related to the time spent on using the various social media forums. The inconsistencies between the usage of social media and mental health warrant the use of additional moderator or mediator variables. Previous study found that cognitive distortion arising in the social domain may be most appropriate factor to develop depression symptoms (Rnic et.al., 2016). It

makes sense to investigate the role of cognitive distortion in effecting the social media – mental health relation.

2.1 Theoretical Background

2.1. U & G Theory

Severin and Tankard (1997) used U&G theory to investigate why and how users actively seek the employment of a given medium to meet their goals. The U&G theory was developed in 1944 and is widely used to determine why people select a particular sort of media (Katz et al., 1973). It was first used in 1954 as an extension of the needs and motivation theory (Katz et al., 1973). It was then utilized in 1964 to assess people's intentions to watch certain television shows and how they perceive the mass media (Katz et al., 1974). U&G theory has become a prominent theoretical framework for explaining the U&Gs behind the usage of various types of media since the 1980s (Katz et al., 1974)

U&G theory was originated in research related to mass communication (Gan and Li, 2018). The U&G theory states that there are social and psychological motives to use any type of media (Leung and Wei, 2000) reasoning the use of any particular media in comparison to others in order to realize certain needs of an individual (Katz and Blumler, 1974). According to U&G theory, a myriad of gratifications influences a users' behavioral pattern. The U&G theory reflects the motives for usage of any particular media as also the motives for using the social media at all (Gan, 2017).

2.2. S-O-R Theory

S-O-R theory developed by Woodworth (1918) states that stimuli (S) affect the behavior response (R) of an individual through organism (O).Furthermore, this theory used by Mehrabian and Russell (1974) who created the S-O-R framework, which posits that a stimulus (S) received from the environment causes individuals to analyze their internal states (organism, O), resulting in positive or negative reactions (R) (Mehrabian and Russell 1974). The paradigm assumes that environmental signals (stimuli) can activate a person's internal assessment state (organisms), which then results in a psychological and cognitive reaction to the stimulus. This might indicate a succession of changes in the individual as a result of external stimuli. Existing research has shown that the S-O-R approach is effective in understanding the emergence of individual psychological issues. For example, Pandita et al (2021) used this framework to investigate the psychological effects of COVID-19 on people. Yang et al. (2021) examined the impact of meta cognitive beliefs and catastrophic misunderstandings on health anxiety in social media users. In addition, the S-O-R framework has been utilized in social media research. The S-O-R model was used by Liu et al. (2021) to investigate the usage of social media during the COVID-19 pandemic. for the current study, cognitive process treated as an organism of S-O-R model which interprets the stimuli and influence the behavioral response. This theory has been applied to various fields for example marketing (Wang et al., 2007), web designing (Parboteeah et al., 2009), information system (Animesh et al., 2011) etc, to examine the impact of various stimuli on users' behavioral response.

Previous evidences of works regarding the application of the U&G theory have covered different uses and gratification of the social media on addictive scenarios (Kircaburun et al., 2020). However, to evaluate the social media behavioral response, cognitive process cannot be ignored. For example, cognitive distortion negatively affects the emotion, motivation and depression (Bathina et al, 2021). Therefore, the current study integrated both S-O-R and U&G theory to examine whether the stimuli (social media usage) affect the response (mental health) through process (cognitive distortion and gratification of social media)?

3.1 Social media and Mental health

Kim (2017) revealed that the rise in psychological illnesses in young adults as a consequence of social media usage and its effect on the mental health, is a major cause of concern. The use of social media has taken a serious toll on mental health, which is comprised of emotional, physical, and social well-being (Galderisi et al., 2015). In India, there were 197.3 million (14.3% of total population) affected from mental illness comprising major contributor of mental illness was depression (33.8%) and anxiety (19%) (Williams, 2016). Previous studies reported that non excessive social media usage can be positively associated to subjective well-being (Wang et.al., 2014), whereas other studies found that excessive usage of social media associated with lower mental well-being (Tandoc et al., 2015; Shaw et al., 2015).

However, the effect of social media on mental health is a result of various contributing factors.Total time spent on social media (TTSSM) and its association with mental health investigated most frequently. It was found that TTSSM has been associated to poor mental health (Huang, 2017; Shukla and Chouhan, 2020). The studies found that there was an inverse relationship between total time spent on social media and psychological distress among Australian samples (O'Dea and Campbell, 2011) and other few studies found no relationship (Neira and Barber, 2014; Banjanin et al., 2015). In contrast other studies revealed that use of social media at least 2 hours daily associated with psychological distress (Sampasa-Kanyinga and Lewis, 2015). Previous studies reported that heavy use of social media was associated with depression and anxiety (Tsitsika et al., 2014; Yan et al.,2017). Even, frequency of use was related to poor mental well-being (Kross et.al., 2013; Shakya and Christakis, 2017). Most of the studies conducted on social media were self-reported studies in which error cannot be eliminated. Therefore, it is required to use the technology to track the total time spent on social media and various social networking activities.

This study used the android application technology to track the respondent's total time spent on social media and various application on which the users spent their leisure time. Previous studies majorly conducted on negative aspect of mental health for example depressive symptoms (Wang et al., 2018; Wartberg et al., 2018), anxiety and loneliness (Hunt et al., 2018), whereas, few studies conducted on positive aspect of mental health for example social support (Meshi & Ellithorpe, 2021), life satisfaction (Ferguson et al., 2014; Orben et aL., 2019; Vally and D'Souza, 2019) etc. Thus, merely concentrating on the downside of the mental health, would not help to

find the causes that drive the individuals for extensive social media usage. Therefore, the current study explores the effect of TTSSM on both the positive and negative aspects of mental health including depression and life satisfaction. Therefore, in light of these findings, we hypothesize that,

H1 (a): Total time spent on social media will affect depression..
H1 (b): Total time spent on social media will affect satisfaction with life.

The uses and gratification theory (U&G) developed to identify the user's motivation and gratification of specific traditional media (Katz et al., 1973). According to U&G theory, individual use of media is motivated by two various types gratifications i.e. gratification sought and gratification obtained. The users' expectations from the type of gratifications through the usage of social media constituted the sought gratifications and the ones satisfying the needs through social media usage constituted the obtained gratifications (Katz et al. 1973; Rubin 1993). As per the U&GT the how and why of any particular media usage (Katz et al., 1973) has been incorporated to the usage of social media. The previous studies demonstrated motives of social media usage (MSMU) were affect the mental health, however the effect of MSMU as mediator is still missing. Hence,it is worth to investigate that how active and passive usage can impact the mental health through various motives of social media usage.

