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RESEARCH ARTICLE

# Necessary Condition Analysis on the Relationship between Fear of Missing Out, Social Networking Addiction, and Psychological Well-Being

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Introduction: With the growth of technology and increasing accessibility to various platforms, concerns surrounding the impact of technology on individuals' well-being are also on the rise. Researchers are making significant efforts to understand this constantly evolving phenomenon.
Aims: The current study aims to investigate the interrelationships between fear of missing out (FoMO), social networking addiction (SNA), and psychological well-being (PWB), as well as the relation between SNA scores and sociodemographic variables.
Methods: This study employs a recently developed data analysis approach called Necessary Condition Analysis (NCA) to observe essential conditions within SNA, PWB, and FoMO. The study's main objective is to determine whether low/high levels of FoMO and SNA correspond to high/low levels of PWB. To address this objective, a convenience sample of 449 participants aged 17–40 years was selected. Statistical analyses were conducted using the NCA package to investigate the relationships between these variables. A chi-square test was also performed to assess the associations between sociodemographic variables and probable SNA cases based on the established cut-off scores.
Results: The results indicated that high levels of FoMO are necessary for high levels of SNA (Effect Size *(d)* = .15 and $p < .001$), and high levels of PWB were found to be necessary for low levels of FoMO ($d = .23$ and $p < .001$) and SNA ($d = .16$ and $p = .01$) and vice versa. It was also observed associations between the demographic variables of gender, marital status, and residence, and SNA.
Conclusions: This research contributes to the current discussions concerning the influence of social media on personal well-being and the field of media psychology. The findings obtained can help in guiding the development of interventions and strategies aimed at promoting psychological welfare within digitally interconnected communities.

Keywords: psychological well-being, fear of missing out, social networking addiction, necessary condition analysis, early adults

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# Introduction

In an era characterized by the prevalent influence of digital technologies, the landscape of global connectivity is rapidly evolving, shaping how individuals interact with information and each other. According to the International Telecommunication Union (ITU, 2023), an estimated 67% of the world's population, equivalent to 5.4 billion people, are now connected to the internet, reflecting a fundamental shift in how societies access and exchange information. However, this connectivity is not uniform across regions, with substantial variation observed. While European countries, the Commonwealth of Independent States (CIS), and the Americas approach near-universal internet usage, with penetration rates between 87% and 91%, Africa's average is just 37%, and the Asia-Pacific region stands at 66%. This digital divide underscores the importance of understanding global factors influencing internet usage, emphasizing sociodemographic dimensions in this evolving digital landscape.

In the digital world, social media platforms play a crucial role in shaping online interactions. A survey reports that there are approximately 5.24 billion social media users globally (We Are Social & Meltwater, 2025), highlighting the significance of these platforms in facilitating communication and disseminating information. Notably, major platforms such as Facebook, YouTube, and Instagram command sizable user bases, reflecting their central role in the digital ecosystem (We Are Social & Meltwater, 2025). Furthermore, individuals worldwide spend an average of 141 minutes per day on social media, emphasizing the substantial time investment in these platforms (We Are Social & Meltwater, 2025). Recent statistics published by KANTAR and Internet and Mobile Association of India (IAMAI) (KANTAR & IAMAI, 2024) show growing internet connectivity in India. Despite 42% of the Indian population not yet being connected to the internet, there are 886 million internet users in India, 95% of whom use the internet daily and spend an average of 91 minutes on it.

There is a growing body of literature on the psychological aspects of social networking sites (Nekkanti & Datti, 2024). Review studies suggest that it is not just the amount of time spent online but the quality and context of online engagement that influence psychological outcomes. While moderate use for connection and support can promote well-being, excessive or addictive use – especially when involving social comparison or negative interactions – is more strongly linked to depression, anxiety, and lower life satisfaction (Seabrook et al., 2016). In contrast, positive experiences such as social support and meaningful communication tend to protect against these issues. However, no universal threshold for "problematic" usage exists, as impacts vary by individual and context (Shin et al., 2022). Research also indicates that problematic digital interactions can lead to cognitive distortions (Agnihotri & Datti, 2023), which may be further intensified by individual vulnerabilities such as personality traits and mood-related issues (Lévesque et al., 2018).

Existing studies have explored the relationship between psychological well-being (PWB) and fear of missing out (FoMO) among social media users (Bacaksız et al., 2023; Blackwell et al., 2017; Hayran & Anik, 2021; Hylkilä et al., 2023; Reer et al., 2019; Sheinov & Tarelkin, 2022; Stead & Bibby, 2017) but have focused less on the relationship between PWB, FoMO, and sociodemographic variables (Roberts & David, 2020; Savitri, 2019). Similarly, while several researchers have investigated the association between psychosocial and demographic factors–such as gender, age, socioeconomic status, domicile, and mental health indicators (e.g., depression, anxiety, and stress levels)-and social networking site addiction, their findings have been inconsistent and often inconclusive (Haripriya et al., 2024; Jahagirdar et al., 2024; Patel et al.).

Given these statistics and the existing literature, it is evident that greater academic attention is needed to understand individuals' engagement levels, motivations, and the impacts of their social networking platform usage. Employing Uses and Gratifications theory, the current study aims to investigate the influence of FoMO-linked social networking addiction (SNA) on PWB. The current research, in addition to studying these variables together, also explores how SNA scores vary across sociodemographic variables in the Indian context.

## Theoretical Framework

This study draws upon two complementary theoretical lenses, Uses and Gratifications Theory (UGT) and Compensatory Internet Use Theory (CIUT), to examine how individuals' psychological needs and digital behaviors relate to FoMO, SNA, and PWB.

UGT, proposed by Katz et al. (1973), posits that individuals actively engage with media to fulfill specific psychological and social needs. These needs include information seeking, social interaction, entertainment, and identity expression. Within this framework, social networking platforms serve as a medium for meeting these needs. However, UGT alone does not explain why some users develop maladaptive or excessive patterns of social media use. Therefore, this study also integrates Kardefelt-Winther's (2014) CIUT, which suggests that individu-

als may turn to the internet-including social networking platforms-not only to gratify typical needs but also to compensate for negative emotions, psychosocial stressors, or unmet real-life needs. This compensatory use may temporarily alleviate distress but can also lead to problematic patterns, including addiction.

