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## Social Support, Quality of Life, and Depression Predict Two Types of Problematic Digital Use among Prenatal Women

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**ABSTRACT: Background:** Problematic digital use has been strongly associated with psychological disturbance, but it is less researched among highly distressed populations such as prenatal mothers. The present study longitudinally explored the predictors of problematic smartphone use (PSPU) and problematic social media use (PSMU) among prenatal mothers to inform the development of preventive strategies. **Methods:** Participants comprised 137 prenatal mothers (mean age = 31.89 years, SD = 4.29), with approximately half of them having their first baby (50.4%). The level of social support, quality of life (QoL), and psychological factors (including stress, anxiety, and depression), were collected at Timepoint 1 of the second trimester, while the severity of PSPU and PSMU was collected at Timepoint 2 of the third trimester. Factors were entered into a hierarchical regression model for analysis, with Model 1 adding age and parity as covariates, Model 2 adding social support and QoL, and Model 3 adding psychological factors. **Results:** In predicting PSPU, only Model 2 was significant ( $R^2 = 0.109$ ,  $F = 7.953$ ,  $p < 0.001$ ), with lower social support and QoL (standardized coefficient [ $\beta$ ] =  $-0.201$ ,  $p = 0.026$  and  $-0.193$ ,  $p = 0.033$ ) predicting higher PSPU. In predicting PSMU, only Model 3 was significant ( $R^2 = 0.118$ ,  $F = 3.631$ ,  $p = 0.021$ ), with higher depression ( $\beta = 0.321$ ,  $p = 0.018$ ) predicting higher PSMU. **Conclusions:** The findings suggest that among prenatal mothers, low social support and QoL may predict PSPU, while depressive symptoms may predict PSMU. The results inform strategies targeting maternal needs at the early stage of pregnancy to prevent the development of problematic digital use. Future studies may focus on the

temporal changes of maternal problematic digital use from prenatal to postnatal, or follow-up examining its influence on parenting or child development to construct a more comprehensive understanding of these behaviors.

**KEYWORDS:** Problematic social media use; problematic smartphone use; social support; quality of life; depression

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## 1 Introduction

With the rapid development of technology, internet use has become an indispensable part of modern life. Its features of entertainment can sometimes foster individuals to develop maladaptive coping behaviors in order to escape from reality [1]. Such maladaptive coping behaviors can either be described using an umbrella term (i.e., problematic digital use) or can be described according to specific behaviors, such as problematic smartphone use (PSPU) and problematic social media use (PSMU) [2–4]. Regardless of the terminology, these maladaptive uses have been previously associated with negative health-related outcomes, such as sleep disturbance [5], food addiction [1], and sedentary behavior [6].

Pregnancy is a unique period for women, and many of them experience great pressures both internally and externally [7], such as the changing of physical appearance, fluctuating physiological hormones, increasing concerns about raising a child, and the social expectation of being a mother. Such pressure may substantially increase as pregnancy progresses [8], making prenatal mothers a vulnerable population to develop problematic digital use [3]. Digital use can be a highly prevalent behavior for prenatal women, given the accessibility of internet-enabled digital devices [9], with activities such as social media use, *YouTube* viewing, online gaming, and online shopping commonly reported [9–12]. Social media use has gained specific attention because it can provide prenatal women with pregnancy-related information [13]. However, it has also been reported as a risk factor for depression during pregnancy [14] and may influence parent-child relationships [15]. In the present study, PSPU and PSMU were targeted as general and specific forms of problematic digital use behaviors to examine such behaviors among prenatal women. From the perspective of preventive medicine, identifying the predictors of problematic digital use can inform policymaking, with the aim of reducing the negative influences of digital use, subsequently promoting maternal well-being.