Therefore, the current study concentrated on seven various gratification of social media use and its direct effect on mental health and indirect effect of TTSSM and active-passive usage. Based on aforementioned findings, we hypothesized that;

H2 (a): The various motives of social media usage (MSMU) mediate the relationship between TTSSM and depression.
H2 (b): The various motives of social media usage (MSMU) mediate the relationship between TTSSM and satisfaction with life.

3.2. Cognitive Distortion and Mental Health

Cognitive distortion are negative biased misconceptions in the thought process that are acknowledged to increase the probability of mental illness for example depression, stress, anxiety and dysphoria (Beck, 1976; Dozois and Beck, 2008; Po Oei et.al., 2008). Generally, individual's thought process automatically activated in response to event which leads to certain emotional and behavioral responses. The automatic thought content is typically influenced by the individual's core belief about themselves and others. Any event (negative, neutral or positive) may negatively influence by negatively activated core belief or induced negative thoughts that are not based on evidence. As a significant risk factor for creating depressive symptoms, core beliefs find specific mention (Alloy and Riskind, 2006). Over a period of time, consistent negative thought process or negative core belief leads to develop the symptoms of mental illness for example depression.

Firstly, the cognitive distortion was introduced by Beck et.al. (1979) outlined seven cognitive distortions found from depressed individuals. Later, Burns (1980) extended to ten common cognitive thinking errors. Specifically, depending on the content of individual's core belief, cognitive errors may arise with varying recurrence and classified in social and achievement domains. In the digital age, Cognitive errors may arise through social media worth to investigate. Therefore, in the current study, we examined the direct effect of social media usage (TTSSM) on cognitive distortion, MSMU and mental health (depression and life satisfaction). Therefore, from aforementioned findings, we hypothesized that;

H3 (a): Cognitive distortion mediates the relationship between TTSSM and depression.
H3 (b): Cognitive distortion mediates the relationship between TTSSM and satisfaction with life.
H4 (a): Cognitive distortion mediates the relationship between various TTSSM and depression through MSMU.
H4 (b): Cognitive distortion mediates the relationship between various TTSSM and satisfaction with life through MSMU.

4.1 Present Study

Filling the gap arising out of inconclusiveness of the extant studies regarding the identification of factors responsible for diminishing mental health, the current study contributes its bit to the coffers of the academic literature by proposing a model in which MSMU and cognitive distortion used as a mediator to investigate the relationship between social media usage and mental health. Extant studies have studied thus far, the influence of the usage of social media, time spent on it on the mental health. Previous studies reported the direct effect of social media usage (TTSSM, MSMU) on mental health, still there were a series of activity conducted by the participant while using the social media for example time spent on specific use may majorly affect the mental health. To our best knowledge and belief, this is the first study for examining various factors (total time spend on social media, motive of social media usage and cognitive distortion) which may contribute to mental illness with the same sample and use of android application to track the total time spent on social media and various social media activities.

5.1 Methods

5.1.1. Design and procedure

The current study was approved by the university ethical committee. The responses for the current study were collected from the students aged 18 to 21 years. The participants were recruited through snowball sampling method during the period to March 2021. During this time restaurants, clubs etc opened with COVID-19 protocol expect school and universities. Students' selection was based on few criteria, which were included in the screening questionnaire. like participants desired to be 18 years of age and secondly they must capable of accessing the Internet. Thirdly, participants should have account on different social media platforms, fourth, they had spent significant time on social media on a daily basis and lastly, the students are using the android smartphones.

Making use of the existing participants for getting newer ones in a, the snowball sampling is a non-probability referral chain-forming sampling method (Pickering, 2004; Ghaljaie et al., 2017). The primary data was taken at the outset of the study and through the primary data the respondents were encouraged to refer their friends, family and acquaintances to take part in the study. Snowball sampling technique is specifically used when the population is unknown. This sampling method has been used in this study as participants were not available physically in the university as universities were shut down due to COVID-19. Recently few studies have used this method successfully to investigate mental health issues in the population (Fekih-Romdhane et al., 2020; Sharma and Vaish,2020; Rapisarda et al., 2020).

Initially the students of Jaypee University of Engineering and Technology contacted for the participation in the survey. After receiving the consent from the students, they have been encouraged to contact their interested friends as much as possible to participate in the study, hence forth the chain was created for the participants to take part in the study. Generally, the points were given in the curriculum to Jaypee university students which count in their grade sheets. To encourage the students to take part in the study and spread the word among their acquaintances, they have been given extra curriculum points which will contribute in their grade sheets. Keeping the participation voluntary, the respondents were given the option of being anonymous and could withdraw at any point in time. Setting the context, the study objectives and data confidentiality were explicitly taken care by the ethical committee of the university in the first page of the form. The survey was hosted on the Google forms and an anonymous link was generated to be further shared with the target population. Participants were signed the consent form for the study and complete the questions related to socio demographic characteristics, COVID-19, social media usage, cognitive distortion and mental health.

Subsequently, after receiving the consent form with few eligibility questions and selected for the study, participants were asked to install an android application named as “Stay Free” on their respective android devices. The participants were instructed that they must keep the android app for at least seven days for tracking the social media usage. After seven days of usual social media usage, participants must submit the screenshots through the google form (Fig.1).

5.1.2. Participants

The survey was assessed by 908 participants in which 9 participants were found COVID-19 positive and 31 participants were unhealthy from chronic disease were excluded from further analysis. Out of these 660 completed the 76% of the participant's responses were considered for advanced analyses. The sample was 52.1% male (n = 344), 47.9% men (n = 316). Participants resided in 13 Indian states, with residing 44.8% (n = 296) in the Uttar Pradesh and 29.1% (n = 192) from the Madhya Pradesh states. Additionally, 87.3% (n = 576) responded no for COVID-19 symptoms experienced in the past by the participants (Table 1).