FoMO – "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski et al., 2013, pp. 1841) – serves as a key factor in both the UGT and CIUT frameworks, shaping individuals' motivations and behaviors on social networking sites (SNSs). From a UGT perspective, FoMO acts as a motivator, driving individuals' to engage with SNSs in pursuit of social enhancement, escapism, and interpersonal connectivity (Bhatiasevi, 2024; Ifinedo, 2016). Within the CIUT framework, FoMO emerges as a psychological response to unmet needs, particularly when basic psychological needs are not being fulfilled in offline life. This unmet need leads to compulsive SNS engagement as individuals attempt to alleviate the discomfort associated with FoMO by immersing themselves in digital spaces. Research has shown that increased FoMO correlates with higher SNS use, highlighting its role in the development of SNA and a potential decline in PWB (Przybylski et al., 2013). In this sense, FoMO can be seen as a necessary condition for both SNA and its associated negative effects on well-being, demonstrating its role in driving compulsive digital behavior.

Social Networking Addiction is conceptualized here not merely as high usage but as a pattern characterized by salience, tolerance, mood modification, conflict, and withdrawal (Andreassen, 2015). CIUT helps explain SNA as a maladaptive coping mechanism, in which online engagement temporarily regulates negative emotional states but ultimately exacerbates distress (Kardefelt-Winther, 2014; Soraci et al., 2025). In contrast, UGT explains how frequent SNS use begins as a goal-oriented behavior aimed at fulfilling specific needs (Ku et al., 2013). By combining these perspectives, the study captures both the motivational underpinnings and the psychological vulnerabilities associated with problematic SNS engagement, allowing for a more comprehensive understanding of how FoMO, SNA, and PWB relate to one another.

Psychological Well-Being refers to positive psychological functioning, including self-acceptance, purpose in life, and autonomy (Ryff & Keyes, 1995). From the UGT perspective, social media can enhance PWB when individuals engage with it for meaningful gratifications such as emotional connection, entertainment, and personal integration (Mittal & Rani, 2024). Research has shown that meaningful use of social media is associated with greater life satisfaction and lower levels of depression and loneliness, particularly among younger and older adults (Bhatiasevi, 2024). However, when use becomes compulsive (as suggested by CIUT), especially under the influence of FoMO, it may undermine well-being.

Research by Hattingh et al. (2022) found that FoMO is positively associated with compulsive use, communication overload, and online subjective well-being (OSWB). This suggests that individuals experiencing FoMO may initially perceive greater online satisfaction. However, from a CIUT perspective, this elevated OSWB might only offer temporary relief, compensating for offline emotional deficits. This highlights the complex relationship between FoMO, SNA, and PWB, underscoring the need to explore how these factors function as necessary conditions for one another.

Drawing from UGT and CIUT, the current study proposes that individuals actively engage with social media to fulfill specific psychological needs, as outlined in UGT. However, in line with CIUT, such engagement can also become a maladaptive coping strategy, particularly when driven by offline emotional deficits or psychological stressors. This may lead to compulsive patterns of use, conceptualized here as SNA, which in turn may impact PWB. Moreover, FoMO may function as a psychological mechanism that exacerbates this process, mediating the relationship between psychological health and problematic social media use (Soraci et al., 2025). Although existing literature has examined the relationship between these three variables (Arya et al., 2021; Savitri, 2019; Sudheer & Saligram, 2023), this study adds nuance by adopting both UGT and CIUT, focusing specifically on social networking addiction, exploring its links with sociodemographic factors, and employing a newly developed statistical method, Necessary Condition Analysis, to test the relation between SNA, PWB, and FoMO. Based on these considerations, the current study proposes the following research objectives:

1. To examine the relationship between sociodemographic variables and SNA scores.
2. To examine the relationship between FoMO and SNA.
3. To examine the relationship between FoMO and PWB.
4. To examine the relationship between SNA and PWB.

### Hypotheses

Based on the research objectives, the following one-tailed hypotheses were developed:

H1: Among the demographic variables, males, individuals living in rural areas, and those from smaller families will exhibit higher SNA scores compared to females, individuals from urban areas, and those from larger families.

H2: Among social variables, single individuals, those without children, students, and those pursuing lower degrees will exhibit higher SNA scores compared to their counterparts.

To explore whether certain psychological variables must be present (or absent) for particular outcomes to occur, the following hypotheses were formulated based on necessary condition analysis. These hypotheses examine the necessity relationships among FoMO, SNA, and PWB.

H3(a): A high level of FoMO is necessary for a high level of SNA.
H3(b): A low level of FoMO is necessary for a low level of SNA.
H4(a): A low level of FoMO is necessary for a high level of PWB.
H4(b): A high level of FoMO is necessary for a low level of PWB.
H5(a): A low level of SNA is necessary for a high level of PWB.
H5(b): A high level of SNA is necessary for a low level of PWB.

## Methodology

The study employed a cross-sectional survey research design to examine the relationships between FoMO, SNA and PWB among early adults in Andhra Pradesh, India.

### Participants and Data Collection

G*Power software was utilized to calculate the minimum sample size required for the study (Faul et al., 2007). Based on an effect size ($f^2$) of 0.5, an alpha level of 0.05, a power of 0.95, and an allocation ratio of 0.75 for a one-tailed means statistical test, a sample size of 180 was estimated. However, the final sample, drawn through convenient sampling, comprised 449 early adults residing in Andhra Pradesh, India. Data were collected via a Google Form, which was distributed between June and December 2023 through social media and communication platforms, including public WhatsApp groups, Facebook, and LinkedIn. To expand the sample, participants were encouraged to further disseminate the form within their networks. The initial section of the form included eligibility screening questions related to age, residence, and consent. Only individuals who met these criteria were allowed to fill out the complete questionnaire, ensuring that all participants were eligible for the study.

### Sample Characteristics

The study sample comprised 449 participants from diverse demographic and socioeconomic backgrounds. The participants ranged in age from 17 to 40 years, with a mean age of 27.3 years ($SD$ = 8.5). Table 1 presents the demographic characteristics of the study sample. The gender ratio was unbalanced, with men making up nearly two-thirds of the sample. In terms of marital status, around one-third of the participants were married, while the remaining two-thirds were single. With respect to parental status, approximately one-quarter of the participants had children, while three-quarters did not. Roughly two-thirds of the participants lived in households with four or fewer members, while one-third lived in larger households. More than four-fifths of the sample resided in urban areas, while less than one-fifth lived in rural areas. Regarding occupation, students accounted for half of the participants, followed by a little more than one-third who were employed. The remainder were either self-employed or homemakers. In terms of education, nearly two-thirds held an undergraduate degree, almost one-third had completed postgraduate studies, and only a small fraction had earned doctoral or other qualifications.

