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Article

The Relationship Between Loneliness and Digital Addiction among Korean Young Adults Living Alone: The Mediating Effect of Depression and Anxiety and the Moderated Mediating Effect of Mental Well-being

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Abstract: Young adults living alone in Korea constitute a group in which limited social support, economic instability, and prolonged time spent alone converge, heightening relational deficits and compensatory reliance on digital devices. Based on the addiction syndrome model and the I-PACE model, this study examined whether depression and anxiety mediate the relationship between loneliness and digital addiction in this population and, on the basis of the complete state model of mental health, whether mental well-being moderates that mediating process. The moderated mediating effect was estimated using the GLM-Mediation module in jamovi. Loneliness was significantly and positively associated with both depression and anxiety, whereas its direct effect on digital addiction was not statistically significant. Depression and anxiety each mediated the relationship between loneliness and digital addiction, indicating full mediation. Mental well-being interacted with anxiety along the indirect pathway leading to digital addiction, attenuating that pathway and thereby producing a moderated mediating effect. These findings suggest that intervention should target the regulation of depression and anxiety rather than the superficial alleviation of loneliness, and that promoting mental well-being constitutes a protective resource underpinning social participation and adaptation within the labor market.

Keywords: Loneliness; Anxiety; Depression; Digital Addiction; Mental Well-being; Living Alone

1. Introduction

From a life-course perspective, youth is the period in which individuals experience active social interaction as they complete their education and training and enter the labor market. However, young people in contemporary Korean society are experiencing difficulties due to polarized social structure, ever job shortage, and unstable social networks. Especially, young adults living alone has further heightened vulnerability in economic conditions, housing, health, safety, and social relationships (Ahn et al., 2022). Accordingly, the Korean government has attempted to improve young people's quality of life through initiatives such as the Youth Mental Health Support Project, the National Mental Health Investment Support Project, and the Basic Plan for Youth Policy; however, the lack of interpersonal factors has increased their reliance on digital devices and has also affected negatively their mental health (The Seoul Institute, 2024). Such difficulties are not confined to individual quality of life; insofar as they constrain the accomplishment of the developmental tasks of young adulthood the formation of social networks and the entry into the labor market they call for a societal response.

Since the COVID-19 pandemic, the direct introduction of digital technology and AI into daily life has produced positive signals for relational factors; however,

relationship-building through digital devices has remained superficial, leading to excessive use, compulsion, and dependence (Almourad et al., 2020). Indeed, young people's digital device usage has been markedly higher than that of other generations, and the population at risk of over-dependence continues to grow (Ministry of Science and ICT & National Information Society Agency, 2025). Prolonged use of digital devices is linked to addiction, and digital addiction has been found to share overlapping mechanisms with mental health factors at the psychological, biological, and etiological levels (Kotyuk et al., 2020). This suggests that, behind the convenience of the fusion between digital technology and daily life, pathological phenomena such as cross-addiction and the loss of control resulting from the stress of forming new relationships are coming to light.

Therefore, this study aims to explore the mental health factors leading to digital addiction among young adults living alone, a group vulnerable to social crises among young people whose mental health has been deteriorating more than in the past. According to the addiction syndrome model (Shaffer et al., 2004), even when an individual's psychosocial vulnerability is low, repeated exposure to addictive behavior activates the brain's reward circuitry, leading to social and neurobiological changes. However, as noted above, social risk and emotional difficulties resulting from relational disconnection among young people in contemporary society have been confirmed as factors that intensify loneliness (Choi & Joo, 2021), and in Korea, loneliness has been found to emerge when an individual's desires within intimate relationships are not fulfilled (An et al., 2023).

Loneliness is an emotion universally experienced by human beings; however, when it becomes chronic, it disrupts stress responses, the immune system, and cardiovascular function, thereby increasing the risk of mental illness (Cacioppo et al., 2011). Cognitive distortions arising from loneliness in the digital era have been reported to increase digital device use as a means of overcoming loneliness, thereby leading to addiction (Cavanaugh & Buehler, 2016; Sul & Lee, 2025). Above all, chronic loneliness lowers self-esteem and fosters the perception that one lacks social support, leading to depression and anxiety (Matthews et al., 2016), and young people sometimes engage in addictive behaviors to overcome negative emotions such as depression (Wemm et al., 2013). Furthermore, when anxiety becomes chronic, negative emotional symptoms emerge and interpersonal relationships are affected, making it difficult to adapt within peer groups (Costello et al., 2005). Depression and anxiety are also associated with digital addiction (Jin & Rhee, 2026; Shiferaw et al., 2025), and these findings suggest that this association is rooted in cognitive distortion. That is, loneliness perceived by young adults living alone gives rise to cognitive errors that lead to depression and anxiety; while they seek to fulfill relational needs, depression and anxiety reduce cognitive flexibility, ultimately leading to digital addiction. Therefore, it is necessary to examine the mediating roles of depression and anxiety, respectively, in the relationship between loneliness and digital addiction.

Focusing on mental health factors in the pathway to digital addiction among young adults living alone distinguishes this study from prior research; furthermore, examining whether a moderating effect occurs when a mental health factor is introduced into the mediation model can yield more specific implications. According to the complete state model of mental health (Keyes et al., 2008), an active attitude toward solving one's own problems allows one to view life's problems in an integrated and multifaceted way. In other words, this does not merely mean improving quality of life, but rather exercising overall well-being through positive efforts to reach one's potential. Mental well-being alleviates negative emotions—making them less frequently experienced—through positive emotions such as life satisfaction and happiness (Lim et al., 2010), and empirical

research has shown that mental well-being has the effect of reducing digital addiction (Seo & Kang, 2025).