Demographic factors	**N (%)**	**M (SD)**	**Min-Max**	**Reliability (α)**
Gender		1.47 (0.49)	1-2	
Male	344 (52.1)			
Female	316 (47.9)			
Location		8.79 (2.62)	1-13	

Bihar	24 (3.6)			
Chhattisgarh	6 (0.9)			
Gujarat	6 (0.9)			
Haryana	8 (1.2)			
Jharkhand	6 (0.9)			
Maharashtra	8 (1.2)			
Madhya Pradesh	192 (29.1)			
New Delhi	36 (5.5)			
Rajasthan	64 (9.7)			
Telangana	2 (0.3)			
Uttar Pradesh	296 (44.8)			
Uttarakhand	2 (0.3)			
West Bengal	10 (1.5)			
Total Time spent on social media (TTSSM), hours		2.44 (8.20)	1-4	
Q1 (0-13)	90 (13.6)			
Q2 (13-26)	238 (36.1)			
Q3 (26-39)	282 (42.7)			
Q4 (39-52)	50 (7.6)			
Uses of social media	660	89.14 (16.07)	38-127	0.908
MER	660	13.71 (4.20)	4-20	
MNPS	660	8.95 (2.57)	3-15	
MEPO	660	10.94 (3.67)	4-20	

PT	660	6.85 (1.71)	2-10	
TMT	660	14.88 (4.12)	5-25	
EMT	660	12.75 (3.53)	4-20	
IAE	660	21.03 (4.66)	6-30	
Cognitive Distortion	660	83.81 (18.79)	28-139	0.934
Depression	660	25.69 (10.65)	2-55	0.905
Life Satisfaction	660	19.16 (6.18)	5-30	0.905

Table 1 Descriptive characteristics (N=660)

MER: Maintain existing relationships; MNPS: Meet new people and socializing; MEPO: Make express, present or more popular oneself; PT: Pass time; TMT: As a task management tool; EMT: Entertainment; IAE: informational and educational

Measure

The survey included ad-hoc sections and standardized questions. There were three sections, detailed below.

Section A contains the questions related to social-demographic characteristics and health status. Participants were asked about the gender (male and female), location (State), COVID-19 symptoms or tested positive (Yes or No) and chronic disease (Yes or No). The purpose of asking the COVID-19 and chronic disease related question to ensure the participants should not be diseased with COVID-19 or any chronic disease at the time of survey.

The time spent on social media was calculated through an android application. The total time was calculated as summation of time spent on each social networking sites. In this study, the total amount of time spent on Facebook and Instagram considered for further analysis.

Section B contains the questions related to Facebook Usage Aim (FAU) (Horzum, 2016) originally designed to identify the aim of using Facebook. This scale was used to identify the user's objective to use the Facebook and Instagram due to almost same characteristics found in both social media platforms named as motives for social media use (MSMU). The scale included 30 items which was classified in seven various subscales for example a. Maintain existing relationships [MER], b. Meet new people and socializing [MNPS], c. Make express, present or more popular oneself [MEPO], d. Pass time [PT], e. As a task management tool [ATMT], f. Entertainment [ENT] g. informational and educational [IAE] in the form of 5-point likert scale.

Next in the line, the section B comprises of questions from the cognitive distortion scale (CDS). Cognitive distortion (Covin et al., 2011) is a 20-item measure of self-reporting, measuring the 10 varieties of cognitive distortion (mindreading, catastrophizing, all-or-nothing thinking,

emotional reasoning, labelling, mental filtering, overgeneralization, personalization, should statements, minimizing or disqualifying the positive) in both conditions – social and work-related achievement. Making use of a 7-pointlikert scale, the respondents are asked to report on the type of thinking in the range of 1-7 (1 = Never, 7 = All the time) in social and achievement context. The CDS has good psychometric properties with respect to including internal consistency, test-retest reliability over two weeks, and construct, discriminant, convergent, and divergent validity.

Section C include the mental health related questions. Mental health measured through various subscale includes depression and satisfaction with life.

Depression: Depression symptoms were assessed via the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The CES-D is a self-report instrument includes 20 items with excellent reliability and validity (Radloff, 1977).

Life satisfaction: Life satisfaction measured through 5-item satisfaction with life scale developed by Diener et al. (1985) to asses overall judgment of one's life. Participants were asked to report their responses of each of the seven questions on a 7-point likert scale ranges from 1-7 (1-Strongly disagree, 7-strongly agree). The scores were added for total score represents low score for low level of life satisfaction and high scores for high level of life satisfaction. The scale has demonstrated excellent internal consistency (α = .93) and reliability Diener et al., 1985).

6.1 Statistical Analyses and Results

The statistical analysis was conducted using SPSS version 25 (IBM, Armonk, NY, USA) to perform descriptive statistics analyses, reliability analyses and bivariate correlation. Additionally, IBM SPSS-AMOS version 25 (Byrne, 2016; Sharma et al., 2017) was used to analyze the relationship proposed in the model. The screenshots of the data reported by the participants were entered into the SPSS for TTSSM. Raw scores of Uses of social media, depressions and life satisfaction were calculated. The data of the proposed model were analyzed using structured equation modeling (SEM). The bootstrapped method was used with maximum likelihood technique to analyze the hypothesized model (Fig. 2).To examine the various causal relationship, S-O-R and U&G theories integrated shown in Figure 2. The current study proposed social media referred as stimulus, various gratification referred as organism and mental health referred as response. The statistical analyses were conducted in two stages, firstly estimated the measurement model and second structured equation modeling were performed on the proposed hypothesized model.

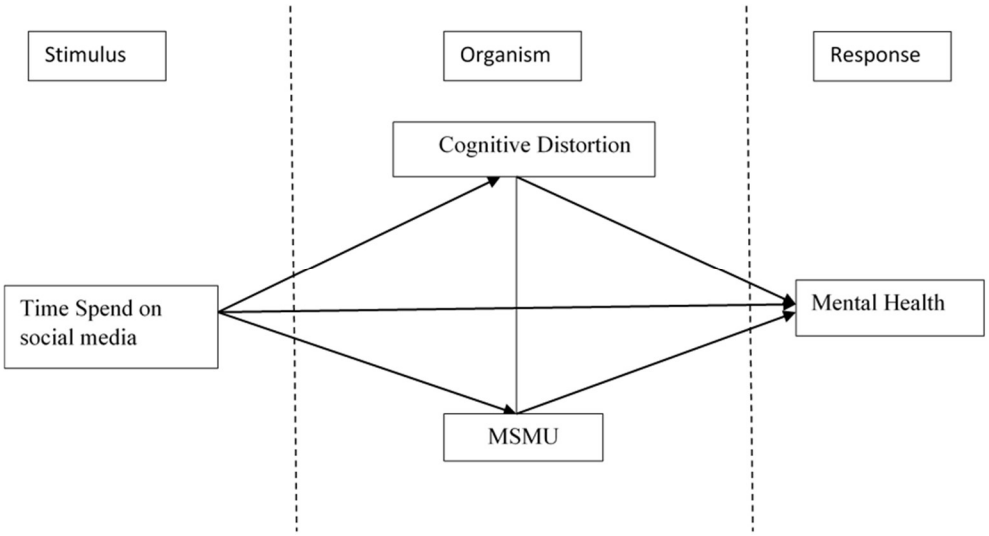

Figure 2 Proposed structural model

6.1.1. Measurement Model and Construct Reliability

To validate the proposed model, overall model fit assessed, construct validity and its reliability. The overall model fit was assessed by following fit indices i.e. chi-square (X2), degree of freedom (df), normed-fit index (NFI), normed chi-square to degree-of-freedom (CMIN/DF), adjusted goodness-of-fit index (AGFI), goodness-of-fit index (GFI) (Bonett, 1980), comparative fit index (CFI) (Bentler. 1990), standardized root mean squared residual (SRMR) (Hu and Bentler,1999), and root mean square error of approximation (RMSEA) (Browne and Cudeck, 1992). The purpose of selecting these fit indices to ensure about the data fit to the proposed model (McDonald and Ho, 2002). Table 2 presented the proposed model fit indices and their threshold values which showed a good fit.