Table 1. Descriptive characteristics of the sample

| Variable | | Frequency | Percentage |
|---|---|---|---|
| Sex | Female | 170 | 37.9 |
| | Male | 279 | 62.1 |
| Marital Status | Single | 313 | 69.7 |
| | Married | 136 | 30.3 |
| Parental Status | No children | 341 | 75.9 |
| | One child | 50 | 11.1 |
| | Two and more children | 58 | 12.9 |
| Family Size | Less than or equal to four members | 308 | 68.6 |
| | More than four members | 141 | 31.4 |
| Residence | Rural | 81 | 18.0 |
| | Urban | 368 | 82.0 |
| Occupation | Student | 226 | 50.3 |
| | Employed | 163 | 36.3 |
| | Self-employed | 36 | 8.0 |
| | Homemaker | 24 | 5.3 |
| Education | Under Graduation | 284 | 63.3 |
| | Post Graduation | 135 | 30.1 |
| | PhD | 18 | 4.0 |
| | Other | 12 | 2.7 |

## Measures

### *Social Networking Addiction Scale*

This 21-item scale was developed by M.G. Shahnawaz and Usama Rehman in 2020, with total scale score ranging from 21 to 147. Lower scores indicate a lack of SNA, while higher scores indicate potential SNA (Shahnawaz & Rehman, 2020). As recommended by the original authors of the scale, a cut-off score of 84 was used, with scores above this threshold indicating probable addiction. The scale assesses SNA across six dimensions: Salience, Mood modification, Tolerance, Withdrawal, Conflict, and Relapse. Items were measured on a 7-point Likert scale, with possible responses ranging from *Strongly Disagree* to *Strongly Agree*. For this scale, global values were used for both analysis and the calculation of overall scale reliability. The scale demonstrated high internal consistency in the current sample, with a Cronbach's alpha of .92 for the overall score and sub-scale alphas ranging from .75 to .90.

### *Fear of Missing Out (FoMO) Scale*

The FoMO scale was developed by Andrew K. Przybylski and colleagues in 2013 (Przybylski et al., 2013). This 10-item scale measures the motivational, emotional, and behavioral aspects of FoMO using a five-point Likert scale (1 = *Not at all true of me*, 2 = *Slightly true of me*, 3 = *Moderately true of me*, 4 = *Very true of me*, and 5 = *Extremely true of me*), and contains items such as "I fear others have more rewarding experiences than me". For this scale, global values were used for both analysis and the calculation of overall scale reliability. The scale demonstrated high internal consistency in the current sample, with a Cronbach's alpha of .87 for the global score.

### *Psychological Well-being (PWB) Scale*

The PWB scale was developed by Carol Ryff in 1989 (Mehrotra et al., 2013; Ryff, 1989). The scale comprises 42 items rated on a 7-point scale (1 = *strongly agree*; 7 = *strongly disagree*) and assesses six dimensions of well-being: Autonomy, Environmental Mastery, Personal Growth, Positive Relations with Others, Purpose in Life, and Self-acceptance. Global scores were used for both analysis and the calculation of overall scale reliability. The scale demonstrated high internal consistency in the current sample, with a Cronbach's alpha of .91 for the global score and sub-scales ranging from .58 to .69.

### Data Analysis

A chi-square analysis was performed to examine the relationship between sociodemographic variables and SNA cut-off scores. Necessary Condition Analysis, an analytical approach proposed by Dul (2016), was used to determine the essential conditions for FoMO, SNA, and PWB. The analysis was carried out using the NCA software package for R (version 4.0.2; Dul, 2024), aligning with the methodology outlined in Jan Dul's comprehensive book on NCA (Dul, 2021). NCA assists in identifying factors that are necessary but not sufficient for an outcome, except when the situation is formulated "in kind" and analyzed using "effect-aggreggation" argument (Dul, 2021).

In conducting the NCA, the total scores obtained for each scale were considered instead of sub-scale scores. NCA has two techniques, which determine the ceiling line, which distinguishes areas with observations from those without. CE-FDH uses a step function with an irregular boundary; the independent and dependent variables are discrete and have a limited number of levels. On the other hand, CR-FDH fits a straight line through the endpoints of the CE-FDH line, with variables that are continuous or discrete at many levels (Dul, 2016, 2021). By default, the NCA software applies both CE-FDH and CR-FDH techniques to construct the ceiling line and calculate the effect size. However, alternative ceiling techniques can also be chosen by specifying them using the *ceilings* argument.

Furthermore, the ceiling line is not accurate if a few data points fall within what should ideally be an empty space. "The ceiling-accuracy (c-accuracy) is the percentage of cases on or below the ceiling line" (Dul, 2021, Chapter 1, Analyse the data section, para. 2). The CE-FDH line is always 100% accurate by definition, whereas the CR-FDH line may not be. A low c-accuracy suggests that the ceiling line might not accurately represent the boundary, in which case another ceiling line may be more suitable. The effect size *(d)* is calculated by dividing the ceiling zone (C) and the scope (S), where S refers to the full range of possible data points, determined by the minimum and maximum values of both variables. This effect size ranges from 0 to 1 and is estimated based on the sampled data. Dul (2016) categorizes effect sizes based on the following guidelines: effect sizes between 0 and .1 are considered "small", those between .1 and .3 "medium", between .3 and .5 "large", and those equal to or greater than .5 are deemed "very large".

NCA allows researchers to test whether the presence or absence of one variable is necessary for the presence or absence of another using the *corner* argument (Dul, 2021). To test whether a high level of Variable 1 is necessary for a high level of Variable 2 [i.e., to test H3(a)], the argument corner = 1 is used (empty upper left). To test whether a low level of Variable 1 is necessary for a low level of Variable 2 [i.e., to test H3(b)], the corner = 4 (empty lower right) argument is applied. Testing whether a low value of Variable 1 is necessary for a high value of Variable 2 [i.e., to test H4(a)/H5(a)] requires a corner = 2 (empty upper right) argument. Finally, to test if a high value of Variable 1 is necessary for a low value of Variable 2 [i.e., to test H4(b)/H5(b)], we use the corner = 3 (empty lower left) argument.

## Results

The results of the chi-square analysis on sociodemographic variables and SNA cut-off scores are presented in Table 2. A significant association was observed between sex and SNA scores, with 22.4% of females and 35.1% of males indicating high SNA scores This finding supports H1 and its directional prediction that males would report higher levels of problematic social networking use. Similarly, residence was significantly associated with SNA, with 43.2% of individuals living in rural areas reporting high SNA scores compared to only 27.4% of those in urban areas, further supporting H1. Although parental status and occupation both initially showed associations with SNA, these associations did not remain significant after applying the Bonferroni correction, suggesting that these two associations may be attributed to chance.

Regarding social variables, marital status showed a significant association with SNA: 35.1% of single individuals were classified as high on SNA, compared to 19.1% of married individuals. This finding aligns with the directional prediction in H2. However, the effect sizes for the significant variables were small (ranging from .13 to .16), indicating that the associations were weak. Therefore, hypothesis H1 is partially supported for demographic variables such as sex and residence, and H2 is partially supported for social variables such as marital status.