The pathway discussed thus far, moreover, is not consummated at the level of individual psychology. Because the process by which loneliness leads to digital addiction through depression and anxiety is accompanied by avoidance of face-to-face interaction and diminished self-regulation, it narrows the opportunities available to young adults to form relationships and perform roles within their communities and organizations. Young people with mental health problems have been reported to experience greater difficulty in job-seeking and employment retention (OECD, 2021); at work, loneliness has been shown to undermine job performance by weakening affective commitment and approachability toward co-workers (Ozcelik & Barsade, 2018), and problematic smartphone use has been associated with more frequent daily work interruptions and lower self-reported productivity (Duke & Montag, 2017). Mental well-being, by contrast, not only buffers the point at which negative affect converts into addiction, as noted above, but also underpins the emotional resources required for forming relationships and the self-regulation demanded in task situations, and thus constitutes a foundation for social participation and labor market adaptation. Elucidating the psychological mechanisms operating among young adults living alone is accordingly bound up with the task of sustaining their social functioning and human capital.

This study differs from previous research in three respects. First, prior studies on loneliness and problematic digital use have predominantly sampled adolescents or university students (Lee et al., 2017; Yao & Zhong, 2014) and have rarely treated household structure as a defining condition. Living alone is not synonymous with loneliness (Klinenberg, 2012); however, among young adults it combines reduced daily co-presence, a large absolute amount of solitary time, and an unstable school-to-work transition (Arnett, 2000)—conditions under which digital devices are likely to become the default channel for meeting relational needs. Focusing on young adults living alone therefore allows the loneliness–digital addiction pathway to be examined in the population in which the compensatory mechanism posited by the model of compensatory internet use (Kardefelt-Winther, 2014) is most likely to operate. Second, whereas earlier studies have generally examined depression or anxiety as a single mediator, the present study specifies them as parallel mediators, so that their unique indirect effects can be distinguished. Third, drawing on the dual-continua perspective (Keyes, 2005), the study tests whether mental well-being—a positive mental health resource distinct from the mere absence of psychopathology—conditions these indirect pathways, thereby moving beyond the risk-factor focus of most previous research toward the identification of a modifiable protective resource.

In summary, young people in Korea perceive threats to their mental health due to the unusual rigidity of the social structure, and young adults living alone in particular tend to use digital devices to build social networks amid a lack of social support, yet become vulnerable to addiction through compulsive use. Furthermore, when loneliness becomes chronic, it produces cognitive distortions that heighten depression, anxiety, and digital addiction, and depression and anxiety have also been shown to affect digital addiction. This is consistent with the claims of the addiction syndrome model, and when mental well-being is introduced as a moderating variable within this mediation model, the mental health factors affecting digital addiction are expected to be partially attenuated, thereby supporting the mental health model. This study further seeks to address, in its discussion, the implications that the elucidation of these pathways holds for young adults' social participation and adaptation within the labor market. Accordingly, the research questions of this study are as follows (RQ).

RQ1. Do loneliness, depression, and anxiety among young adults living alone affect digital addiction?

RQ2. Do depression and anxiety mediate the relationship between loneliness and digital addiction among young adults living alone?

RQ3. Does mental well-being moderate the relationship among loneliness, depression, anxiety, and digital addiction among young adults living alone?

2. Theoretical Background

2.1. Digital Addiction among Young People

Digital addiction refers to a pathological loss of control characterized by the excessive and repetitive use of digital devices such as computers, the internet, and smartphones, to the point where it becomes difficult to carry out daily activities. As a superordinate concept encompassing the various forms of behavioral addiction that have emerged alongside the advancement of digital technology—such as smartphone addiction, social media addiction, and YouTube overdependence—it focuses not on any particular device or content, but on the common mechanism of dependence and compulsion arising from the excessive use of digital devices and content in general (Almourad et al., 2020; Kim et al., 2021). The advancement of digital technology has enriched human life while simultaneously giving rise to new forms of uncertainty and risk, of which digital addiction is a representative adverse consequence.

The rationale for treating digital addiction as a superordinate category, rather than the sum of separate addictions, can be found in the co-occurrence and cross-addiction phenomena frequently observed in addiction problems. The addiction syndrome model of Shaffer et al. (2004) conceptualizes addiction not as a collection of unrelated individual disorders, but as a single syndrome that shares common antecedent factors—individual vulnerability and repeated exposure—while differing only in its surface target. Indeed, various addictive behaviors and substances have been reported to share overlapping mechanisms at the phenomenological, etiological, and psychobiological levels (Kotyuk et al., 2020). Because the digital convergence environment—which allows immediate access to multiple addictive targets such as gaming, gambling, shopping, and social interaction within a single device—structurally increases the frequency of exposure and interaction, an integrative approach through the concept of digital addiction is required, rather than treating each medium-specific addiction separately.

The mechanisms underlying the formation of digital addiction are more precisely explained through integrative models. The I-PACE (Interaction of Person-Affect-Cognition-Execution) model of Brand et al. (2019) posits that addictive behavior is formed and maintained when an individual's predisposing characteristics, filtered through affective and cognitive responses, combine with a decline in executive functioning, and that the transient emotional relief that follows use operates as a reinforcing mechanism, entrenching a cycle of "use–relief–reuse." The model of compensatory internet use likewise explains excessive digital use not as a product of the addictive properties of the technology itself, but as a coping response aimed at compensating for psychosocial deficits in real life (Kardefelt-Winther, 2014). Both models commonly define digital addiction as the outcome of maladaptive coping formed via negative emotion, which constitutes the theoretical basis for this study's placement of depression and anxiety between loneliness and digital addiction.

