

Self-Transcendence and Nature Connectedness as Predictors of Healthy Digital Engagement

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Abstract— Digital technologies are now part of daily life, and research has shifted from simply measuring how much people use screens to asking how they use them. This study examined whether self-transcendence and nature connectedness predict healthy digital engagement, defined as intentional, self-regulated, and balanced use of digital devices. A cross-sectional survey was conducted with 412 adults aged 18 to 45 years. Participants completed the Self-Transcendence Scale, the Connectedness to Nature Scale, and a Healthy Digital Engagement Scale, and reported their daily screen time. Self-transcendence ($r = .38, p < .001$) and nature connectedness ($r = .43, p < .001$) were both positively correlated with healthy digital engagement. Hierarchical regression showed that, after controlling for age, gender, and daily screen time, self-transcendence explained an additional 10% of variance in healthy digital engagement, and nature connectedness explained a further 7%. The final model accounted for 30% of the variance. Mediation analysis showed that nature connectedness partially mediated the relationship between self-transcendence and healthy digital engagement (indirect effect = 0.18, 95% CI [0.11, 0.26]). The findings suggest

that people who orient beyond the self and feel connected to the natural world tend to use technology more intentionally. These dispositions may be useful targets for digital well-being interventions.

Keywords: self-transcendence, nature connectedness, healthy digital engagement, digital well-being, screen time, self-regulation

INTRODUCTION

Smartphones, social media, streaming platforms, and messaging applications have changed how people work, learn, relate to others, and spend their free time. These tools bring clear benefits, including access to information, social contact across distance, and new forms of creativity. Many users also report difficulty disengaging, compulsive checking, disrupted sleep, and a sense that technology uses them rather than the other way round. Research on problematic smartphone and

social media use has grown considerably, and much of it focuses on risk factors such as anxiety, loneliness, fear of missing out, and poor impulse control.

A growing body of scholarship argues that deficit-based models give an incomplete picture. Studies of screen time and well-being have produced small and inconsistent associations, which suggests that the quality and purpose of engagement matter more than its quantity. This raises a constructive question: what personal resources help people engage with technology in a healthy way?



This study examines two such resources. Self-transcendence is a psychological orientation in which a person expands personal boundaries toward others, toward broader meaning, and toward something larger than the self. Nature connectedness is the extent to which a person feels emotionally and cognitively part of the natural world. Both constructs are linked with well-being, meaning, and reduced self-focus. Both also offer sources of fulfilment and restoration that do not depend on digital stimulation. People high in these qualities may therefore feel less pull toward compulsive use and may approach technology with more purpose.

The study had three aims: to examine the associations among self-transcendence, nature connectedness, and healthy digital engagement; to test whether both constructs predict healthy digital engagement beyond demographic factors and screen time; and to test whether nature connectedness mediates the relationship between self-transcendence and healthy digital engagement.

LITERATURE REVIEW

Self-Transcendence as a Psychological Resource

Reed (1991a) described self-transcendence as a developmental capacity to expand self-boundaries inwardly, through introspection; outwardly, through concern for others; and temporally, by integrating past and future into the present. Reed (1991b) developed the Self-Transcendence Scale and found that higher self-transcendence was associated with better mental health among older adults. Levenson, Jennings, Aldwin, and Shiraishi (2005) further conceptualised self-transcendence as a decreasing reliance on external definitions of the self, linked with wisdom and reduced self-centredness. Yaden, Haidt, Hood, Vago, and Newberg (2017) reviewed self-transcendent experiences, including awe, flow, mindfulness, and peak experiences, and noted that they share a reduction in self-salience and an increase in felt connection. Piff, Dietze, Feinberg, Stancato, and Keltner (2015) showed experimentally that awe produces a "small self" effect that increases prosocial behaviour.

These findings are relevant to technology use because much problematic engagement is self-referential. Social comparison, validation seeking, and constant self-presentation online all place the self at the centre. A self-transcendent orientation may reduce the appeal of these patterns and direct attention toward meaningful goals.