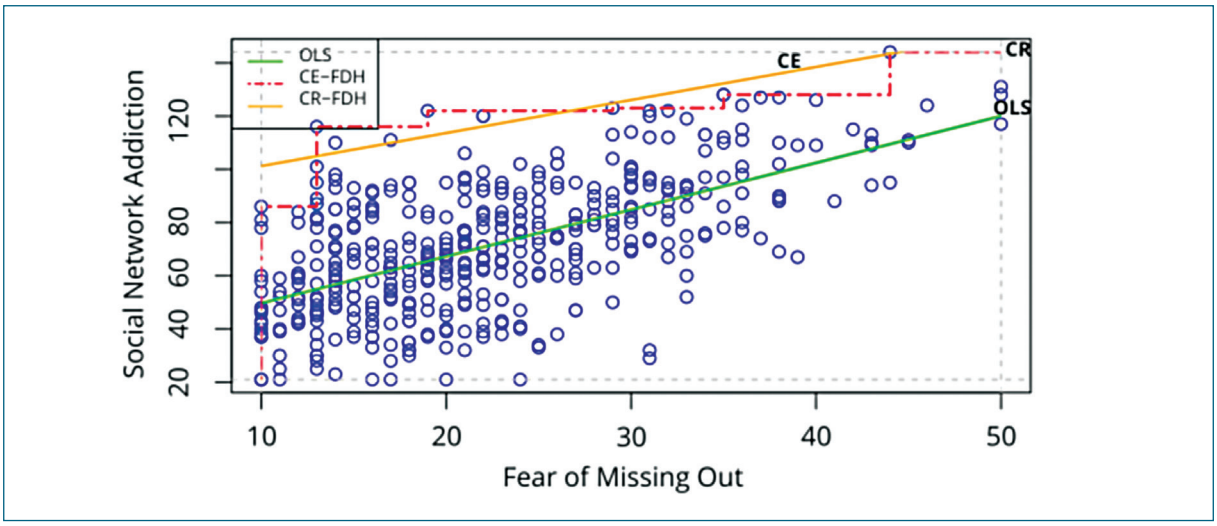
As the next step, the data was further analyzed using the NCA package. The scatterplot obtained after using the "*plots*" argument is presented in Figure 1. It indicates two default ceiling lines, namely CR-FDH (hereafter referred to as CR) and CE-FDH (hereafter referred to as CE), along with the Ordinary Least Squares (OLS) regression line. For the CR line, some data points fall within the ceiling zone, indicating 98.4% accuracy (Table 3). Since the variables are continuous, the CR line is used to further explore the data, and CE is not explored in depth to maintain clarity.

Table 2. Chi-square results of demographic variables with SNA cut-off scores

| Demographic Variables | | SNA ≤ 84 | | SNA > 84 | | $\chi^2$ | *p* | Effect Size (φ) |
|---|---|---|---|---|---|---|---|---|
| | | *n* | % | *n* | % | | | |
| Gender | Female | 132 | 77.6 | 38 | 22.4 | 8.16 | .004 | .13** |
| | Male | 181 | 64.9 | 98 | 35.1 | | | |
| Education | Undergraduation | 190 | 66.9 | 94 | 33.1 | 7.12 | .068 | .12 |
| | Postgraduation | 97 | 71.9 | 38 | 28.1 | | | |
| | Ph.D | 14 | 77.8 | 4 | 22.2 | | | |
| | Other | 12 | 100 | 0 | 0 | | | |
| Marital Status | Single | 203 | 64.9 | 110 | 35.1 | 11.53 | <.001 | -.16*** |
| | Married | 110 | 80.9 | 26 | 19.1 | | | |
| Children | No Children | 226 | 66.3 | 115 | 33.7 | 7.93 | .019^ | .13* |
| | 1 Child | 40 | 80.0 | 10 | 20.0 | | | |
| | ≥ 2 Children | 47 | 81.0 | 11 | 19.0 | | | |
| Family size | ≤ 4 Members | 215 | 69.8 | 93 | 30.2 | 0.004 | .949 | .003 |
| | > 4 Members | 98 | 69.5 | 43 | 30.5 | | | |
| Residence | Rural | 46 | 56.8 | 35 | 43.2 | 7.81 | .005 | -.13** |
| | Urban | 267 | 72.6 | 101 | 27.4 | | | |
| Occupation | Student | 144 | 63.7 | 82 | 36.3 | 9.13 | .027^ | .14* |
| | Employed | 120 | 73.6 | 43 | 26.4 | | | |
| | Self-Employed | 29 | 80.6 | 7 | 19.4 | | | |
| | Homemaker | 20 | 83.3 | 4 | 16.7 | | | |

*** $p < .001$; ** $p < .01$; * $p < .05$
^ p-values are shown to be insignificant after applying the Bonferroni correction.
Phi (φ) coefficients are presented for gender, marital status, family size, and residence variables, and Crammer's V values are given for education, children, and occupation variable.

Figure 1. Scatterplot for Fear of Missing Out and Social Network Addiction (corner:1) [CR (straight ceiling line): y = 88.82 + 1.240x].




The scatterplot for FoMO and SNA presented in Figure 1 contains an empty space in the upper left corner above the space containing observations, indicating the probable presence of a necessary condition. By examining Table 3 and Figure 1 together, it can be observed that for FoMO versus SNA (corner = 1), the space for empirical observations (i.e., scope) is 4.92, with a ceiling zone of 737.47 (CR technique). Dividing the ceiling zone by the scope resulted in a medium effect size of .15, with $p < .001$. This indicates that a high level of FoMO is necessary for a high level of SN, supporting H3(a). A similar condition using corner = 4 indicated that a low level of FoMO is necessary for a low level of SNA, with a medium effect size of .24 and $p < 0.001$, supporting H3(b). Furthermore, applying the *effect aggregation* function (corners: 1 and 4) to FoMO and SNA, the results indicated that FoMO is necessary and sufficient for SNA ($p < .001$).