Young people are a group particularly vulnerable to digital addiction. Having grown up exposed to digital devices since childhood, the current generation of young people is not only proficient in using such devices but also quick to adopt new media, owing to the high innovativeness characteristic of early adulthood,

placing them at greater risk of overuse than other generations (Song et al., 2018). In addition, algorithm-based personalized information delivery induces repeated exposure to similar content, deepening filter bubbles and cognitive distortion (Pariser, 2011), while social media and video platforms, which offer high accessibility and immediate gratification, increase the likelihood of a transition to dependence and compulsive use (Almourad et al., 2020). A meta-analysis study of young people found that subtypes of digital addiction were significantly associated with an overall deterioration in physical and mental health indicators (Shiferaw et al., 2025).

This risk is likely to be amplified among young adults living alone. As of 2024, young adults living alone in Korea numbered 8.045 million, accounting for 36.1% of all households (Ministry of Data and Statistics, 2025), and young adults living alone have been reported to be more vulnerable than multi-person households in terms of economic conditions, housing, safety, health, and social relationships, and to experience more severe emotional problems (Ahn et al., 2022). In particular, young people in living alone tend to support themselves alone amid prolonged periods of study and job-seeking, experiencing labor market instability, and report a high rate of feeling that they have no one to rely on (Lee & Han, 2025). A lack of social support and economic hardship heighten their vulnerability to mental health problems (Lee et al., 2014), and a living structure involving a large absolute amount of time spent alone leads them to meet relational needs through digitally mediated interaction rather than face-to-face contact. Young adults living alone are therefore a group that simultaneously possesses both the individual vulnerability and the exposure conditions for digital addiction, making it necessary to investigate the psychological pathway leading to digital addiction in this population.

2.2 The Relationships among Loneliness, Depression, Anxiety, Mental Well-being, and Digital Addiction in Young People

2.2.1 Loneliness and Digital Addiction

Loneliness is the subjective distress experienced when a discrepancy arises between the level of intimacy or social relationship an individual expects and the level of relationship perceived in reality, and is defined as an individual's perception and appraisal of relational deficiency (Seo et al., 2020). It is a subjective construct distinct from objective social isolation, with an individual's cognition and appraisal of relationships constituting its essential property (Peplau & Perlman, 1982). Although loneliness is a universal emotion, when its frequency and intensity intensify, it negatively affects mental health and when it becomes chronic, it gives rise to emotional problems and behavioral deficits (Cacioppo et al., 2011).

The mechanism by which loneliness leads to digital addiction can be explained by the evolutionary theory of loneliness proposed by Cacioppo and Cacioppo (2018). According to this theory, loneliness functions as an adaptive signal indicating a deficit in social connection and triggers reconnection behavior, but it simultaneously activates vigilance toward social threat and negative bias, placing the individual in a vicious cycle in which face-to-face relationships are avoided. That is, because loneliness heightens the motivation to restore relationships while also inflating the perceived psychological cost of face-to-face contact, individuals tend to readily choose controllable and immediate digitally mediated relationships as an alternative. Indeed, individuals who feel lonely tend to minimize face-to-face contact and instead attempt to satisfy relational needs through smartphones (Cavanaugh & Buehler, 2016), and a cross-lagged panel study found that loneliness significantly predicted later internet addiction (Yao & Zhong, 2014). In Korea as well, loneliness has been confirmed as a factor

that increases the tendency toward social media addiction (Lee et al., 2017), and loneliness among young people has been shown to significantly increase digital addiction (Seo & Kang, 2025). Furthermore, loneliness has risen sharply since 2020, and has been found to be closely associated with smartphone and social media addiction (Sul & Lee, 2025).

2.2.2 Loneliness, Depression, and Digital Addiction

Depression is a state accompanied by sadness, emptiness, loss of interest and motivation, and problems with sleep and appetite, which causes serious disruption to daily functioning (American Psychiatric Association, 2013), and is a dimensional construct that can be quantified along a continuum ranging from mild symptoms to major depressive disorder. Young adulthood is a key period for the onset of depression, with a substantial proportion of individuals with mild to severe depression experiencing their first symptoms by age 24 (Kessler et al., 2005), and in Korea as well, individuals in their 20s and 30s have been reported to show the highest rate of psychiatric treatment experience (National Center for Mental Health, 2024).

Individuals who frequently experience loneliness show reduced self-esteem due to the perception that they lack family or social support and have no one to rely on (Cacioppo & Hawkley, 2003), and social isolation and loneliness show a significant association with depression in early adulthood (Matthews et al., 2016). A domestic study analyzing socially isolated young people also found that loneliness and depression sequentially mediated a reduction in life satisfaction (Kim et al., 2025), and a sequential double mediation effect of loneliness and depression was confirmed in the pathway from caregiving burden to suicidal ideation among young family caregivers (Kim & Kang, 2026). These findings indicate that the pathway through which loneliness transitions into depression has been repeatedly verified among young populations.

Depression, in turn, promotes digital addiction. Because negative emotions such as depression are inherently distressing, they increase the addictive use of digital devices as a means of avoidance (Young, 1999), and young people tend to choose addictive behaviors as a means of coping with negative emotions (Wemm et al., 2013). COVID-19-related stress experienced by college students significantly influenced their tendency toward social media addiction through the mediation of depression (Park & Kim, 2022), and a psychological pathway was confirmed in which job-seeking stress heightens the tendency toward social media addiction via depression (Jin & Rhee, 2026). These findings support the mediating pathway through which loneliness leads to digital addiction via depression.

2.2.3 Loneliness, Anxiety, and Digital Addiction

Anxiety is an unpleasant emotion experienced when one feels that one's safety is threatened in a situation that has not actually occurred or is uncertain, and it is composed of cognitive, emotional, and physiological components (Mauss et al., 2005; Spielberger, 2010). An appropriate level of anxiety serves an adaptive function by helping individuals prepare for danger (Beck, 1997), but excessive and persistent anxiety impairs quality of daily life and the ability to perform one's roles (Hwang et al., 2012).