Psychological distress (including stress, anxiety, and depression) has consistently been identified as a key antecedent of maladaptive digital behaviors [16]. Empirical evidence suggests that elevated psychological distress impairs emotional regulation capacity, increasing the likelihood of using digital platforms as a coping mechanism [2]. Empirically, studies across adolescent, adult, and clinical populations have demonstrated robust associations between psychological distress and both PSPU and PSMU [5,16–18]. Evidence further indicates that psychological distress is associated with problematic digital use among the perinatal population, with one study reporting that psychological distress may be associated with PSMU among prenatal women, while another study identified anxiety as a significant predictor of PSPU among first-time parents [3]. More specifically, existing evidence suggests that psychological distress can function as an antecedent to (and a consequence of) problematic digital use [1,2,16]. Individuals with higher levels of psychological distress (e.g., depression, anxiety) appear to be more vulnerable to engaging with digital use, which in turn, may increase their psychological distress [5] and lead to further detrimental consequences [1,5,16]. Because the present study aimed to explore the predictive ability, psychological distress (e.g., stress, anxiety, and depression) was considered as a proximal psychological predictor in the proposed framework.

Quality of life (QoL) is defined as a subjective measure for individuals' wellbeing, and has also been reported as having a negative association with problematic digital use [9,19]. Studies have reported that individuals may engage in more digital use when they have a lower QoL, which may derive from the need for emotional regulation, and problematic digital use is adopted as a coping strategy [20,21]. QoL among perinatal women has been found to be significantly lower than population norms [22] and to gradually decline as gestational weeks increase [23]. This decline may be attributable to increasing physical discomfort as pregnancy progresses. Reduced QoL may, in turn, lead prenatal women to engage in maladaptive digital use as a coping strategy. Therefore, QoL was conceptualized as an intrinsic factor in the present study to examine its role in the development of problematic digital use.

Social support is defined as the instrumental or emotional assistance that individuals receive from their social networks [24]. Among perinatal women, social support has been reported with a positive relationship to maternal mental health [25], while low social support has been reported to be associated with increased risk of psychological distress [26]. Moreover, low social support has been reported to be associated with PSMU [27], possibly because individuals seek online social interactions as compensation [25]. Considering that social support represents an external resource available to perinatal women, it was conceptualized as an extrinsic factor in the present study to examine its contribution to the development of problematic digital use.

Compensatory Internet Use Theory (CIUT) [28] can be applied to the current context. CIUT posits that individuals may engage in maladaptive digital use as a coping strategy to compensate for unmet needs and/or to alleviate negative emotional states. Within the context of pregnancy, women often experience heightened emotional vulnerability alongside fluctuations in broader life-context factors (i.e., reduced social support and changes in QoL). As such, the compensatory use of digital technologies may be particularly salient among this population. Integrating psychological distress with life-context factors may therefore provide a theoretically grounded approach to understanding the development of problematic digital use behaviors.

Therefore, grounded in CIUT, the present study longitudinally investigated the predictors of problematic digital use among prenatal women. PSPU was targeted because of its high penetration rate and easy accessibility [3,29], and has made smartphone use an ideal conduit for avoidance, while PSMU was targeted because social media is frequently used by perinatal women for providing pregnancy-related information or support [13,30]. Social support and QoL were conceptualized as extrinsic and intrinsic factors, respectively, while psychological distress (i.e., stress, anxiety, and depression) was incorporated as a related construct to examine their predictive roles in PSPU and PSMU. By identifying the critical predictive factors, preventive strategies can be developed and implemented to reduce the impact of problematic digital use on prenatal women, thereby supporting maternal well-being throughout early motherhood.

## **2 Methods**

### ***2.1 Participants and Procedure***

The present study used data from a larger project using a convenience sampling method to longitudinally collect maternal participants from a regional hospital located in the southern part of Taiwan (E-Da Hospital). Participants were eligible to participate if they were (i) aged 18 years and over, (ii) able to read and comprehend traditional Chinese characters, and (iii) in the second trimester of pregnancy (i.e., between 13th and 27th week). Participants were excluded if they were (i) unable to complete the survey independently, (ii) diagnosed with a blood-borne disease, (iii) identified as being at risk of early termination of pregnancy, and/or (iv) unable to pass the attention check items in the survey.