In order to estimate the construct reliability and validity of instruments, the current study employed composite reliability (CR), discriminant validity and convergent validity. Average variance extraction (AVE) method was used for convergent validity and maximum shared variance (MSV) and √AVE was used to determine the divergent validity of the instrument. In addition, Cronbach alpha (α) was calculated to ensure the reliability of the instrument.

Fit Indices	**Threshold**	**Conceptual Model**
X^2		7.14
df		6

CMIN/DF	≤3.0	1.19
GFI	≥0.90	.998
AGFI	≥0.80	.975
NFI	≥0.90	.997
CFI	≥0.90	.999
SRMR	≤0.08	.0104
RMSEA	≤0.08	.017

Table 2 Fit indices for proposed model and their respective threshold

We tested the construct reliability, discriminant validity and convergent validity. As Table 4 represents that AVE values of all latent construct were above the threshold level (0.5), hence confirming convergent validity. The square root of average variance extraction values of each construct was higher than inter-construct correlation (Table 3). Furthermore, maximum shared variance values were less than respective AVE values (Table 4). Therefore, according to the findings, the current study data demonstrated the discriminant validity (Fornell and Larcker, 1981; Matemba, 2018).

	TTTSSM	Gender	LOC	MER	MNPS	MEPO	PT	TMT	EMT	IAE	COG	DEP	SWL
TTTSSM	**1**												
Gender	.030	**1**											
LOC	-.013	-.069	**1**										
MER	.377**	.046	.029	**.813**									
MNPS	.463**	-.003	.079*	.545**	**.754**								
MEPO	.395**	.043	-.094*	.413**	.254**	**.715**							

PT	.200**	.101**	-.053	.351**	.260**	.479**	**.747**						
TMT	.252**	.016	-.078*	.285**	.129**	.510**	.375**	**.764**					
EMT	.163**	.100**	-.062	.308**	.146**	.458**	.447**	.492**	**.729**				
IAE	.003	.090*	.051	.222**	.052	.228**	.242**	.352**	.351**	**.741**			
COG	-.035	-.059	-.020	-.049	-.080*	.040	.052	.138**	.038	.056	**.784**		
DEP	.633**	.014	-.074	.331**	.319**	.397**	.217**	.252**	.214**	-.088*	.107**	**.707**	
SWL	-.666**	-.025	.059	-.286**	-.347**	-.306**	-.168**	-.095*	-.169**	.038	.025	-.543**	**.824**

Table 3 Person correlation between various construct

Note. ∗ p ≤ .05, ∗∗p ≤ .01, ∗∗∗p ≤ .001.

Latent Construct	**CR (CR>0.70)**	**AVE (AVE>0.50)**	**√AVE (√ AVE > Inter-construct correlations)**
MER	.886	.662	.813
MNPS	.798	.569	.754
MEPO	.804	.512	.715

PT	.817	.559	.747
TMT	.875	.585	.764
EMT	.927	.532	.729
IAE	.879	.550	.741
Cognitive Distortion	.969	.615	.784
Depression	.951	.500	.707
Life Satisfaction	.913	.679	.824

Table 4 Reliability and validity of the construct

6.1.2. Correlational Analysis

Table 3 represents correlation analysis and descriptive statistics. The correlation analysis showed that TTSSM was associated with most of the construct, for example, TTSSM is most strongly associated with depression (r = .633, $p< 0.01$) whereas TTSSM was negatively associated with life satisfaction (r = -.666, $p< 0.01$). Eventually, it was also found that TTSSM was associated with various MSMU except educational and informative use (EIYSM). This result indicated that the most associated motive of social media was make express, present or more popular oneself (MEPO) with depression (r = .397, $p< 0.01$) and satisfaction with life (r = -.306, $p<0.01$) as compared to other motives of social media. Surprisingly, if the user uses the social media for information and educational purpose it decreases the depression (r = -.088, $p< 0.01$). It was also found that cognitive distortion was positively associated with depression. In other words, as the cognitive bias of the user increases, the risk of depression (r = .107, $p< 0.01$) also increases. Gender and location were not associated with mental health.

6.1.3. Structure Equation Modeling Analysis

The current study data showed convergent and discriminant validity, we examined the hypothesized relationship of proposed model through structural equation modelling method (Figure 2). Based on the findings represented in Table 2, $Chi^2 = 7.14$, Df = 6, CMID/DF = 1.19, GFI = 0.998, AGFI = 0.9575, NFI = 0.997, CFI = 0.999, SRMR = 0.014, RMSEA = 0.018. These values fall well in acceptable range of indices (Table 2), thus showed a good model fit. Subsequently, found that statistical outcome accounted for 42%, 17%, 9%, 26%, 21%, 28%, 8%, 15%, 26% and 47% of the variance in EMT, TMT, PT, MEPO, MNPS, MER, IAE, cognitive distortion, depression, and satisfaction with life respectively.

As shown in Table 6, the direct positive effect was found between TTSSM and depression (β = .575, p<0.01), and negative effect of TTSSM on satisfaction with life (β = -.581, p<0.01). Therefore, H1 (a) to H1 (b) were accepted.