Loneliness has been reported as a significant predictor of anxiety. Adolescents' loneliness has been confirmed as a factor that increases anxiety, and this relationship was moderated by smartphone overdependence and gender (Na, 2025). In addition, loneliness, together with smartphone overdependence, had a significant effect on generalized anxiety (Kim, 2024). These findings are consistent with the vigilance toward social threat proposed by the evolutionary theory of loneliness, suggesting that loneliness sustains arousal toward potential

threats, which in turn leads to anxiety. In particular, young adulthood is a period in which developmental tasks such as employment, academic achievement, and the reorganization of relational networks are concentrated, and anxiety tends to intensify when combined with a fear of negative evaluation (Rapee & Abbott, 2007).

Anxiety also functions as an antecedent of digital addiction. Anxiety has been found to directly affect social media addiction (Lee et al., 2025), and anxiety symptoms have shown a significant association with digital addiction (Shiferaw et al., 2025). Individuals with high anxiety exhibit attentional bias toward threat-related information and reduced cognitive flexibility (Mitte, 2008), and tend to choose avoidance behaviors in order not to experience anxiety; digital devices draw them into this vicious cycle by offering an immediate and controllable means of avoidance.

Meanwhile, although depression and anxiety show a high rate of comorbidity (Noyes, 2001), they possess distinct emotional and cognitive characteristics. In that depression is a response to loss and helplessness, whereas anxiety is a state of arousal toward potential threat, the two variables may mediate distinct mechanisms in the process through which loneliness translates into digital addiction. This study therefore sets depression and anxiety as parallel mediators in order to examine their unique indirect effects.

2.2.4 The Moderating Effect of Mental Well-being

Mental well-being refers to a state in which an individual realizes their own abilities, copes well with the normal stresses of life, works productively, and is able to contribute to their community (World Health Organization, 2005). Keyes (2002) defined it as a comprehensive concept composed of three domains—emotional, psychological, and social well-being—and later, through the complete state model of mental health, proposed a dual continua perspective in which the presence or absence of mental illness and the level of mental well-being constitute two independent continua (Keyes, 2005). From this perspective, mental well-being is not a residual concept denoting the mere absence of pathology, but an independent protective resource that buffers the effects of negative factors. This structure has also been confirmed in Korea through the validation of the Mental Health Continuum–Short Form (MHC-SF) (Lim et al., 2012), and mental well-being has been reported as a protective factor that prevents serious mental health problems such as suicidal behavior (Noh & Cho, 2015).

The prediction that mental well-being will moderate the pathway to digital addiction is supported by several lines of evidence. First, individuals with a high level of mental well-being possess a greater sense of control over stress and more adaptive coping resources (Eo & Kim, 2015), and therefore have relatively less need to rely on digital devices as an avoidant means of alleviating depression and anxiety. This is consistent with the view, held within the I-PACE model, that coping style and executive functioning moderate the relationship between emotional response and addictive behavior. Second, an experimental study found that a mindfulness-based intervention reduced excessive smartphone use while also improving mental well-being, demonstrating that mental well-being is a modifiable moderating resource (Nam et al., 2019). Third, research conducted abroad has also shown that well-being functions protectively by mediating between participation in social activities and problematic smartphone use (Koçak et al., 2025), and a study of young people confirmed that mental well-being is both a factor that reduces digital addiction and a mediated moderator.

3. Methods

3.1. Research Model and Hypotheses

This study aims to explore the mediating effects of depression and anxiety

on the relationship between loneliness and digital addiction among young adults living alone, and to examine the moderated mediating effect of mental well-being. This is illustrated in **Figure 1**, and the research hypotheses formulated to address the research questions are as follows.

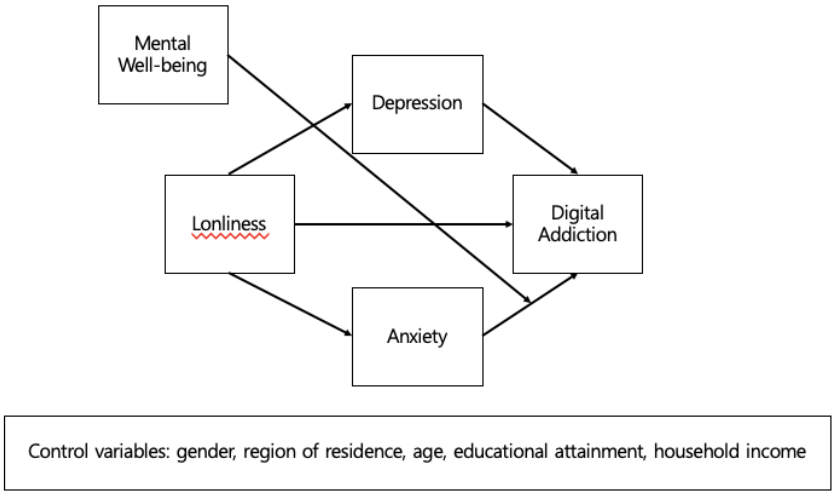


Figure 1. Research Model.

Hypothesis 1. Loneliness will have a positive (+) effect on depression among young adults living alone.

Hypothesis 2. Loneliness will have a positive (+) effect on anxiety among young adults living alone.

Hypothesis 3. Loneliness will have a positive (+) effect on digital addiction among young adults living alone.

Hypothesis 4. Depression and anxiety will mediate the relationship between loneliness and digital addiction among young adults living alone.

Hypothesis 5. Mental well-being will moderate the relationships among loneliness, depression, anxiety, and digital addiction among young adults living alone.