Research staff members approached eligible participants during their routine clinical checks. After a thorough explanation, individuals who agreed to participate provided their written informed consent. An

online survey created using *LimeSurvey* was sent to participants during their second trimester (between the 17th and 26th week, Timepoint 1 [T1]) and third trimester (between 32nd and 36th week, Timepoint 2 [T2]). Between the two timepoints, a minimum interval of less than 10 weeks was maintained. Participants received 300 New Taiwan Dollars as compensation each time they completed the survey. The study protocol was approved by the Institutional Review Board of E-Da Hospital (Approval No.: EMRP22112N). All participants provided their consent prior to the study beginning.

## 2.2 Measures

Baseline characteristic data were collected, including age and parity. Other measures were included to assess social support, QoL, psychological distress including stress, anxiety, and depression at T1, as well as PSPU and PSMU at T2.

### 2.2.1 Multidimensional Scale of Perceived Social Support (MSPSS)

The Multidimensional Scale of Perceived Social Support (MSPSS) [31] was used to assess perceived social support. The scale comprises 12 items (e.g., “*My friends really try to help me*”) rated using a 7-point Likert scale (1 = *strongly disagree*; 7 = *strongly agree*) to generate total scores ranging between 12 and 84. Higher scores indicate that individuals perceived they had a higher level of social support. Robust psychometric properties of the Chinese MSPSS have previously been reported [32]. The internal consistency of the scale in the present study was excellent (Cronbach’s alpha [ $\alpha$ ] = 0.956).

### 2.2.2 5-Level EuroQoL-5 Dimensions (EQ-5D-5L)

The 5-Level EuroQoL-5 Dimensions (EQ-5D-5L) [33] was used to assess the level of QoL. The scale comprises five items assessing individuals’ ability in performing five daily functions and one item assessing overall QoL self-rated by individuals. A unique scoring equation is used to calculate the five items into a utility score ranging between  $-1.0259$  and 1 (Taiwan norm) [34]. The remaining item is scored using a visual analogue score (VAS) ranging from 0 to 100, which was used in the present study to represent QoL. Higher scores indicate a greater perceived QoL. Robust psychometric properties of the Chinese EQ-5D-5L have previously been reported [35,36].

### 2.2.3 Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS) [37] was used to assess perceived stress symptoms. The scale comprises 10 items (e.g., “*In the last month, how often have you felt that you were on top of things?*”) rated using a 5-point Likert scale (0 = *never*; 4 = *very often*) to generate total scores ranging between 0 and 40. Higher scores indicate a greater level of perceived stress. Robust psychometric properties of the Chinese PSS have previously been reported [38–41]. The internal consistency of the scale in the present study was very good ( $\alpha$  = 0.886).

### 2.2.4 21-Item Depression, Anxiety and Stress Scale (DASS-21)

The 21-item Depression, Anxiety and Stress Scale (DASS-21) [42] was used to assess anxiety symptoms. The scale comprises 21 items consisting of three subscales: depression, anxiety, and stress, with seven items in each subscale. Only the anxiety subscale was used in the present study. It has seven items (e.g., “*I was aware of dryness of my mouth*”) rated using a 4-point scale (0 = *Did not apply to me at all*; 3 = *Applied to me very much or most of the time*) to generate the scores ranging between 0 and 21. Higher scores indicate a greater level of perceived anxiety. Robust psychometric properties of the Chinese version of DASS-21 have

previously been reported [43]. The internal consistency of the subscale in the present study was close to acceptable ( $\alpha = 0.681$ ).

### 2.2.5 Edinburgh Postnatal Depression Scale (EPDS)

The Edinburgh Postnatal Depression Scale (EPDS) [44] was used to assess depressive symptoms. The scale comprises 10 items (e.g., “*I have felt sad or miserable*”) rated using a 4-point scale (0 = “*yes, most of the time*”, 1 = “*yes, quite often*”, 2 = “*not very often*”, 3 = “*no, not at all*”) to generate total scores ranging between 0 and 30. Higher scores indicate a greater level of perceived depression. Robust psychometric properties of the Chinese EPDS have previously been reported [45]. The internal consistency of the scale in the present study was very good ( $\alpha = 0.881$ ).