Depression					Life satisfaction				
Conceptualized Path			Std. Estimate	S.E.	Conceptualized Path			Std. Estimate	S.E.
IAE	<---	TTSSM	.215**	.200	IAE	<---	TTSSM	.215**	.200
MER	<---	TTSSM	.312**	.188	MER	<---	TTSSM	.312**	.188
MNPS	<---	TTSSM	.453**	.115	MNPS	<---	TTSSM	.453**	.115
MEPO	<---	TTSSM	.286**	.159	MEPO	<---	TTSSM	.286**	.159
PT	<---	TTSSM	.122*	.081	PT	<---	TTSSM	.122*	.081
TMT	<---	TTSSM	.145**	.189	TMT	<---	TTSSM	.145**	.189
EMT	<---	TTSSM	.564**	.156	EMT	<---	TTSSM	.564**	.156
COG	<---	MER	-.091	.210	COG	<---	MER	-.091	.210
COG	<---	MNPS	-.074	.323	COG	<---	MNPS	-.074	.323
COG	<---	MEPO	-.043	.244	COG	<---	MEPO	-.043	.244
COG	<---	PT	.034	.465	COG	<---	PT	.034	.465
COG	<---	TMT	.100*	.199	COG	<---	TMT	.100*	.199
COG	<---	EMT	-.020	.205	COG	<---	EMT	-.020	.205
COG	<---	IAE	.031	.172	COG	<---	IAE	.031	.172
DEP	<---	COG	.119**	.017	SWL	<---	COG	.022	.010
DEP	<---	IAE	-.109**	.077	SWL	<---	IAE	.029	.045
DEP	<---	EMT	-.058	.102	SWL	<---	EMT	-.130**	.059
DEP	<---	TMT	-.017	.089	SWL	<---	TMT	.158**	.052
DEP	<---	PT	.008	.209	SWL	<---	PT	-.027	.121
DEP	<---	MEPO	.126*	.111	SWL	<---	MEPO	-.071	.064
DEP	<---	MNPS	.014	.150	SWL	<---	MNPS	-.014	.087
DEP	<---	MER	.051	.094	SWL	<---	MER	.007	.054
DEP	<---	TTSSM	.575**	.508	SWL	<---	TTSSM	-.581**	.293

Table 6 Direct effects for the paths of various model

The mediation analysis was found between TTSSM and depression through IAE (β = -.023, p<0.01), MEPO (β = .036, p<0.01) (Table 7). Hence, H2 (a) was accepted. Eventually, mediation test was examined for satisfaction with life and found that TTSSM was effect satisfaction with life through TMT (β = .023, p<0.01) and ENT (β = -.074, p<0.01) (Table 8). Table 7 and 8 represents the significant path of structural model. Therefore H2 (b) accepted.

Depression			
Indirect Path	Std. Estimate	LL	UL
TTSSM --> IAE --> DEP	-0.023***	-0.524	-0.157
TTSSM --> MER --> COG	-0.028*	-1.246	-0.151
TTSSM --> MER --> COG --> DEP	-0.028*	-0.098	-0.013
TTSSM --> MEPO --> DEP	0.036**	0.238	0.765
TTSSM --> TMT --> COG	0.014**	0.114	0.708
TTSSM --> TMT --> COG --> DEP	0.014**	0.008	0.055

Table 7: Indirect effects for the proposed model; $N = 660$, $^{*}p < 0.05$, $^{**}p < 0.01$, , $^{***}p < 0.001$

Life satisfaction			
Indirect Path	Std Estimate	LL	UL
TTSSM --> MER --> COG	-0.028*	-1.246	-0.151
TTSSM --> TMT --> COG	0.014**	0.114	0.708
TTSSM --> TMT --> SWL	0.023***	0.081	0.298
TTSSM --> ENT --> SWL	-0.074**	-0.847	-0.280

Table 8: Indirect effects for the proposed model; $N = 660$, $^{*}p < 0.05$, $^{**}p < 0.01$, , $^{***}p < 0.001$

Furthermore, alternative paths also examined which may affect depression and satisfaction with life through cognitive distortion. Result revealed that depression and satisfaction with life was not affected by TTSSM through cognitive distortion. Hence, H3 (a) and H3 (b) were rejected.

Finally, serial mediation analysis was investigated to identify whether TTSSM affect the depression and life satisfaction through MSMU and cognitive distortion. From Table 7 and 8 it was evident that depression symptoms were affected by TTSSM through MER and cognitive distortion (β = -.028, p<0.05) and TTSSM through TMT and cognitive distortion (β = .014, p<0.01). Therefore, H4 (a) was accepted and H4 (b) rejected.

Discussion

With the broader aim of examining the effect of TTSSM on mental health in mind, we tried to assess earnestly how the TTSSM use of social media for gratification and cognitive distortion was resulting in poor mental health of university students. This study focused on four various dimensions; a) direct effect of TTSSM on mental health, b) indirect effect of TTSSM on mental health through cognitive distortion, c) mediating effect of uses and gratification of social media

between on TTSSM and mental health, d) serial mediation effect of TTSSM on mental health through uses and gratification of social media and cognitive distortion. In this way, the current study investigated which specific parameter or combination is responsible for poor mental health.

The result showed that TTSSM was one of the crucial factors which affect all dimensions of mental health. As the user increases the time spent on social media, it increases the user's depression, and decreases the satisfaction with life. Our findings were more consistent with previous studies suggested that there was an association between TTSSM and mental health. This is due to several probable reasons for example when user spent more time on social media, they might compare the status of friends and acquaintances with themselves, feel jealous and perceived that other are living more happily and they are not achieved anything which leads to poor mental health. In our findings life satisfaction affected by TTSSM through task management use and entertainment use. .

As previous studies revealed that uses and gratification also one of other factors which affect the mental health. Mediation analysis revealed that there were some crucial combinational factors affect the mental health for example if the user spent more time on informational and educational use (IAE) and make express, present or more popular oneself (MEPO) use will affect the depression symptoms whereas, maintain existing relationships (MER) use and task management tool (TMT) use will affect the depression symptoms with cognitive distortion. For the current study it was well evident that the specific motives of social media or the combination of MSMU with TTSSM and cognitive distortion makes worst for mental health. As, the uses and gratification of social media was a self-reported scale, it was difficult for participants to identify that which content of social media was information, education or entertainment. Therefore, the content analysis of social media according to MSMU will be worth to investigate in future studies.

The impact of social media was evident worldwide. The current study will be helpful for parents, educationists and health practitioners. From the current study findings, it is advisable that users must limit the social media usage, it should not be excessive, so that it affects the mental health. It is also recommended that the users should rectify the negative biased error, which will help the individual to protect from the poor mental health. For this individual can consult with counsellors and health practitioners. Another important factor is the combination of social media usage, uses and gratification and cognitive distortion. It was evident that specific motives of social media for example information and educational, time pass, task management, make express and oneself popular with cognitive distortion impact the mental health. Therefore, users must be conscious of using social media.

7.1 Limitation and Future Research

This study has few limitations that need to recognized at the time of result interpretation. Firstly, the total amount of time was from Facebook and Instagram, other social media network was not considered for analysis. Other network like Youtube, Whatsapp etc can be consider to investigate in future studies. The selection of the participants was non probabilistic incidental. The participants were from India only, therefore, the findings may be limited to this country. Future

studies can be conducted from various cultural perspective as moderating or mediating variable. The sample used in the current study was young aged group, other age groups and gender studies can be conducted to generalize the result.