3.2. The Study subjects and Data Collection

The subjects of this study were drawn from data collected for the study "Factors of Despair among Young People," conducted by Institute B at University A in Seoul, Korea. The data were collected in January 2025 through an online survey panel company, sampling 515 young people nationwide. To ensure the ethics and rigor of the study, the research protocol was reviewed and approved by the Institutional Review Board (IRB) of the affiliated institution (IRB-A-2410-125). In accordance with the age range used to define young adults in Korean youth policy (e.g., the Seoul Metropolitan Government Framework Ordinance on Youth), young adults were defined as those aged 19 to 39 years (in completed years of age). Respondents living alone were identified using a single direct screening item, "Are you a single-person household?", to which participants answered either "Yes" or "No." Only respondents who answered "Yes" were included, yielding 118 young adults living alone for the final analysis. Because household status was determined by participants' explicit self-identification on this dichotomous item, rather than being inferred indirectly from other household information, the classification of the analytic sample was unambiguous.

3.3. Measures

3.3.1. Dependent Variable: Digital Addiction

Digital addiction, the dependent variable in this study, was measured using

the Korean version of the Digital Addiction Scale developed by Kim et al. (2021). The scale is rated on a 4-point Likert scale and consists of 19 items, including "I am not aware of what is happening around me while using digital devices," "I keep digital devices next to me when I sleep," and "I have missed many opportunities because I spent too much time using digital devices." Higher scores indicate a higher level of digital addiction. In this study, the reliability coefficient (Cronbach's α) was .915.

3.3.2. Independent Variable: Loneliness

Loneliness, the independent variable in this study, was measured using the UCLA Loneliness Scale (Version 3) developed by Russell (1996). The scale is rated on a 4-point Likert scale and consists of 20 items, including "How often do you feel that there is no one who really knows you?", "How often do you feel that your interests and ideas are not shared by those around you?", and "How often do you feel left out?" Higher scores indicate a higher level of loneliness. In this study, the reliability coefficient (Cronbach's α) was .910.

3.3.3. Mediating Variable: Depression

Depression, one of the mediating variables in this study, was measured using the Center for Epidemiologic Studies Depression Scale (CES-D), adapted by Chon et al. (2001). The scale is rated on a 4-point Likert scale and consists of 20 items, including "I felt that everything I did was an effort," "I talked less than usual," "I felt that people disliked me," and "I could not get going." Higher scores indicate higher levels of depressive symptoms. In this study, the reliability coefficient (Cronbach's α) was .917.

3.3.4. Mediating Variable: Anxiety

Anxiety, one of the mediating variables in this study, was measured using the Generalized Anxiety Disorder scale (GAD-7), adapted by Kim et al. (2018). The scale is rated on a 4-point Likert scale and consists of 7 items, including "(Over the last 2 weeks) worrying too much about different things," "(Over the last 2 weeks) feeling afraid as if something awful might happen," and "(Over the last 2 weeks) not being able to stop or control worrying." Higher scores indicate a higher level of anxiety. In this study, the reliability coefficient (Cronbach's α) was .910.

3.3.5. Moderating Variable: Mental Well-being

Mental well-being, the moderating variable in this study, was measured using the Mental Well-Being Scale developed by Lim et al. (2012). The scale is rated on a 6-point Likert scale and consists of 14 items, including "I felt happy," "I felt confident thinking or expressing my own ideas and opinions," "I felt I was handling my daily responsibilities well," and "I felt interested in life." Higher scores indicate a higher level of mental well-being. In this study, the reliability coefficient (Cronbach's α) was .958.

3.3.6. Control Variable

The control variables in this study were the sociodemographic characteristics of the subjects, namely gender, region of residence, educational attainment, age, and household income. Gender (male $= 1$, female $= 0$) and region of residence (metropolitan area $= 0$, non-metropolitan area $= 1$) were recoded as dummy variables, while educational attainment (high school graduate or below $= 1$, college graduate $= 2$, graduate degree or higher $= 3$), age, and household income were used as continuous variables

3.4. Data Analysis Procedures

Statistical analyses in this study were conducted using jamovi (version 2.6.44). First, descriptive statistics and frequency analysis were used to examine the sociodemographic characteristics of the subjects and the properties and

normality of the major variables. Second, correlation analysis was conducted to identify the magnitude and direction of the relationships among variables and to check for multicollinearity. Finally, the 'GLM-Mediation' module was used to examine the moderated mediating effect.

4. Results

4.1. Sociodemographic Characteristics of the Subjects

The sociodemographic characteristics of the subjects are summarized in **Table 1**. In terms of gender, there were more male subjects, with 66 males (55.9%) and 52 females (44.1%). Regarding residence, 62 subjects (52.5%) resided in the metropolitan area and 56 subjects (47.5%) resided outside the metropolitan area. Regarding educational attainment, 23 subjects (19.5%) had a high school education or below, 88 (74.6%) were college graduates, and 7 (5.9%) held a graduate degree or higher. The mean age was 32 years (SD = 4.54), and the mean household income was approximately USD 3,577 (SD = 5,942).

Table 1. Sociodemographic characteristics of the Subjects.

Variable	Category	N	%
Gender	Male	66	55.9
	Female	52	44.1
Residence	Metropolitan area	62	52.5
	Non-metropolitan area	56	47.5
Education	High school graduate or below	23	19.5
	College graduate	88	74.6
	Graduate degree or higher	7	5.9
Age	Min = 22, Max = 39, Mean = 32(SD = 4.54)		
Household Income	Min = USD 0, Max = USD 41,300, Mean = USD 3,577(SD = 5,942)		

4.2. Descriptive Statistics and Correlations among Major Variables

The characteristics of the major variables used in this study and the results of the correlation analysis are presented in **Table 2**. The independent variable, loneliness, had a mean score of 2.45 (SD = .580). The mediating variables, depression and anxiety, had mean scores of 1.14 (SD = .749) and 1.15 (SD = .573), respectively. The dependent variable, digital addiction, had a mean score of 1.22 (SD = .596), and the moderating variable, mental well-being, had a mean score of 1.71 (SD = 1.080).