### 2.2.6 Smartphone Application-Based Addiction Scale (SABAS)

The Smartphone Application-Based Addiction Scale (SABAS) [46] was used to assess the level of PSPU. In the present study, PSPU was conceptualized as a generalized form of excessive smartphone use encompassing a broad range of problematic digital activities. The scale comprises six items (e.g., “*My smartphone is the most important thing in my life*”) rated using a 6-point Likert scale (1 = *strongly disagree*; 6 = *strongly agree*) to generate total scores ranging between 6 and 36. Higher scores indicate a greater level of PSPU. Robust psychometric properties of the Chinese SABAS have previously been reported [47]. The internal consistency of the scale in the present study was very good ( $\alpha = 0.822$ ).

### 2.2.7 Bergen Social Media Addiction Scale (BSMAS)

The Bergen Social Media Addiction Scale (BSMAS) [48] was used to assess the level of PSMU. In the present study, PSMU specifically referred to excessive and problematic use related to social media platforms. The scale comprises six items (e.g., “*You feel an urge to use social media more and more*”) rated using a 5-point Likert scale (1 = *very rarely*; 5 = *very often*) to generate total scores ranging between 6 and 30. Higher scores indicate a greater level of PSMU. Robust psychometric properties of the Chinese BSMAS have previously been reported [47]. The internal consistency of the scale in the present study was very good ( $\alpha = 0.816$ ).

## 2.3 Statistical Analysis

Data were first summarized using descriptive analysis. The baseline characteristics of participants were presented as means and standard deviations for continuous variables and as frequencies and percentages for categorical variables. The data were then tested for their normality using both the Shapiro-Wilk test and the examination of skewness and kurtosis values. Although Shapiro-Wilk tests indicated significant deviations from normality for some variables, skewness and kurtosis values fell within the acceptable range ( $|\text{skewness}| < 2$ ,  $|\text{kurtosis}| < 7$ ) [49,50], suggesting that the data were approximately normally distributed. The correlations among study variables were therefore examined using Pearson’s correlation coefficients.

Hierarchical linear regression analyses were used to explore predictors of PSPU and PSMU at T2, with age and parity controlled as covariates. Because parity is an ordinal variable, it was recoded into a categorical variable with two groups: first-time mothers and mothers with more than one child, and then included as a covariate in the regression models. In each model, variables were entered sequentially in three models, with Model 1 adding demographic covariates (age and parity), Model 2 adding psychosocial factors (social support and QoL), and Model 3 adding psychological factors (stress, anxiety, and depression). The sequence of factors in Models 2 and 3 was determined because psychosocial factors often represent broader contextual and resource-based influences that typically precede psychological states, while psychological

factors are conceptually more proximal to behavioral outcomes and therefore expected to exert the strongest direct effects on problematic digital use. All statistics were performed using *SPSS 29.0* (IBM Corp., Armonk, NY, USA) with a significance level set at  $p$ -value < 0.05.

### 3 Results

Baseline characteristics and scores on each of the psychometric measures are shown in Table 1. The average age of participants ( $n = 137$ ) was 31.89 years ( $SD = 4.29$ ), with almost half of them having their first baby (50.4%). Results of correlations are shown in Table 2. Social support was significantly correlated to QoL (standardized coefficient [ $\beta$ ] = 0.389,  $p < 0.001$ ), the three psychological distress factors (stress, anxiety, and depression:  $\beta = -0.317$ ,  $-0.419$ , and  $-0.405$ , all  $p$ -values < 0.001), and PSPU ( $\beta = -0.275$ ,  $p = 0.001$ ). QoL was significantly correlated to all three psychological distress factors (stress, anxiety, and depression:  $\beta = -0.447$ ,  $-0.467$ , and  $-0.503$ , all  $p$ -values < 0.001), and both forms of problematic digital use (PSPU:  $\beta = -0.271$ ,  $p = 0.001$ ; PSMU:  $\beta = -0.208$ ,  $p = 0.015$ ). The three psychological distress factors and both forms of problematic digital use were significantly correlated with each other ( $\beta$  ranged between 0.186 and 0.721).