Table 3. Necessary condition analysis results for SNA, FoMO, and PWB

| Construct | Corner | Method | Accuracy | Ceiling Zone | Scope | Effect Size *(d)* | *p*-value |
|---|---|---|---|---|---|---|---|
| FoMO-SNA | 1 | CE | 100% | 832.00 | 4920 | .17 [b] | - |
| | | **CR** | 98.4% | 737.47 | | .15 [b] | **< .001** |
| | 4 | CE | 100% | 1317.00 | | .27 [b] | - |
| | | **CR** | 98.7% | 1202.01 | | .24 [b] | **< .001** |
| FoMO-PWB | 2 | CE | 100% | 1540.00 | 6080 | .25[b] | - |
| | | **CR** | 98.9% | 1420.74 | | .23 [b] | **< .001** |
| | 3 | CE | 100% | 652.00 | | .11 [b] | - |
| | | **CR** | 99.3% | 543.81 | | .09[a] | **< .001** |
| SNA-PWB | 2 | CE | 100% | 3358.00 | 18696 | .18 [b] | - |
| | | **CR** | 99.1% | 2925.18 | | .16 [b] | **.009** |
| | 3 | CE | 100% | 2231.00 | | .12 [b] | - |
| | | **CR** | 99.6% | 1641.59 | | .09 [a] | **.023** |

Note: PWB-Psychological Well-being; FoMO-Fear of Missing Out; SNA-Social Networking Addiction; CE-Ceiling Envelopment; CR-Ceiling Regression
[a] $0 < d < .1$: small effect
[b] $.1 \leq d < .3$: medium effect

The same approach has been adopted to examine the remaining two conditions as well (shown in Figures 3–6 and Table 3). The NCA analysis indicated that a low level of FoMO is necessary for a high level of PWB (Figure 3; corner = 2, medium effect of .23, and $p < .001$), supporting H4(a). Similarly, a high level of FoMO is necessary for a low level of PWB (Figure 4; corner =3, small effect of .09, and $p < .001$), supporting H4(b). It is also observed that a low level of SNA is necessary for a high level of PWB (Figure 5; corner = 2, medium effect of .16, and $p = .01$), supporting (H5(a). Additionally, a high level of SNA is necessary for a low level of PWB (Figure 6; corner = 3, small effect of .09, and $p = .023$), supporting (H5(b).

NCA allows researchers to assess necessary conditions in degree using the tool known as the "*bottleneck table*". This table presents the ceiling line in tabular form, with the first column of the table indicating the outcome, while the subsequent columns include the necessary conditions. It is important to note that the interpretation of bottleneck tables differs based on the corner selected (Dul, 2021). Using the CR technique, PWB was designated as the outcome, with FoMO and SNA as the necessary conditions. The bottleneck condition was applied to Corner 2 to identify the values of FoMO and SNA that must be equal to or lower than the threshold value for a given PWB value.

Figure 2. Scatterplot for Fear of Missing Out and Social Network Addiction (corner:4) [CR (straight ceiling line): y = -86.85 + 4.156x]

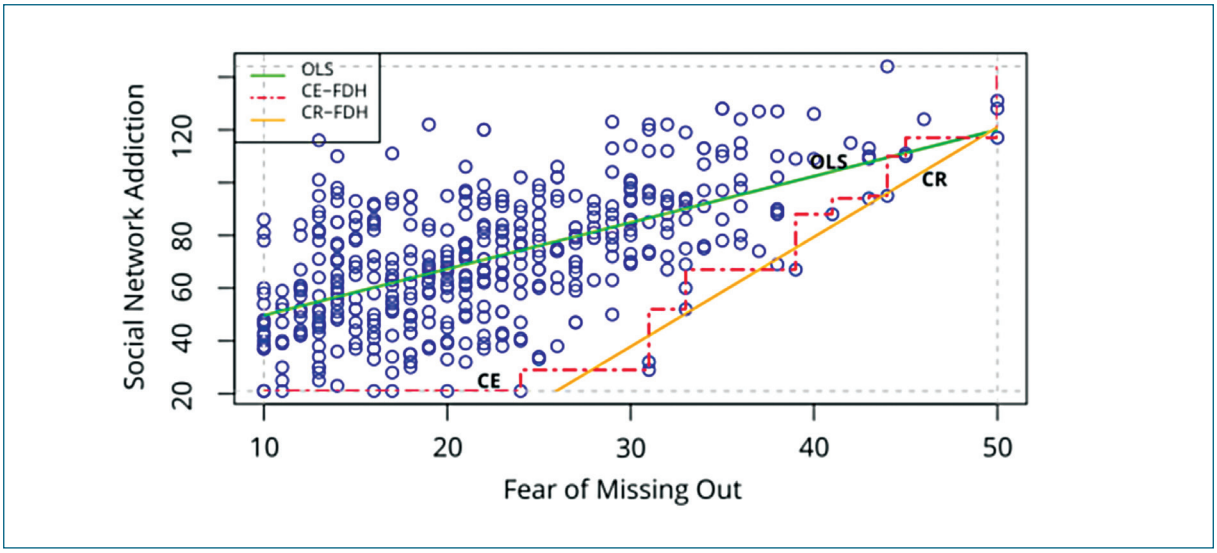


Figure 3. Scatterplot for Fear of Missing Out and Psychological Well-being (corner:2) [CR (straight ceiling line): y = 296.24 - 2.842x]

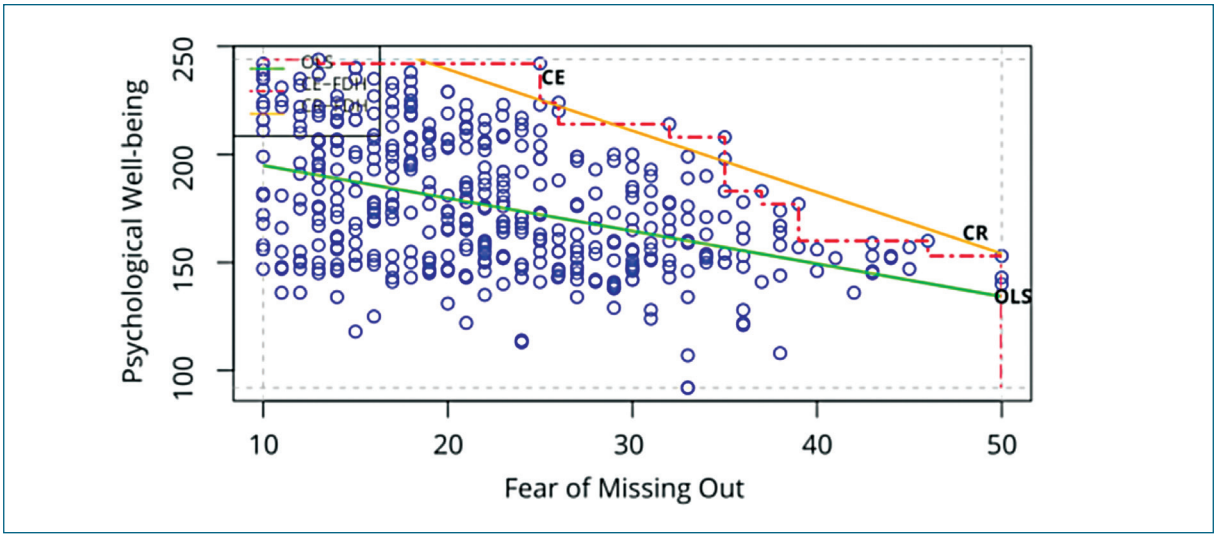



Figure 4. Scatterplot for Fear of Missing Out and Psychological Well-being (corner:3) [CR (straight ceiling line): y = 160.74 - 2.098x]