Regarding the correlation analysis, the independent variable, loneliness, was positively correlated with depression ($r = .676$, $p < .001$) and anxiety ($r = .574$, $p < .001$), and was significantly negatively correlated with the moderating variable, mental well-being ($r = -.616$, $p < .001$). The mediating variable, depression, was positively correlated with anxiety ($r = .762$, $p < .001$) and digital addiction ($r = .532$, $p < .001$), and was negatively correlated with mental well-being ($r = -.450$, $p < .001$). In addition, the mediating variable, anxiety, was positively correlated with the dependent variable, digital addiction ($r = .520$, $p < .001$), and was negatively correlated with mental well-being ($r = -.302$, $p < .001$). Finally, the dependent variable, digital addiction, was negatively correlated with mental well-being, but this correlation was not significant ($r = -.148$, $p > .05$).

Table 2. Descriptive Statistics and Correlations among Major Variables

Variable	Independent	Mediator1	Mediator2	Dependent	Moderator
Independent	1				
Mediator1	.676***	1			
Mediator2	.574***	.762***	1		
Dependent	.400***	.532***	.520***	1	
Moderator	-.616***	-.450***	-.302***	-.148	1
Mean	2.45	1.14	1.15	1.22	1.71
SD	.580	.749	.573	.596	1.080
Skewness	-.027	.150	.284	.001	.352
Kurtosis	.241	-.102	-.533	-.532	-.375

*Note: *p < .05, **p < .01, ***p < .001*

4.3. Verification of the Moderated Mediating Effect

This study aimed to examine the mediating effects of depression and anxiety on the relationship between loneliness and digital addiction among 118 young adults living alone, and to verify the moderated mediating effect of mental well-being. The results of the analysis are presented in **Table 3**. In detail, first, none of the control variables—gender (B = -.118, p > .05), residence (B = -.023, p > .05), age (B = .007, p > .05), educational attainment (B = -.106, p > .05), and household income (B = -1.000, p > .05)—had a significant effect on the dependent variable, digital addiction. Second, the independent variable, loneliness, had a significant effect on the mediating variables, depression (B = .636, p < .001) and anxiety (B = .837, p < .001). This indicates that as loneliness increases, depression and anxiety also increase, supporting Hypotheses 1 and 2 of this study. However, although loneliness had a positive (+) effect on the dependent variable, digital addiction, this effect was not statistically significant (B = .101, p > .05). Accordingly, Hypothesis 3 of this study was not supported. Third, the results of the mediation analysis showed that depression (B = .221, p < .05) and anxiety (B = .173, p < .05) each mediated the relationship between loneliness and digital addiction. That is, loneliness can be considered a factor that intensifies digital addiction by heightening depression and anxiety; and because the independent variable, loneliness, did not have a direct effect on the dependent variable, digital addiction, depression and anxiety were found to fully mediate this relationship, supporting Hypothesis 4. Fourth, when mental well-being was introduced as a moderator into the above mediation model, the interaction between anxiety and mental well-being was negative and statistically significant (B = -.190, p < .05). The negative sign indicates that the positive association between anxiety and digital addiction became weaker as mental well-being increased; that is, mental well-being buffered the pathway from loneliness through anxiety to digital addiction, thereby producing a moderated mediating effect. Thus, Hypothesis 5 was supported for the anxiety pathway.

Table 3. Results of the Moderated Mediating Effect Analysis

	Path	B[C.I]	t
Gender	Digital Addiction	-.118 [-.293~.056]	-1.326
Residence		-.023 [-.200~.154]	-.025
Age		.007 [-.012~.026]	.723
Education		-.106 [-.299~.087]	-1.074
Household Income		-1.000 [-2.181~1.721]	-1.673

Continued table:

	Path	B[C.I]	t
Loneliness		.101 [-.132~.333]	.852
Loneliness	Depression	.636 [.462~.809]	7.194***
	Anxiety	.837 [.588~1.087]	6.589***
	Loneliness → Depression → Digital Addiction	.221 [.044~.398]	2.450*
	Loneliness → Anxiety → Digital addiction	.173 [.012~.339]	2.114*
	Anxiety × Mental Well-being → Digital Addiction	-.190 [-.031~-.349]	-2.349*

*Note: *p < .05, **p < .01, ***p < .001*

5. Conclusion and Discussion

Based on the Addiction Syndrome Model and the I-PACE Model, this study examined the mediating effects of depression and anxiety on the relationship between loneliness and digital addiction among young adults living alone, and verified the moderated mediating effect of mental well-being based on the complete state model of mental health. To this end, an analysis was conducted on 118 young adults living alone nationwide, and the results of this study can be summarized as follows. First, loneliness among young adults living alone was not directly associated with digital addiction once depression and anxiety were taken into account; it was, however, significantly associated with both depression and anxiety. Second, depression and anxiety were found to mediate the relationship between loneliness and digital addiction among young adults living alone. Finally, when mental well-being was introduced into the mediation model, it moderated the path from anxiety to digital addiction, thereby exhibiting a moderated mediating effect. The discussion of these findings is as follows.

First, regarding the relationship of loneliness, depression, and anxiety with digital addiction, young adults living alone experience compounded psychological distress due to weaker social support combined with economic hardship. In particular, the pressure to fulfill socially prescribed developmental tasks further suppresses social interaction, leading to the experience of loneliness. Although an increasing number of individuals use digital devices—through which they can connect with others relatively comfortably—to escape loneliness, when a gap arises between an individual's perception of a relationship and the other party's perception, loneliness is amplified and compulsive use of digital devices follows (Cavanaugh & Buehler, 2016). However, this premise fails to account for individual differences in social relationship skills, making it difficult to fully explain the relationship between loneliness and digital addiction. This result contrasts with prior studies reporting that loneliness increases digital addiction (Sul & Lee, 2025), suggesting that when inferring the causal relationship between technology and addiction, the positive aspects of technology also need to be sufficiently explored.