**Table 1:** Baseline characteristics of participants ( $n = 137$ ).

| Characteristic                                             | $n$ (%) or Mean $\pm$ SD |
|------------------------------------------------------------|--------------------------|
| Age (in years)                                             | 31.89 $\pm$ 4.29         |
| Parity                                                     |                          |
| 1                                                          | 69 (50.4%)               |
| 2 <sup>a</sup>                                             | 53 (38.1%)               |
| 3                                                          | 9 (6.5%)                 |
| 4 and above                                                | 6 (4.3%)                 |
| First-time mother                                          | 69 (50.4%)               |
| Mothers with more than one child                           | 68 (49.6%)               |
| Average gestational age when completing the survey (years) |                          |
| Timepoint 1 (T1)                                           | 21.47 $\pm$ 2.93         |
| Timepoint 2 (T2)                                           | 34.13 $\pm$ 2.45         |
| Social support (possible score range: 12–84)               | 71.49 $\pm$ 15.82        |
| Quality of life (possible score range: 0–100)              | 85.62 $\pm$ 10.64        |
| Stress (possible score range: 0–40)                        | 15.54 $\pm$ 5.60         |
| Anxiety (possible score range: 0–21)                       | 2.11 $\pm$ 2.07          |
| Depression (possible score range: 0–30)                    | 8.10 $\pm$ 5.16          |
| PSPU (possible score range: 6–36)                          | 17.09 $\pm$ 5.32         |
| PSMU (possible score range: 6–30)                          | 11.79 $\pm$ 3.70         |

Note: <sup>a</sup>Two participants were having twins in their secondary parity. PSPU, problematic smartphone use; PSMU, problematic social media use; SD, standard deviation.

The results of hierarchical linear regression are shown in Table 3. In the regression model predicting PSPU, only Model 2 showed a significant improvement ( $R^2 = 0.109$ ,  $F$  change = 7.953,  $p < 0.001$ ). More specifically, lower social support (unstandardized coefficient [ $B$ ] =  $-0.067$ ,  $\beta = -0.201$ ,  $p = 0.026$ ) and lower QoL ( $B = -0.096$ ,  $\beta = -0.193$ ,  $p = 0.033$ ) were significant predictors. In the regression model predicting PSMU, only Model 3 showed a significant improvement ( $R^2 = 0.118$ ,  $F$  change = 3.631,  $p = 0.021$ ), with depression ( $B = 0.231$ ,  $\beta = 0.321$ ,  $p = 0.018$ ) a significant predictor. Overall, the results suggested that social support and QoL were key predictors of PSPU, whereas depression was the primary predictor of PSMU. Given the high correlations between stress, anxiety, and depression ( $r$ -values ranged from 0.507 to 0.721), entering them simultaneously in Model 3 may pose a high risk of multicollinearity. In this regard, variance inflation factors (VIFs) are reported, and all VIF values were below 3, suggesting minimal multicollinearity.

**Table 2:** Correlation between study variables ( $n = 137$ ).

| Variable          | 1              | 2              | 3                         | 4                         | 5                        | 6                        | 7                        | 8                        | 9 |
|-------------------|----------------|----------------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---|
| 1 Age             | -              |                |                           |                           |                          |                          |                          |                          |   |
| 2 Parity          | 0.132 (0.124)  | -              |                           |                           |                          |                          |                          |                          |   |
| 3 Social support  | -0.042 (0.625) | -0.008 (0.923) | -                         |                           |                          |                          |                          |                          |   |
| 4 Quality of life | -0.027 (0.755) | -0.024 (0.784) | <b>0.389 (&lt;0.001)</b>  | -                         |                          |                          |                          |                          |   |
| 5 Stress          | -0.033 (0.704) | 0.064 (0.461)  | <b>-0.317 (&lt;0.001)</b> | <b>-0.447 (&lt;0.001)</b> | -                        |                          |                          |                          |   |
| 6 Anxiety         | 0.018 (0.839)  | 0.0323 (0.709) | <b>-0.419 (&lt;0.001)</b> | <b>-0.467 (&lt;0.001)</b> | <b>0.507 (&lt;0.001)</b> | -                        |                          |                          |   |
| 7 Depression      | -0.024 (0.780) | 0.097 (0.261)  | <b>-0.405 (&lt;0.001)</b> | <b>-0.503 (&lt;0.001)</b> | <b>0.721 (&lt;0.001)</b> | <b>0.600 (&lt;0.001)</b> | -                        |                          |   |
| 8 PSPU            | -0.008 (0.922) | 0.040 (0.642)  | <b>-0.275 (0.001)</b>     | <b>-0.271 (0.001)</b>     | <b>0.197 (0.021)</b>     | <b>0.186 (0.029)</b>     | <b>0.242 (0.004)</b>     | -                        |   |
| 9 PSMU            | 0.004 (0.967)  | -0.014 (0.869) | -0.076 (0.377)            | <b>-0.208 (0.015)</b>     | <b>0.247 (0.004)</b>     | <b>0.195 (0.022)</b>     | <b>0.328 (&lt;0.001)</b> | <b>0.554 (&lt;0.001)</b> | - |