Nature Connectedness and Well-Being

Mayer and Frantz (2004) developed the Connectedness to Nature Scale to measure an individual's sense of emotional kinship with the natural world. They found that it predicted life satisfaction and ecological behaviour. Nisbet, Zelenski, and Murphy (2009) proposed the related construct of nature relatedness and linked it with environmental concern and well-being. A meta-analysis by Capaldi, Dopko, and Zelenski (2014) found a small but reliable positive association between nature connectedness and happiness across many samples. Attention Restoration Theory (Kaplan, 1995) offers a mechanism: natural environments engage attention softly and allow the directed attention needed for self-regulation to recover. Richardson et al. (2020) identified pathways to nature connectedness, including contact, beauty, meaning, emotion, and compassion, and argued that connectedness depends more on the quality of engagement with nature than on time spent outdoors.

People who feel connected to nature may have access to a restorative alternative to screens and may place more value on

offline experiences. This could support more balanced digital habits.

Digital Engagement: From Quantity to Quality

Early research treated screen time as the main indicator of risk. Twenge and Campbell (2018) reported that heavier screen use among young people was associated with lower psychological well-being. Orben and Przybylski (2019), using specification curve analysis on large datasets, found that the association between digital technology use and adolescent well-being was negative but very small, explaining at most 0.4% of variance. Kardefelt-Winther (2014) argued that problematic internet use is often compensatory, reflecting unmet psychological needs rather than a disorder of the technology itself.

Research on problematic use has identified clear correlates. Andreassen et al. (2016) found that addictive use of social media and video games was associated with symptoms of ADHD, obsessive-compulsive disorder, anxiety, and depression in a large sample. Kwon, Kim, Cho, and Yang (2013) developed the Smartphone Addiction Scale–Short Version, which is widely used to assess compulsive smartphone use. Przybylski, Murayama, DeHaan, and Gladwell (2013) linked fear of missing out with lower need satisfaction and higher social media engagement. Hunt, Marx, Lipson, and Young (2018) showed experimentally that limiting social media use to about 30 minutes per day reduced loneliness and depression.

Self-determination theory (Ryan & Deci, 2000) provides a useful frame. When basic needs for autonomy, competence, and relatedness are met, behaviour tends to be self-endorsed rather than driven by pressure or compulsion. Healthy digital engagement can be understood as an autonomous form of use, where technology serves the person's values and goals.

Research Gap

Studies have examined self-transcendence and nature connectedness mainly in relation to well-being, spirituality, and environmental behaviour. Research on digital engagement has focused mainly on risk factors. Few studies have examined positive dispositions as predictors of healthy technology use, and the possible link between self-transcendence and nature connectedness in this context has not been tested. Because self-transcendence involves expanding the self toward what lies beyond it, it may encourage a sense of belonging to the natural world, which in turn may support balanced digital habits.

Hypotheses

Based on the literature, the following hypotheses were proposed:

H1: Self-transcendence will be positively associated with healthy digital engagement.

H2: Nature connectedness will be positively associated with healthy digital engagement.

H3: Self-transcendence and nature connectedness will each predict healthy digital engagement after controlling for age, gender, and daily screen time.

H4: Nature connectedness will mediate the relationship between self-transcendence and healthy digital engagement.