8.1 Conclusion

The current study integrates the S-O-R and U&G theories to examine the impact of social media usage, gratification of social media and cognitive distortion on mental health. The findings of this study provide empirical evidence and information related to social media by representing that gratification and cognitive distortion impacts on mental health. Previous studies investigated the impact of social media usage on mental health; however, this study is crucial which represents how social media usage impact on mental health. This is the first study which demonstrates the role of cognitive distortion between social media usage and mental health. Hence, the findings of the current study are important and relevant in terms of implications for research on social media usage and for health practitioners.

References

Allen, K. A., Ryan, T., Gray, D. L., McInerney, D. M., & Waters, L. (2014). Social media use and social connectedness in adolescents: The positives and the potential pitfalls. The Educational and Developmental Psychologist, 31(1), 18-31.

Alloy LB and Riskind JH, editors (2006) Cognitive Vulnerability to Emotional Disorders. Hillsdale, NJ: Lawrence Erlbaum

Animesh, A., Pinsonneault, A., Yang, S. B., & Oh, W. (2011). An odyssey into virtual worlds: exploring the impacts of technological and spatial environments on intention to purchase virtual products. Mis Quarterly, 789-810.

Banjanin, N., Banjanin, N., Dimitrijevic, I., &Pantic, I. (2015). Relationship between internet use and depression: Focus on physiological mood oscillations, social networking and online addictive behavior. Computers in Human Behavior, 43, 308–312.

Bathina, K. C., Ten Thij, M., Lorenzo-Luaces, L., Rutter, L. A., &Bollen, J. (2021). Individuals with depression express more distorted thinking on social media. Nature Human Behaviour, 5(4), 458-466.

Beck AT, Rush A, Shaw B, Emery G (1979) Cognitive therapy of depression. New York: Guilford Press

Beck, A.T. (1976). Cognitive therapy and the emotional disorders. New York: Hoeber

Bentler, P. M. (1990). Comparative fit indexes in structural models. Psychological bulletin, 107(2), 238.

Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. Psychological bulletin, 88(3), 588-606.

Browne, M. W., &Cudeck, R. (1992). Alternative ways of assessing model fit. Sociological methods & research, 21(2), 230-258.

Burns, D. D. (1980). Feeling Good. The new mood therapy. New York: Willian Morrow and Company. Inc.(2).

Byrne, B.M. (2016). Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming; Routledge: Abingdon-on-Thames, UK.

Carr, C. T., & Hayes, R. A. (2015). Social media: defining, developing, and divining. Atlantic Journal of Communication, 23 (1), 46–65.

Chaffey, D. (2021, March 19). Global social media statistics research summary [updated 2021].

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. Journal of Personality Assessment, 49(1), 71e75. http://doi.org/10.1207/s15327752jpa4901_13

Dozois, D. J., & Beck, A. T. (2008). Cognitive schemas, beliefs and assumptions. Risk factors in depression, 119-143.

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. Journal of computer-mediated communication, 12(4), 1143-1168.

Fekih-Romdhane, F., Ghrissi, F., Abbassi, B., Cherif, W., &Cheour, M. (2020). Prevalence and predictors of PTSD during the COVID-19 pandemic: findings from a Tunisian community sample. Psychiatry research, 290, 113131.

Ferguson, C. J., Munoz, M. E., Garza, A., and Galindo, M. (2014). Concurrent and prospective analyses of peer, television and social media influences on body dissatisfaction, eating disorder symptoms and life satisfaction in adolescent girls. J. Youth Adolesc. 43, 1–14. doi: 10.1007/s10964-012-9898-9.

Fornell, C., &Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics.

Fox, J., & Moreland, J. J. (2015). The dark side of social networking sites: An exploration of the relational and psychological stressors associated with Facebook use and affordances. Computers in Human Behavior, 45, 168e176. http:// doi.org/10.1016/j.chb.2014.11.083.

Galderisi, S., Heinz, A., Kastrup, M., Beezhold, J., & Sartorius, N. (2015). Toward a new definition of mental health. World Psychiatry, 14, 231– 233. https://doi.org/10.1002/wps.20231

Gan, C. (2017). Understanding WeChat users' liking behavior: An empirical study in China. Computers in human behavior, 68, 30-39.

Gan, C., & Li, H. (2018). Understanding the effects of gratifications on the continuance intention to use WeChat in China: A perspective on uses and gratifications. Computers in Human Behavior, 78, 306-315.

Ghaljaie, F., Naderifar, M., &Goli, H. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. Strides in Development of Medical Education, 14(3).

Global Webindex. (2020, March). GWI Corona virus Research | March 2020.

Grieve, R., Indian, M., Witteveen, K., Tolan, G. A., &Marrington, J. (2013). Face-to-face or Facebook: Can social connectedness be derived online?. Computers in human behavior, 29(3), 604-609.

Horzum, M. B. (2016). Examining the relationship to gender and personality on the purpose of Facebook usage of Turkish university students. Computers in Human Behavior, 64, 319-328.

Hu, L. T., &Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation modeling: a multidisciplinary journal, 6(1), 1-55.

Huang, C. (2017). Time spent on social network sites and psychological well-being: A meta-analysis. Cyberpsychology, Behavior, and Social Networking, 20(6), 346-354.

Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No more FOMO: Limiting social media decreases loneliness and depression. Journal of Social and Clinical Psychology, 37(10), 751-768. doi: 10.1521/jscp.2018.37.10.751.

Katz, E., & Blumler, J. G. (1974). The uses of mass communications: Current perspectives on gratifications research.

Katz, E., Blumler, J. G., & Gurevitch, M. (1973). Uses and gratifications research. Public Opinion Quarterly, 37(4), 509–523.

Kemp, S. (2021, February 11). Digital in India: All the Statistics You Need in 2021. DataReportal – Global Digital Insights. https://datareportal.com/reports/digital-2021-india.

Kim, H. H. (2017). The impact of online social networking on adolescent psychological well-being (WB): A population-level analysis of Korean schoolaged children. International Journal of Adolescence and Youth, 22(3), 364–376.

Kircaburun, K., Alhabash, S., Tosuntaş, Ş. B., & Griffiths, M. D. (2020). Uses and gratifications of problematic social media use among university students: A simultaneous examination of the Big Five of personality traits, social media platforms, and social media use motives. International Journal of Mental Health and Addiction, 18(3), 525-547.