Note: The results are presented in the form of “standardized coefficient  $\beta$  ( $p$ -value)”. Emboldened figures refer to statistically significant results. PSPU, problematic smartphone use; PSMU, problematic social media use.

**Table 3:** Hierarchical linear regression model in predicting two types of digital addiction.

| Model                                                    | Variable        | $R^2$ ( $\Delta R^2$ ) | F Change ( $p$ -Value)   | Unstandardized Coefficient (B) | Standardized Coefficient ( $\beta$ ) | $p$ -Value   | VIF   |
|----------------------------------------------------------|-----------------|------------------------|--------------------------|--------------------------------|--------------------------------------|--------------|-------|
| Dependent variable = Problematic smartphone use (PSPU)   |                 |                        |                          |                                |                                      |              |       |
| 1                                                        | Age             |                        |                          | -0.017                         | -0.014                               | 0.873        | 1.018 |
|                                                          | Parity          | 0.002                  | 0.121 (0.887)            | 0.444                          | 0.042                                | 0.631        | 1.018 |
| 2                                                        | Age             |                        |                          | -0.033                         | -0.027                               | 0.746        | 1.020 |
|                                                          | Parity          | <b>0.109 (0.107)</b>   | <b>7.953 (&lt;0.001)</b> | 0.397                          | 0.037                                | 0.652        | 1.018 |
|                                                          | Social support  |                        |                          | <b>-0.067</b>                  | <b>-0.201</b>                        | <b>0.026</b> | 1.180 |
|                                                          | Quality of life |                        |                          | <b>-0.096</b>                  | <b>-0.193</b>                        | <b>0.033</b> | 1.179 |
| 3                                                        | Age             |                        |                          | -0.026                         | -0.021                               | 0.801        | 1.026 |
|                                                          | Parity          |                        |                          | 0.306                          | 0.029                                | 0.732        | 1.031 |
|                                                          | Social support  |                        |                          | -0.062                         | -0.184                               | 0.056        | 1.320 |
|                                                          | Quality of life | 0.115 (0.006)          | 0.274 (0.844)            | -0.080                         | -0.161                               | 0.115        | 1.493 |
|                                                          | Stress          |                        |                          | 0.012                          | 0.013                                | 0.918        | 2.149 |
|                                                          | Anxiety         |                        |                          | -0.069                         | -0.027                               | 0.806        | 1.743 |
|                                                          | Depression      |                        |                          | 0.093                          | 0.091                                | 0.501        | 2.621 |
| Dependent variable = Problematic social media use (PSMU) |                 |                        |                          |                                |                                      |              |       |
| 1                                                        | Age             |                        |                          | 0.005                          | 0.006                                | 0.949        | 1.018 |
|                                                          | Parity          | 0.000                  | 0.016 (0.984)            | -0.111                         | -0.015                               | 0.864        | 1.018 |
| 2                                                        | Age             |                        |                          | 0.001                          | 0.001                                | 0.994        | 1.020 |
|                                                          | Parity          | 0.044 (0.044)          | 3.006 (0.203)            | -0.142                         | -0.019                               | 0.823        | 1.018 |
|                                                          | Social support  |                        |                          | 0.001                          | 0.006                                | 0.948        | 1.180 |
|                                                          | Quality of life |                        |                          | -0.073                         | -0.211                               | 0.024        | 1.179 |
| 3                                                        | Age             |                        |                          | 0.017                          | 0.020                                | 0.811        | 1.026 |
|                                                          | Parity          |                        |                          | -0.368                         | -0.050                               | 0.554        | 1.031 |
|                                                          | Social support  |                        |                          | 0.021                          | 0.088                                | 0.357        | 1.320 |
|                                                          | Quality of life | <b>0.118 (0.074)</b>   | <b>3.631 (0.021)</b>     | -0.027                         | -0.076                               | 0.451        | 1.493 |
|                                                          | Stress          |                        |                          | 0.009                          | 0.014                                | 0.911        | 2.149 |
|                                                          | Anxiety         |                        |                          | -0.003                         | -0.002                               | 0.987        | 1.743 |
|                                                          | Depression      |                        |                          | <b>0.231</b>                   | <b>0.321</b>                         | <b>0.018</b> | 2.621 |