Meanwhile, as depression among young adults living alone increased, digital addiction also increased. Unpredictable social crises such as the COVID-19 pandemic have imposed constraints on daily life, and young adults living alone —given their relatively weak support systems—have been classified as a group in which such negative effects persist over a long period (Lee, 2022). Although depression can arise from biological factors, it is increasingly explained as the result of an interaction between personal and environmental factors (World Health Organization, 2024), and young adulthood is a period in which depression is frequently experienced (Kessler et al., 2005). An increasing number of individuals turn to addictive substances or behaviors as a means of coping with negative

emotions, including depression (Wemm et al., 2013), and this can extend beyond addiction itself to weaken the psychological pathways that protect against suicidal ideation and attempts (Kim, 2020). Moreover, depression is also associated with interpersonal difficulties; although young people in contemporary society engage in more active communication through social media than other generations, relationship networks overly concentrated on social media are highly likely to lead to pathological phenomena such as loss of control. These findings are consistent with those of prior research (Jin & Rhee, 2026).

In addition, anxiety among young adults living alone was found to be a factor that increases digital addiction. Anxiety, a form of tension, refers to a phenomenon in which cognitive, emotional, and behavioral responses unfold as a continuous process. Given that young adulthood involves frequent evaluation by others as part of its developmental tasks, fear of negative evaluation tends to lower self-esteem and intensify anxiety. Persistent anxiety in daily life affects not only social functioning but also interpersonal relationships (Mennin et al., 2002), and individuals may respond by avoiding the problems they face or by becoming dependent on their parents rather than actively resolving them. That is, anxiety can also manifest within interpersonal relationships, such that difficulty clearly asserting oneself in front of others, or excessive shyness and awkward behavior, embarrasses those around the individual and becomes an obstacle to relationship formation. This relational vulnerability leads to compulsive use of digital devices, and in the long term, cognitive bias makes it more difficult to break free from addiction. These findings are consistent with prior research (Jin & Rhee, 2026; Shiferaw et al., 2025).

Second, regarding the mediating effects of depression and anxiety on the relationship between loneliness and digital addiction among young adults living alone, both depression and anxiety were each found to have mediating effects. In particular, because loneliness did not have a direct effect on digital addiction, depression and anxiety can be regarded as full mediators of this relationship. This suggests that, in order to attenuate the pathway leading to digital addiction, attention must be paid to depression and anxiety. According to the addiction syndrome model (Shaffer et al., 2004), individual vulnerability is a factor that precedes addiction. That is, from the perspective of neurobiological and psychosocial factors, an individual's environment can heighten susceptibility to addiction, and even in the absence of such vulnerability, repeated exposure to a behavior can ultimately result in addiction. Above all, a key characteristic observed in individuals experiencing depression is impairment of the frontal and prefrontal cortex, leading to a loss of control and self-regulation. Depression can therefore be regarded as a factor that fosters digital addiction among young people; and inferring from social factors, the structural currents of contemporary society not only exert a negative influence on mental health but also induce structural and functional changes in the brain regions that regulate stress responses, constituting a mechanism linking depression and addiction. Accordingly, alternatives should be developed to strengthen psycho-emotional support and thereby alleviate depression.

Furthermore, given that anxiety also fully mediated the relationship between loneliness and digital addiction, the three-system model of anxiety (Mauss et al., 2005) explains anxiety in terms of cognitive, affective, and physiological components, each of which operates independently. The cognitive component refers to a decline in attentional control even in the absence of an actual threat, while the affective component refers to feelings of apprehension about a potential threat that may arise in the future. The physiological component, in turn, is characterized by unstable autonomic nervous system activity, in which the nervous system's response to arousal and stress slows, delaying recovery. Anxiety thus

manifests in various forms, and a common feature is that it clouds judgment about the present situation, with distorted thinking manifesting as a complication of substance or behavioral addiction. Anxiety, like depression, can therefore be regarded as a mechanism underlying digital addiction, and measures to alleviate anxiety are needed in order to reduce digital addiction. In sum, the estimation of the mediating effects of depression and anxiety on the relationship between loneliness and digital addiction in this study underscores the need to lower depression and anxiety, both of which are characterized as arising from relational factors. Therefore, community-based institutions such as family centers, support centers for young adults living alone, mental health centers, and youth centers should establish self-help groups or community-based programs to help build positive relational networks, and professional counseling should be provided for individuals experiencing chronic depression and anxiety.

Third, regarding the moderated mediating effect of mental well-being within the mediating relationships among loneliness, depression, anxiety, and digital addiction among young adults living alone, mental well-being was found to interact along the indirect pathway through which anxiety leads to digital addiction. Importantly, this moderation indicates not merely that individuals with higher mental well-being report lower anxiety, but that, at a given level of anxiety, anxiety is less strongly translated into digital addiction when mental well-being is high. Three mechanisms may account for this buffering effect. First, from the perspective of the I-PACE model (Brand et al., 2019), the transition from negative affect to addictive use depends on coping styles and inhibitory control; individuals with higher well-being possess more adaptive coping resources and a stronger sense of control (Eo & Kim, 2015), and therefore have less need to rely on digital devices as an immediate means of escaping anxious arousal. Second, according to the broaden-and-build theory (Fredrickson, 2001), positive emotional states broaden attention and action repertoires and build durable personal and social resources, counteracting the attentional narrowing toward threat that characterizes anxiety (Mitte, 2008). Third, the psychological and social components of well-being—a sense of purpose, environmental mastery, and social integration (Keyes, 2002)—provide alternative sources of reward and connection, thereby reducing the reinforcing value of the “use–relief–reuse” cycle. The absence of a corresponding moderation in the depression pathway may reflect the fact that depression involves anhedonia and diminished approach motivation, which may limit the extent to which positive resources can be mobilized. The practical significance of this finding lies in the fact that mental well-being is a modifiable resource (Nam et al., 2019): even when anxiety cannot be fully eliminated, strengthening well-being may weaken its conversion into problematic digital behavior. As argued by the complete state model of mental health (Keyes et al., 2008), positive mental health enables individuals to lead a meaningful, positive, and active life, and is grounded in a humanistic, self-actualizing approach. That is, human beings are interpreted not as passive and negative beings, but as beings capable of clearly recognizing their own problems and possessing the ability, attitude, and sense of responsibility needed to resolve them. Accordingly, the higher one’s mental well-being, the lower the negative emotion of anxiety becomes, and as anxiety decreases, its effect on digital addiction is correspondingly attenuated. Therefore, overall life satisfaction, along with both positive emotions (e.g., joy, happiness, comfort) and negative emotions (e.g., depression, anxiety, anger), should be addressed in ways that enhance emotional well-being and foster a sense of satisfaction with life. Accordingly, in practice, it is necessary to further expand the mental health service system based on the Mental Health Welfare Act in order to promote the mental health of young adults living alone, and active outreach is required to ensure that no one is excluded