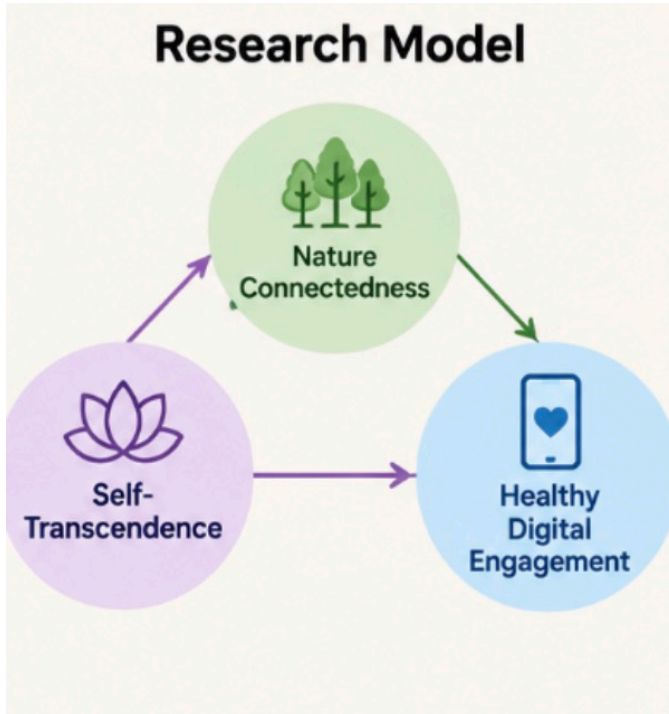
METHODOLOGY

Research Design

The study used a quantitative, cross-sectional, correlational survey design. This design was chosen to examine associations and predictive relationships among variables in a naturally occurring population.

Participants

The sample consisted of 412 adults aged 18 to 45 years recruited through university networks, professional groups, and social media announcements. Inclusion criteria were being at least 18 years old, owning a smartphone, and using the internet daily. Of 447 responses received, 35 were removed because of incomplete data ($n = 21$) or failed attention checks ($n = 14$), leaving a final sample of 412. An a priori power analysis in G*Power for multiple regression with five predictors, a small-to-medium effect ($f^2 = 0.05$), $\alpha = .05$, and power = .95 indicated a minimum sample of 402, so the final sample was adequate.



meaning in my past experiences" are rated on a 4-point scale from 1 (not at all) to 4 (very much). Higher mean scores indicate greater self-transcendence. Internal consistency in this sample was $\alpha = .84$.

Connectedness to Nature Scale (CNS). Mayer and Frantz's (2004) 14-item scale assesses the sense of emotional connection with the natural world. An example item is "I often feel a sense of oneness with the natural world around me." Items are rated from 1 (strongly disagree) to 5 (strongly agree), and three items are reverse-scored. Internal consistency was $\alpha = .86$.

Healthy Digital Engagement Scale (HDES). A 12-item scale was adapted for this study from established digital well-being and self-regulation literature. It covers three facets: intentional use (e.g., "I usually know why I am picking up my phone"), self-regulation (e.g., "I can stop using an app when I decide to"), and balance (e.g., "My device use does not interfere with sleep, work, or relationships"). Items are rated from 1 (strongly disagree) to 5 (strongly agree). Confirmatory factor analysis supported the three-factor structure, $\chi^2(51) = 121.47$, $p < .001$, CFI = .95, TLI = .94, RMSEA = .058 (90% CI [.045, .071]), SRMR = .045. Because the facets were highly correlated ($r = .58$ to $.67$), a total mean score was used. Internal consistency for the total scale was $\alpha = .88$.

Demographics and screen time. Participants reported age, gender, education, residence, and average daily non-work screen time in hours.

Procedure

Data were collected online over eight weeks. Participants read an information sheet and gave informed consent before starting. The survey took about 15 minutes. Two attention-check items were embedded in the survey. Participation was voluntary and anonymous, and no identifying information was collected. The instrument order was counterbalanced between the STS and CNS to reduce order effects. The study followed standard ethical guidelines for research with human participants and received institutional ethical approval.

Data Analysis

Data were analysed using SPSS version 27 and the PROCESS macro version 4.2 (Hayes, 2018). Preliminary analysis checked missing data, normality, outliers, and multicollinearity. Descriptive statistics and Pearson correlations were computed to test H1 and H2. Hierarchical multiple regression was used to

Table 1: Demographic Characteristics of Participants ($N = 412$)

Characteristic	Category	n	%
Gender	Female	218	52.9
	Male	190	46.1
	Other / prefer not to say	4	1.0
Age group	18–24 years	171	41.5
	25–34 years	163	39.6
	35–45 years	78	18.9
Education	Undergraduate (ongoing or completed)	196	47.6
	Postgraduate	181	43.9
	Other	35	8.5
Residence	Urban	297	72.1
	Semi-urban / rural	115	27.9

Mean age was 26.8 years ($SD = 6.4$). Mean self-reported daily screen time for non-work purposes was 5.9 hours ($SD = 2.3$).