Note: Emboldened figures refer to statistically significant results. Parity was recoded into a categorical variable with two groups: first-time mothers and mothers with more than one child [0 = First-time; 1 = Multiparous]. In the model, parity of 0 (i.e., first-time) was used as the reference group. VIF, variance inflation factor.

## 4 Discussion

The present study investigated the predictors of two types of problematic digital use (PSPU and PSMU) among prenatal women. Factors, including age, parity, social support, QoL, and three types of psychological distress (stress, anxiety, and depression), were assessed at T1 and added into a hierarchical regression model to predict PSPU and PSMU at T2. The results showed that among prenatal women, social support and QoL significantly predicted PSPU, whereas depression significantly predicted PSMU. The findings can be further understood through the lens of the Compensatory Internet Use Theory [28], which posits that individuals engage in problematic digital use as a means of compensating for unmet needs and/or alleviating negative emotional states. In the present study, psychological distress and life-context factors (i.e., social support and QoL) represent two distinct yet complementary pathways that may drive compensatory digital behaviors among prenatal women.

Distinct underlying mechanisms may explain the disparity of predictors between PSPU and PSMU. From the perspective of CIUT, PSMU appears to be more closely associated with psychological distress, particularly depressive symptoms. This finding is consistent with the notion that individuals experiencing depressive symptoms may turn to social media as an emotion-focused coping strategy to regulate negative affect and seek psychological relief [2,51]. The findings further suggest that social media use during pregnancy may provide sufficient social support, leaving depression as the only significant predictor. Considering the benefits of social support for perinatal mothers [25], the context of social media use during pregnancy, whether actively or passively participated in [52], can be further investigated to inform teleinterventions [53], with the aim of improving maternal social support. In addition, although the model was not significant, QoL also showed significance in predicting PSMU. This result suggests that QoL may have some level of influence, but because of the small sample size, it failed to demonstrate its predictive effect in the present study. Further research is needed on a larger scale to examine the role of QoL in PSMU. Moreover, the PSMU assessed in the present study did not consider specific forms of social media use. Given that different social media platforms (e.g., *YouTube* and *Instagram*) may contain different functions, future studies may also want to examine the different effects of specific social media use (e.g., comparisons between problematic *YouTube* use [54], problematic *Instagram* use [55] and problematic *Facebook* use [56]).

In contrast, social support and QoL, rather than psychological distress, were identified as predictors of PSPU. This suggests two possible mechanism routes. First, mothers often turn to the internet to seek information, emotional and social support, and a smartphone is the easiest way to access such information and support [9]. Second, individuals with a poor QoL may increase their engagement on the internet as a form of compensatory behavior, which may involve other online behaviors in addition to social media use (e.g., online shopping, online gaming, etc.) [19] subsequently resulting in an increased use of smartphones, given their accessibility [57]. From a CIUT perspective, reduced social support and poorer QoL may reflect unmet interpersonal and overall well-being conditions, prompting individuals to rely on smartphones as an easily accessible and immediate coping outlet. As the results indicate, problematic digital use, manifesting as PSPU, was identified in the model as the outcome predicted by social support and QoL. However, such problematic use may not only be engaged in on social media platforms, which may explain the non-significance of social support or QoL in predicting PSMU. Given that there are other forms of problematic digital use, such as problematic gaming and problematic online shopping [16], future studies could target other forms of problematic digital use to better understand coping behaviors among prenatal women.