from access to information about relevant systems or services.

Taken together, the findings identified in this study may be reinterpreted at the level of young adults' social functioning. That loneliness exerted no direct effect on digital addiction and that a significant pathway emerged only under full mediation by depression and anxiety lends empirical support to the view that addiction is a product of the emotional distress derived from relational deficit rather than of that deficit in itself. This indicates that the target of intervention should lie in the regulation of depression and anxiety rather than in the superficial alleviation of loneliness, and it directs attention at the same time to the consequences that follow when this pathway is left unaddressed. Loss of control over digital devices erodes daily rhythms and attentional resources and displaces face-to-face contact, thereby issuing in constricted social participation, which in turn is likely to be transmitted into difficulty performing the roles demanded within the labor market. Insofar as they suggest a pathway by which emotional problems in young adulthood expand into losses in career trajectory and human capital, the present findings furnish social-level support for the urgency of psychological intervention.

Against this backdrop, the present finding that mental well-being moderated the pathway from anxiety to digital addiction assumes particular significance. Mental well-being denotes not the absence of pathology but a state in which individuals realize their own abilities, cope with the ordinary stresses of life, work productively, and are able to contribute to their communities (World Health Organization, 2005). The promotion of mental health, then, does not merely interrupt the point at which negative affect converts into addiction; it constitutes in itself the foundation of social participation and occupational role performance. Insofar as young adults with higher levels of mental health are better able to secure the emotional resources required for forming relationships and to sustain self-regulation in task situations, the promotion of mental health should be understood not only as a means of preventing addiction but as an investment that enhances labor market adaptation and resilience. Interventions directed at young adults living alone should therefore combine a therapeutic approach aimed at alleviating depression and anxiety with a preventive and facilitative approach that actively promotes mental well-being. Workplace-level support systems such as employee assistance programs, alongside community mental health services, may be considered as delivery channels for this approach.

These implications can be made more concrete for young adults who are entering, or have recently entered, employment. First, for job-seekers and new labor market entrants, public employment services and university career centers could integrate brief screening for depression and anxiety into job-search support and link those at risk to community mental health services; integrating mental health support into employment and skills services has been recommended as a means of improving labor market outcomes (OECD, 2021). Second, organizations could incorporate psychological support into the onboarding of newly hired young employees—for example, peer-mentoring or buddy systems that compensate for the limited daily social contact of employees living alone, together with employee assistance programs offering short-term counseling for anxiety and depressive symptoms. Third, stress management and mindfulness-based programs, which have been shown to reduce excessive smartphone use while improving mental well-being (Nam et al., 2019), may be delivered as part of workplace health promotion; meta-review evidence supports the effectiveness of workplace interventions for common mental disorders (Joyce et al., 2016). Fourth, workplace well-being policies that set clear norms on after-hours digital connectivity may reduce the blurring of work-related and private device use that can reinforce compulsive use. Because positive mental health is associated with fewer lost

workdays and better work performance (Keyes & Grzywacz, 2005), such measures should be framed not merely as welfare provisions but as investments in the occupational adjustment, psychological resilience, and human capital of young workers, consistent with resource-based perspectives such as the job demands–resources model (Bakker & Demerouti, 2017).

In summary, by illuminating the mediating effects of depression and anxiety on the relationship between loneliness and digital addiction among young adults living alone, this study demonstrated its academic value by supporting the addiction syndrome model and the three-system model of anxiety across each pathway, as well as the complete state model of mental health through the moderated mediating effect of mental well-being. Furthermore, the study offers practical implications by exploring ways to reduce negative emotions and promote mental well-being in practice settings, and it has discussed how such interventions connect to the conditions that underpin young adults' social participation and adaptation within the labor market. First, although the analysis of young adults living alone is meaningful, the sample size was relatively small, and caution is therefore needed in generalizing the findings. Future research should recruit a larger sample to re-examine the hypotheses of this study. Second, because the data were cross-sectional, the temporal ordering among loneliness, depression, anxiety, and digital addiction cannot be established, and the indirect effects reported here should be interpreted as statistical associations rather than causal effects; cross-sectional estimates of mediation may also diverge from the underlying longitudinal process (Maxwell & Cole, 2007). Longitudinal panel or experience-sampling designs are needed to test the temporal sequence and possible reciprocal relationships. Third, all variables were measured by self-report at a single time point, raising the possibility of common method variance (Podsakoff et al., 2003) as well as social desirability bias, to which mental health indicators are particularly prone. Future studies could complement self-reports with objective indicators of device use (e.g., screen-time logs) and with in-depth interviews that allow for a richer interpretation of the quantitative findings. Fourth, because the data were collected through an online survey panel, digitally active young adults may have been over-represented, which may limit the generalizability of the findings.

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