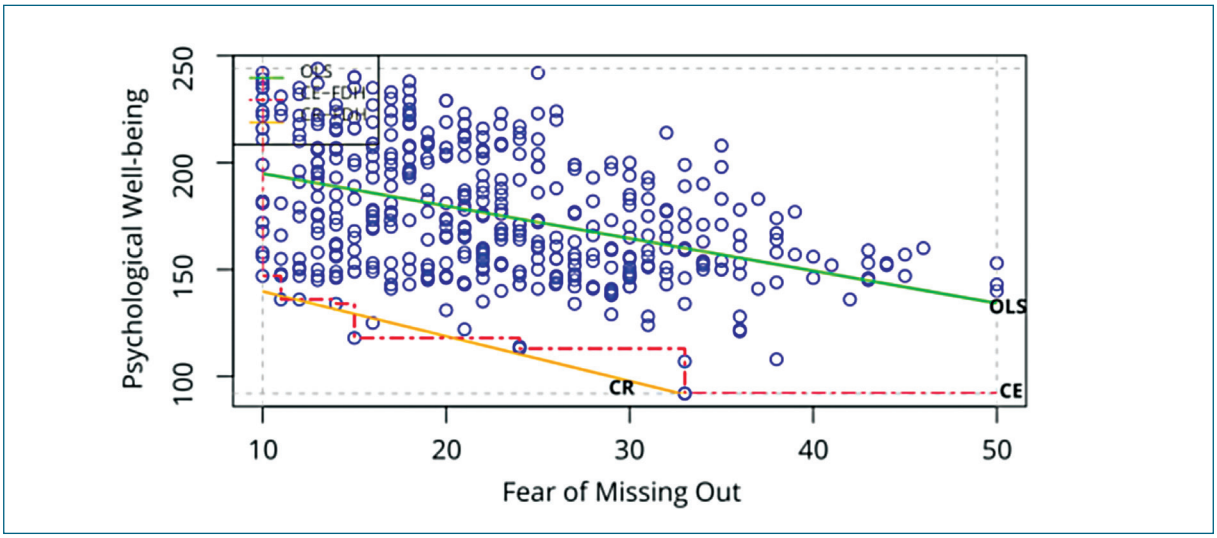



Figure 5. Scatterplot for Social Networking Addiction and Psychological Well-being (corner:2) [CR (straight ceiling line): y = 301.41- 0.904x]

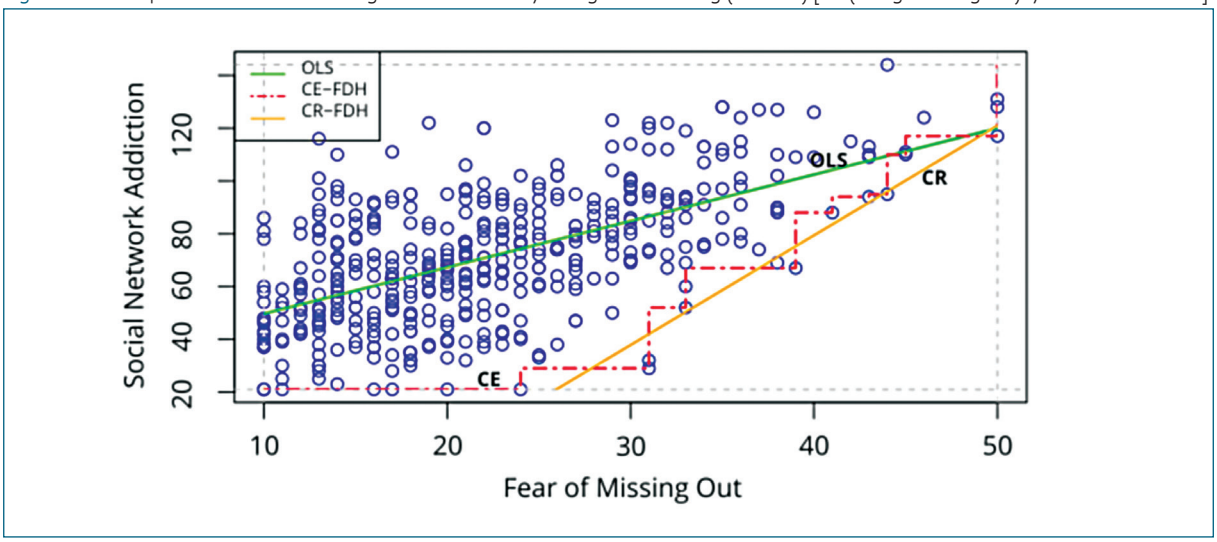
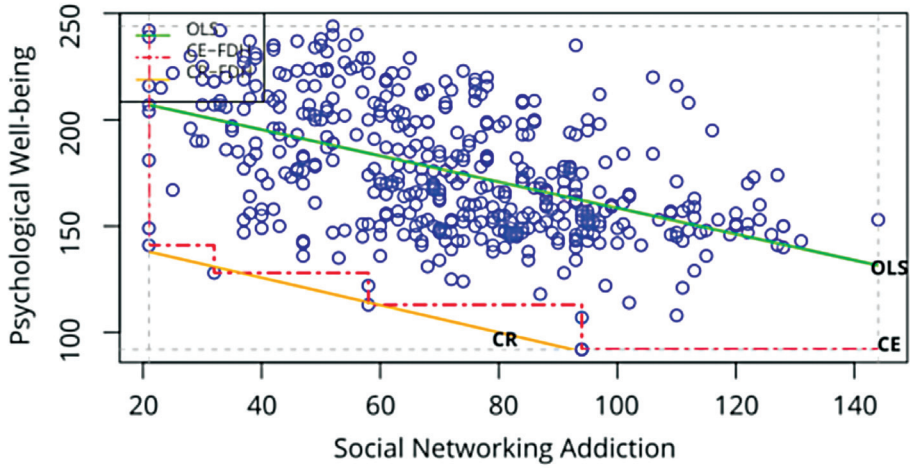


Figure 6. Scatterplot for Social Networking Addiction and Psychological Well-being (corner:3) [CR (straight ceiling line): y = 151.49 - 0.644x]




To facilitate interpretation, the observations in the bottleneck table (Table 4) were divided into three groups based on PWB data. The first level (up to 40%) indicates a low level of PWB, corresponding to PWB scores below 156. The table also shows that none of the conditions were found to be necessary for low levels of PWB. The second level (45% to 70%) indicates a medium level of PWB, with PWB scores ranging from 156 to 204. At this level, it can be observed that 45% of PWB corresponds to 94.5% FoMO, and at 55%, it is shown to correspond to 96.1% SNA. These levels clearly indicate that FoMO and SNA must remain below 94.5% and 96.1%, respectively, to attain a medium level of PWB. Lastly, the third level (above 75%) indicates a high level of PWB, with PWB scores of more than 204 (maximum 244). At this level, it can be observed that the levels of FoMO and SNA must be less than 21% and 34.6%, respectively, to attain the highest levels of PWB.