Taken together, these findings suggest that different forms of problematic digital use may be driven by distinct pathways. While PSPU appears to reflect vulnerabilities in broader life-context conditions, PSMU

seems to be more directly associated with psychological distress, particularly depression. This distinction highlights the importance of differentiating between types of digital behaviors because each may serve different compensatory functions within the CIUT framework. The longitudinal design further supports this interpretation by suggesting that earlier levels of psychological distress and life-context conditions may shape subsequent engagement in problematic digital use over time.

A previous longitudinal study investigated the predictors of PSPU among first-time parents [3] and reported that anxiety predicted parental PSPU. The inconsistency between the present and previous studies may be explained by several reasons. First, a difference in sample characteristics. More specifically, participants in the previous study were first-time parents, whereas the present study also included both first-time mothers and women who had children before. In addition, both fathers and mothers were included in the previous study compared to the present study, which included mothers only. Second, the uniqueness of first-time parents. Another study found that first-time parents reported experiencing a significantly higher level of psychological disturbance compared to couples without children, with postpartum depression and perinatal anxiety reported as the most frequent psychological disorders [58]. Not being familiar with taking care of a newborn baby may cause a strong dependency on smartphones for information seeking and emotional coping. In contrast, the present sample included some mothers who had previously had children. The experienced multiparous mothers had already gained parenting experience, therefore reducing their needs for coping with psychological distress through digital means [59]. Third, the inclusion of social support, QoL, and depression in the multivariate model may have absorbed variance typically attributed to anxiety, leading to anxiety becoming a nonsignificant predictor. Lastly, differences in the timing of measurement (prenatal vs. perinatal period) and the involvement of fathers, whose smartphone use patterns may differ, may also partially account for the discrepancies.

The present study has several limitations. First, individuals who were willing to participate in the study were likely to have more time and better social support than those who were unwilling to participate, which may also limit the generalizability of the results. Second, the absence of baseline (T1) measures of PSMU and PSPU, along with a single follow-up, may constrain the ability to capture temporal changes and developmental trajectories. Accordingly, the findings should be interpreted with caution because the observed associations may partly reflect pre-existing, stable relationships rather than dynamic changes over time. Third, only two types of problematic digital use were investigated. However, there are other types of problematic digital use, such as problematic online gaming and problematic online shopping [11,12,16], which are also prevalent nowadays. In addition, PSMU cannot be clearly distinguished from PSPU. Accordingly, the present findings should be interpreted with caution because not all types of problematic digital use were investigated, and potential conceptual overlap between constructs cannot be ruled out. Fourth, the use of self-report data may be subject to recall or social desirability bias. Fifth, the internal consistency of the anxiety subscale ( $\alpha = 0.681$ ) was slightly below the conventional threshold (0.7). Given that the DASS-21 anxiety subscale is well-validated, such reliability lower than conventional threshold in the present sample may reflect sample-specific response patterns and could have attenuated the observed associations, potentially contributing to the non-significant findings for anxiety. Nevertheless, the present study still identified key factors in predicting two types of problematic digital use. Future studies could either investigate the temporal change of maternal problematic digital use from prenatal to postnatal to validate the present findings, or examine the effect of maternal problematic digital use on the development of their children. This could help provide more information for building a comprehensive intervention network to enhance maternal and infant health.

## 5 Conclusions

The present study longitudinally investigated the predictive roles of social support, QoL, and psychological distress (stress, anxiety, and depression) on two types of problematic digital use (i.e., PSPU and PSMU) among prenatal women. The results showed that social support and QoL significantly predicted PSPU, whereas depression significantly predicted PSMU. These findings highlight the importance of addressing maternal psychosocial vulnerability to prevent the early onset of problematic digital use during pregnancy. Future studies may either validate the present findings using a prospective study design or explore the impact of maternal problematic digital use on their children's development. Such studies would likely contribute to a more comprehensive understanding of how digital use behaviors during pregnancy shape maternal and infant health.

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