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., ... & Ybarra, O. (2013). Facebook use predicts declines in subjective well-being in young adults. PloS one, 8(8), e69841.

Kuss, D. J., & Griffiths, M. D. (2011a). Online social networking and addiction—a review of the psychological literature. International journal of environmental research and public health, 8(9), 3528-3552.

Kuss, D. J., & Griffiths, M. D. (2011b). Excessive online social networking: Can adolescents become addicted to Facebook?. Education and Health, 29(4), 63-66.

Leung, L., & Wei, R. (2000). More than just talk on the move: Uses and gratifications of the cellular phone. Journalism & mass communication quarterly, 77(2), 308-320.

Lilley, C., Ball, R., & Vernon, H. (2014). The experiences of 11-16 year olds on social networking sites. National Society for the Prevention of Cruelty to Children (NSPCC), United Kingdom.

Liu, H., Liu, W., Yoganathan, V., &Osburg, V. S. (2021). COVID-19 information overload and generation Z's social media discontinuance intention during the pandemic lockdown. Technological Forecasting and Social Change, 166, 120600

Marino, C., Gini, G., Vieno, A., & Spada, M. M. (2018). The associations between problematic Facebook use, psychological distress and well-being among adolescents and young adults: A systematic review and meta-analysis. Journal of Affective Disorders, 226, 274-281.

Marwick, A. E., & Boyd, D. (2014). Networked privacy: How teenagers negotiate context in social media. New media & society, 16(7), 1051-1067.

Matemba, E. D., & Li, G. (2018). Consumers' willingness to adopt and use WeChat wallet: An empirical study in South Africa. Technology in Society, 53, 55-68.

McCrae, N., Gettings, S., &Purssell, E. (2017). Social media and depressive symptoms in childhood and adolescence: A systematic review. Adolescent Research Review, 2(4), 315-330.

McDonald, R. P., & Ho, M. H. R. (2002). Principles and practice in reporting structural equation analyses. Psychological methods, 7(1), 64.

Mehrabian, A., & Russell, J. A. (1974). An approach to environmental psychology. the MIT Press.

Meshi, D., &Ellithorpe, M. E. (2021). Problematic social media use and social support received in real-life versus on social media: Associations with depression, anxiety and social isolation. Addictive Behaviors, 119, 106949.

National Institute of Mental Health. (2021, January 5). NIMH » Mental Illness. NIMH. https://www.nimh.nih.gov/health/statistics/mental-illness.shtml. Retrieved on 11 April 2021

Neira, B. C. J., & Barber, B. L. (2014). Social networking site use: Linked to adolescents' social self-concept, self-esteem, and depressed mood. Australian Journal of Psychology, 66(1), 56–64.

O'Dea, B., & Campbell, A. (2011). Online social networking amongst teens: Friend or foe? Annual Review of CyberTherapy and Telemedicine, 9(1), 108–112.

Orben, A., Dienlin, T., and Przybylski, A. K. (2019). Social media's enduring effect on adolescent life satisfaction. Pro. Natl. Acad. Sci. U.S.A. 116, 10226–10228. doi: 10.1073/pnas.1902058116.

Parboteeah, D. V., Valacich, J. S., & Wells, J. D. (2009). The influence of website characteristics on a consumer's urge to buy impulsively. Information systems research, 20(1), 60-78.

Patton, G., &Borschmann, R. (2017). Responding to the adolescent in distress. The Lancet, 390(10094), 536-538.

Pickering, M. J. (2004). Qualitative content analysis. The SAGE encyclopedia of social science research methods. Thousand Oaks: Sage, 890.

Po Oei, T., Lin, J., &Raylu, N. (2008). The relationship between gambling cognitions, psychological states, and gambling: A cross-cultural study of Chinese and Caucasians in Australia. Journal of cross-cultural psychology, 39(2), 147-161.

Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977;1(3):385–401.

Rapisarda, F., Vallarino, M., Cavallini, E., Barbato, A., Brousseau-Paradis, C., De Benedictis, L., & Lesage, A. (2020). The early impact of the Covid-19 emergency on mental health

workers: a survey in Lombardy, Italy. International journal of environmental research and public health, 17(22), 8615.

Rnic, K., Dozois, D. J., & Martin, R. A. (2016). Cognitive distortions, humor styles, and depression. Europe's journal of psychology, 12(3), 348.

Sagioglou, C., & Greitemeyer, T. (2014). Facebook's emotional consequences: Why Facebook causes a decrease in mood and why people still use it. Computers in Human Behavior, 35, 359e363. http://doi.org/10.1016/j.chb.2014.03.003.

Sampasa-Kanyinga, H., & Lewis, R. F. (2015). Frequent use of social networking sites is associated with poor psychological functioning among children and adolescents. Cyberpsychology, Behavior, and Social Networking, 18 (7), 380–385.

Severin, W. J., & Tankard, J. W. (1997). Communication theories: Origins, methods, and uses in the mass media (pp. 300-310). New York: Longman.

Shakya, H. B., & Christakis, N. A. (2017). Association of Facebook use with compromised well-being: A longitudinal study. American journal of epidemiology, 185(3), 203-211.

Sharma, N., &Vaish, H. (2020). Impact of COVID–19 on mental health and physical load on women professionals: an online cross-sectional survey. Health care for women international, 41(11-12), 1255-1272.

Sharma, S. K., Gaur, A., Saddikuti, V., & Rastogi, A. (2017). Structural equation model (SEM)-neural network (NN) model for predicting quality determinants of e-learning management systems. Behaviour & Information Technology, 36(10), 1053-1066.

Shaw, A. M., Timpano, K. R., Tran, T. B., and Joormann, J. (2015). Correlates of Facebook usage patterns: the relationship between passive Facebook use, social anxiety symptoms, and brooding. Computer HumanBehavior. 48, 575–580. doi: 10.1016/j.chb.2015.02.003.

Shukla, A., & Chouhan, V. S. (2020). A Moderating Role of Indian Rural and Urban Environment on the Relationship Between Various Social Networking Sites and Anxiety and Depression during Covid-19. Psychology and Education Journal, 57(9), 2155-2163.

Tandoc, E. C., Ferrucci, P., and Duffy, M. (2015). Facebook use, envy, and depression among college students: Is facebooking depressing? Comput. Hum. Behav. 43, 139–146. doi: 10.1016/j.chb.2014.10.053.

Tsitsika, A. K., Tzavela, E. C., Janikian, M., Ólafsson, K., Iordache, A., Schoenmakers, T. M., . . . Richardson, C. (2014). Online social networking in adolescence: Patterns of use in six European countries and links with psychosocial functioning. Journal of Adolescent Health, 55(1), 141–147.