Table 4. Bottleneck Levels (in percentage) using Ceiling Regression (NN = Not Necessary)

| Psychological Well-being | Fear of Missing Out | Social Networking Addiction |
|---|---|---|
| 0 | NN | NN |
| 5 | NN | NN |
| 10 | NN | NN |
| 15 | NN | NN |
| 20 | NN | NN |
| 25 | NN | NN |
| 30 | NN | NN |
| 35 | NN | NN |
| 40 | NN | NN |
| 45 | 94.5 | NN |
| 50 | 87.8 | NN |
| 55 | 81.1 | 96.1 |
| 60 | 74.4 | 89.3 |
| 65 | 67.7 | 82.4 |
| 70 | 61.1 | 75.6 |
| 75 | 54.4 | 68.8 |
| 80 | 47.7 | 61.9 |
| 85 | 41.0 | 55.1 |
| 90 | 34.3 | 48.3 |
| 95 | 27.6 | 41.4 |
| 100 | 21.0 | 34.6 |

Notes: 1. The percentages provided represent the proportion within the range of a condition, stretching from the lowest observed value to the highest found in the dataset.
2. Highlighted in bold lines, signify the divisions between three categories of psychological well-being. These categories were determined based on the distribution of data on psychological well-being.

## Discussion

In recent research, PWB and FoMO have been identified as key psychological factors associated with problematic social media behaviors, including SNA (Groenestein et al., 2024; Meier & Reinecke, 2021). While prior research (Fioravanti et al., 2021; Groenestein et al., 2024; Hjetland et al., 2021; Nekkanti & Datti, 2024) has used diverse methodological approaches to examine these variables, the current study contributes to the literature by employing NCA, a novel method that offers unique insights into how key psychological factors constrain one another. Additionally, various theoretical frameworks, such as the multidimensional model of social media use, uses and gratification theory, and the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Arya et al., 2021; Bhatiasevi, 2024; Yang et al., 2021), have been employed to understand the relationships between social media usage, PWB, and FoMO. This existing research consistently highlights the strong relationship between PWB, FoMO, and SNA (Bhatiasevi, 2024; Blackwell et al., 2017; Hayran & Anik, 2021; Reer et al., 2019; Roberts & David, 2020; Stead & Bibby, 2017).

The current study examined the relationship between sociodemographic variables and SNA cut-off scores. The findings indicate that 30.3% of participants screened positive for probable SNA based on their scale scores. Previous studies in other southern Indian cities reported higher prevalence rates, specifically 36.9% and 70.7% (Masthi et al., 2017; Raj et al., 2018), whereas a study conducted in a western Indian city reported a lower prevalence of 15.02% (Patel et al., 2021). This indicates that the prevalence of probable SNA may vary considerably across different regions of India, potentially reflecting cultural, environmental, and lifestyle differences influencing social networking site usage patterns.

The demographic variable of gender was shown to be significantly associated with SNA scores, with a higher proportion of males screening positive for probable SNA compared to females. Existing Indian literature both supports and contradicts these findings. While one Indian study observed higher SNA levels among males (Chidambaram et al., 2023), another found higher scores among females (Patel et al., 2021). Considering international research, a Spanish study observed higher SNA among males (Aparicio-Martínez et al., 2020), further supporting the present results. In contrast, an American study observed greater SNA among females (Chen, 2019), and an Italian study observed no significant gender difference (Bottaro et al., 2024). These mixed findings across different cultural contexts suggest that gender differences in SNA may be influenced by cultural, social, and contextual factors, highlighting the need for further cross-cultural and longitudinal research to better understand these patterns.

Residence also emerged as a significant demographic factor associated with SNA scores. A higher proportion of participants from rural areas screened positive for probable SNA compared to urban residents. This could be due to growing digital penetration in rural India (KANTAR & IAMAI, 2024), even though urban residents, on average, continue to spend more time online. Rural users have increasingly adopted the internet, often using it primarily for entertainment purposes rather than educational or professional activities (Laskar, 2023). This entertainment-focused usage pattern may increase the risk of developing problematic or addictive social media behaviors among rural populations.

The social variable of marital status was found to be associated with SNA, with married individuals showing a lower proportion of probable SNA cases compared to single individuals. While direct studies on marital status and SNA are limited, it is possible that the added responsibilities and life commitments often associated with marriage may reduce the likelihood of excessive engagement with social networking platforms (Sharifinia et al., 2019). Although the study observed that the social variables parental status and occupation were initially shown to be associated with SNA, upon further analysis these were revealed to be insignificant. This insignificance may partly be attributed to the limited subgroup sizes within the sample, which could have reduced the statistical power to detect differences.

The current study also utilized Uses and Gratifications Theory and Compensatory Internet Use Theory, along with NCA, a novel and evolving data analysis approach, to further examine the relationships between the previously mentioned variables within the Indian context. The NCA model adopted in this study provided a better understanding of the relationship between these variables. NCA revealed that low levels of FoMO and SNA are necessary for achieving high levels of psychological well-being. The findings also indicated that varied levels of PWB necessitate individuals to attain distinct threshold levels of SNA and FoMO. Failure to meet any of these specific thresholds would result in lower PWB outcomes, regardless of whether the remaining thresholds are met or surpassed. This underscores the interconnectedness and dependency of these factors, indicating that a comprehensive balance between SNA and FoMO is crucial for achieving better PWB.

From the perspective of UGT, these findings further emphasize the role of user motivations and their impact on psychological outcomes. The results suggest that when these motivations are skewed toward excessive engagement, as seen in cases of high levels of SNA or through by the anxiety of missing out on experiences, as represented by FoMO, the balance required for positive PWB is disrupted. This aligns with UGT's assertion that both the type and intensity of media use are influenced by the gratification individuals seek, which in turn impact users' experiences (Dhir & Tsai, 2017; Katz et al., 1973).

However, integrating CIUT adds a deeper layer to this interpretation: it suggests that compulsive or anxiety-driven engagement may not stem merely from goal-directed media use but from an attempt to compensate for offline emotional or psychological deficits (Kardefelt-Winther, 2014). From this lens, FoMO may function as a psychological stressor that drives individuals to use social media not merely to fulfill needs but to escape discomfort-creating a loop that heightens SNA and undermines long-term well-being.