Vally, Z., & D'Souza, C. G. (2019). Abstinence from social media use, subjective well-being, stress, and loneliness. Perspectives in psychiatric care, 55(4), 752-759. doi: 10.1111/ppc.12431.

Wang, J.-L., Jackson, L. A., Gaskin, J., and Wang, H.-Z. (2014). The effects of Social Networking Site (SNS) use on college students' friendship and well-being. Comput. Hum. Behav. 37, 229–236. doi: 10.1016/j.chb.2014.04.051.

Wang, L. C., Baker, J., Wagner, J. A., & Wakefield, K. (2007). Can a retail web site be social?. Journal of marketing, 71(3), 143-157.

Wang, P., Wang, X., Wu, Y., Xie, X., Wang, X., Zhao, F., et al. (2018). Social networking sites addiction and adolescent depression: A moderated mediation model of rumination and self-esteem. Personal. Individ. Differ. 127, 162–167. doi: 10.1016/j.paid.2018.02.008.

Wartberg, L., Kriston, L., and Thomasius, R. (2018). Depressive symptoms in adolescents. Dtsch. Arztebl. Int. 115, 549–555.

Williams, L. M. (2016). Precision psychiatry: a neural circuit taxonomy for depression and anxiety. The Lancet Psychiatry, 3(5), 472-480.

Woodworth, R. S. (1918). Dynamic psychology. Columbia University Press.

Yan, H., Zhang, R., Oniffrey, T. M., Chen, G., Wang, Y., Wu, Y., . . . Moore, J. B. (2017). Associations among screen time and unhealthy behaviors, academic performance, and well-being in Chinese adolescents. International Journal of Environmental Research and Public Health, 14(6). doi:10.3390/ijerph14060596.

Yang, X., Gu, D., Wu, J., Liang, C., Ma, Y., & Li, J. (2021). Factors influencing health anxiety: The stimulus–organism–response model perspective. Internet Research.

Mehraj, H., Jayadevappa, D., Haleem, S. L. A., Parveen, R., Madduri, A., Ayyagari, M. R., & Dhabliya, D. (2021). Protection motivation theory using multi-factor authentication for providing security over social networking sites. Pattern Recognition Letters, 152, 218-224.

Soni, M., Khan, I. R., Babu, K. S., Nasrullah, S., Madduri, A., & Rahin, S. A. (2022). Light weighted healthcare CNN model to detect prostate cancer on multiparametric MRI. Computational Intelligence and Neuroscience, 2022.

Sreenivasu, S. V. N., Gomathi, S., Kumar, M. J., Prathap, L., Madduri, A., Almutairi, K., ... & Jayadhas, S. A. (2022). Dense convolutional neural network for detection of cancer from CT images. BioMed Research International, 2022.

Sharma, D. K., Chakravarthi, D. S., Boddu, R. S. K., Madduri, A., Ayyagari, M. R., & Khaja Mohiddin, M. (2022, June). Effectiveness of machine learning technology in detecting patterns of certain diseases within patient electronic healthcare records. In Proceedings of Second International Conference in Mechanical and Energy Technology: ICMET 2021, India (pp. 73-81). Singapore: Springer Nature Singapore.

Mannepalli, K., Vinoth, K., Mohapatra, S. K., Rahul, R., Gangodkar, D. P., Madduri, A., ... & Mohanavel, V. (2022). Allocation of optimal energy from storage systems using solar energy. Energy Reports, 8, 836-846.

Rubavathy, S. J., Kannan, N., Dhanya, D., Shinde, S. K., Soni, N. B., Madduri, A., ... & Sathyamurthy, R. (2022). Machine Learning Strategy for Solar Energy optimisation in Distributed systems. Energy Reports, 8, 872-881.

Bansal, P., Ansari, M. J., Ayyagari, M. R., Kalidoss, R., Madduri, A., & Kanaoujiya, R. (2023, April). Carbon quantum dots based nanozyme as bio-sensor for enhanced detection of glutathione (U) from cancer cells. In AIP Conference Proceedings (Vol. 2603, No. 1). AIP Publishing.

Kadam, P. S., Rajagopal, N. K., Yadav, A. K., Madduri, A., Ansari, M. J., & Patil, P. Y. (2023, April). Biomedical waste management during pandemics. In AIP Conference Proceedings (Vol. 2603, No. 1). AIP Publishing.

Torres-Cruz, F., Nerkar Charushila, K., Chobe Santosh, S., Subasree, N., Madduri, A., & Pant, B. (2023, April). A review on future prospects on magnetic levitation for disease diagnosis. In AIP Conference Proceedings (Vol. 2603, No. 1). AIP Publishing.

Sugumar, D., Dixit, C. K., Saavedra-Lopez, M. A., Hernandez, R. M., Madduri, A., & Pant, B. (2023, April). White matter microstructural integrity in recovering alcoholic population. In AIP Conference Proceedings (Vol. 2603, No. 1). AIP publishing.

Performance Rubrics for Robustness Evaluation of Web Mutation Operators
Suguna Mallika, S., Rajya Lakshmi, D., Esther Rani, T.
International Journal on Recent and Innovation Trends in Computing and Communication, 2023, 11(9s), pp. 665–674

Sign Language Interpretation Using Deep LearningSuguna Mallika, S., Sanjana, A., Vani Gayatri, A., Veena Naga Sai, S.
Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics) this link is disabled, 2023, 14078 LNAI, pp. 692–703

C. Ch.Sarada, K. V. . Lakshmi, and M. Padmavathamma, “MLO Mammogram Pectoral Masking with Ensemble of MSER and Slope Edge Detection and Extensive Pre-Processing”, IJRITCC, vol. 11, no. 3, pp. 135–144, Apr. 2023.

C. Sarada, V. Dattatreya and K. V. Lakshmi, "Deep Learning based Breast Image Classification Study for Cancer Detection," 2023 IEEE International Conference on Integrated Circuits and Communication Systems (ICICACS), Raichur, India, 2023, pp. 01-08, doi: 10.1109/ICICACS57338.2023.10100206.

C. Sarada, K. V. Lakshmi and M. Padmavathamma, "Spatial Intuitionistic Fuzzy C-means with Calcifications enhancement based on Nonsubsampled Shearlet Transform to detect Masses and Microcalcifications from MLO Mammograms," 2023 Advanced Computing and Communication Technologies for High Performance Applications (ACCTHPA), Ernakulam, India, 2023, pp. 1-10, doi: 10.1109/ACCTHPA57160.2023.10083338.