Together, these perspectives imply that to promote higher PWB, individuals need to maintain mindful, moderated social media use driven by balanced and conscious motivations rather than emotional avoidance or anxiety (Kardefelt-Winther, 2014; Meier & Reinecke, 2021). By drawing on both UGT and CIUT, this study underscores the importance of understanding what users seek online and why they seek it-and how unmet offline needs can shape problematic digital behaviors. A balanced approach to engagement that mitigates the compensatory pull of FoMO and the addictive tendencies of SNA is essential for sustaining healthy psychological outcomes.

## Strengths and Limitations

A key strength of the present study' lies in its application of an innovative methodological approach to observe associations among the relevant variables. Using NCA, the study provides a unique perspective on how specific thresholds of social networking addiction and FoMO are essential for achieving optimal PWB. This approach clearly indicates that certain levels of SNA and FoMO are necessary to maintain PWB, emphasizing the interdependence of these factors. Additionally, focusing on young adults in the Indian context adds a valuable cultural dimension to the research. This approach improves the study's relevance and contributes to the existing literature on social media and mental health.

The study acknowledges limitations related to data collection and analysis. Utilizing convenience sampling and self-reported online forms, while common in social sciences, introduces issues including response bias, subjectivity, and potential social desirability bias. Though the employed scales demonstrated validity and reliability, respondents' understanding of questions may have led to inaccuracies. Moreover, the study acknowledges the need to validate Ryff's 42-item PWB scale and Przybylski's FoMO scale in the Indian context. The SNA scale used in the study is measured using a self-reported scale; therefore, the conclusions of the study should be interpreted with caution.

It is also important to acknowledge the lack of updated state-level population statistics for Andhra Pradesh beyond the 2011 Census. Given this limitation, coupled with the absence of current demographic breakdowns, constrains direct comparisons between the study sample and the broader population. As a result, it is difficult to accurately assess the representativeness of the sample against the existing population profile. Furthermore, the study did not examine demographic variables in their continuous form or conduct additional NCA analyses involving these variables in order to maintain focus on the primary variables of interest. The study also categorized SNA scores based on established cut-off points to assess group differences; treating SNA as a continuous variable in future analyses could offer more detailed insights.

NCA, like other analytical techniques, relies on valid and reliable variable scores, which are susceptible to measurement errors. Given that the present research is an observational study without experimental manipulation, caution is warranted in establishing causal relationships. Moreover, NCA is an emerging technique, necessitating further exploration and refinement in terms of its statistical and causal inferences. While it offers a unique perspective on causality, ongoing development and validation are essential (Van der Valk et al., 2016). In conclusion, these limitations highlight the need for future research that involved including more diverse populations, refining measurement tools, validating NCA, and exploring mediation and moderation. This iterative process will enhance understanding and promote more robust conclusions.

## Conclusion, Implications and Future Directions

The current study examined the prevalence of probable SNA cases and its associations with sociodemographic variables among the participants. Females, individuals residing in urban areas, and those who are married were shown to have lower SNA scores compared to their counterparts. Additionally, the study applied NCA, a new data analysis technique commonly used in the field of management to identify necessary conditions within a dataset. As expected, this method provided new insights into an already well-research topic, showing that low levels of problematic factors such as FoMO and SNA are necessary for high levels of PWB, and vice versa. Given these promising results, it is important for researchers to explore this technique further in psychology research.

The findings of this study imply that for young adults, excessive attachment to social media or a constant need to stay updated and connected might negatively impact their PWB. However, it is important to recognize that the relationship between social media use and mental health is not merely one of causality. Underlying psychological factors such as emotional distress, unmet psychological needs, or a lack of coping mechanisms may also play a significant role in the development of FoMO and SNA. Addressing these underlying issues is essential for promoting overall mental health and preventing problematic digital behavior.

Interventions and strategies should be designed with an understanding that it is not solely the quantity of social media use that matters but also the emotional and psychological motivations behind it. Mental health professionals, educators, and policymakers should adopt holistic approaches combining digital behavior regulation with psychological support, such as cognitive-behavioral strategies, to address underlying issues contributing to FoMO and SNA. For example, interventions might include mindfulness-based practices, stress management techniques, and the building of emotional resilience as ways to manage FoMO and reduce the need for compensatory social media use.

Furthermore, raising awareness about the psychological drivers of social media addiction and FoMO is essential. Programs can be designed to educate young adults on how to recognize and address internal factors, such as low mood or anxiety due to personal or social issues, which may contribute to their need for constant online engagement. The focus should not solely be on reducing screen time but also on understanding and addressing the psychological mechanisms that lead to problematic social media use.

In addition, interventions could include offline engagement opportunities, such as peer support groups, offline activities, or community involvement, which can help reduce FoMO, improve PWB, and provide healthy alternatives to excessive social media use. Tailoring interventions to specific demographic factors-such as gender, age, or location-can further enhance their relevance and effectiveness.

Furthermore, the findings add to the body of knowledge on new and emerging data analysis techniques, particularly NCA. The study demonstrates that it can be utilized to examine the interdependencies and thresholds necessary to understand complex relationships between various psychological factors.

Future research exploring social media-related factors such as media-associated anonymity (Bacaksız et al., 2023), emotional responses like anger and worry (Elhai et al., 2019), attachment styles (Blackwell et al., 2017), and personality traits (Blackwell et al., 2017; Stead & Bibby, 2017) could benefit from the application of the NCA method. Examining these factors through the lens of NCA might reveal additional causal factors and their direct impact on outcomes, contributing significantly to our understanding of the complex web of influences that shape individual well-being. Furthermore, future NCA research may consider using continuous demographic variables to better understand nuanced relationships, which could inform the development of more targeted, demographic-specific interventions. In addition to this, it is also important to use more diverse and representative sampling methods to study a broader range of individuals. As NCA is still an emerging analytical technique, future research should focus on refining and validating its application in psychology.

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### Author contribution

Maneela SIRISETY: design, methodology, formal analyses, interpretation, writing original draft.
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Ravi Shanker DATTI: conceptualization, design, funding acquisition, project administration, data management, supervision, writing review and editing.
Nalini BIKKINA: funding acquisition, project administration, supervision, writing review and editing.
Eduard V. PATRAKOV: funding acquisition, project administration, writing review and editing.
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### Declaration of interest statement

The authors have no conflicts of interest to disclose.

### Ethical statement

This manuscript is the authors' original work.
All participants engaged in the research voluntarily and anonymously.
Their data are stored in coded materials and databases without personal data.
The studies involving human participants were reviewed and approved by Department Research Committee, Department of Applied Psychology, School of Humanities and Social Sciences, GITAM (Deemed to be University) on 01.03.2024 (File No. DRC/03/2024/0001).

### Data availability statement

Datasets presented in this article are available from the corresponding author upon reasonable request.

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