Instruments

Self-Transcendence Scale (STS). Reed's (1991b) 15-item scale measures self-transcendence across intrapersonal, interpersonal, and temporal dimensions. Items such as "Finding

test H3, with age, gender (coded 0 = male, 1 = female; the four participants in the "other" category were excluded from this analysis only), and screen time entered in Step 1, self-transcendence in Step 2, and nature connectedness in Step 3. Mediation (H4) was tested with PROCESS Model 4 using 5,000 bootstrap samples and bias-corrected 95% confidence intervals, with the same covariates.

RESULTS

Preliminary Analysis

Skewness (−0.62 to 0.48) and kurtosis (−0.71 to 0.83) were within acceptable limits for all study variables. No multivariate outliers were found using Mahalanobis distance ($p < .001$). Variance inflation factors ranged from 1.05 to 1.27, indicating no multicollinearity concerns. Harman's single-factor test showed that one factor explained 24.6% of the variance, suggesting that common method bias was not a major concern.

Descriptive Statistics and Correlations

Table 2: Descriptive Statistics and Reliability of Study Variables ($N = 412$)

Variable	Range	M	SD	α
Self-transcendence	1–4	2.94	0.46	.84
Nature connectedness	1–5	3.52	0.61	.86
Healthy digital engagement	1–5	3.18	0.68	.88
Daily screen time (hours)	1–14	5.90	2.30	—
Age (years)	18–45	26.80	6.40	—

Variable	1	2	3	4	5
1. Self-transcendence	—				
2. Nature connectedness	.41**	—			
3. Healthy digital engagement	.38**	.43***	—		
4. Daily screen time	−.12*	−.19**	−.34**	—	
5. Age	.11*	.09	.14**	−.21**	—

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Self-transcendence was positively and moderately correlated with healthy digital engagement ($r = .38$, $p < .001$), supporting H1. Nature connectedness showed a slightly stronger positive correlation with healthy digital engagement ($r = .43$, $p < .001$), supporting H2. The two predictors were moderately correlated with each other ($r = .41$). Daily screen time was negatively correlated with healthy digital engagement ($r = −.34$) and weakly negatively correlated with both predictors.

Hierarchical Regression Analysis

Table 4: Hierarchical Regression Predicting Healthy Digital Engagement ($n = 408$)

Predictor	Step 1 β	Step 2 β	Step 3 β
Age	.07	.05	.05
Gender (female = 1)	.05	.04	.04
Daily screen time	−.32***	−.28***	−.23***
Self-transcendence		.32***	.20***
Nature connectedness			.30***
R^2	.13	.23	.30
ΔR^2	.13***	.10***	.07***
F	20.33***	30.39***	34.80***
ΔF	20.33***	52.86***	40.60***

Note. Degrees of freedom: Step 1 $F(3, 404)$; Step 2 $F(4, 403)$; Step 3 $F(5, 402)$. *** $p < .001$.

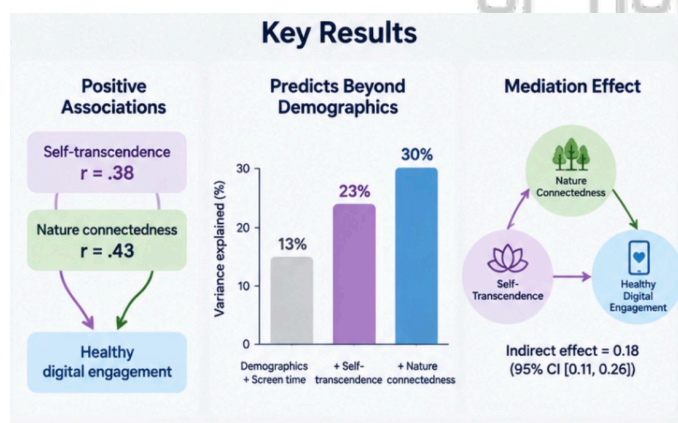


Table 3: Pearson Correlations Among Study Variables ($N = 412$)

In Step 1, the covariates explained 13% of the variance in healthy digital engagement, with daily screen time as the only significant predictor ($\beta = −.32$, $p < .001$). Adding self-transcendence in Step 2 explained an additional 10% of

variance ($\Delta R^2 = .10$, $p < .001$). Adding nature connectedness in Step 3 explained a further 7% ($\Delta R^2 = .07$, $p < .001$). In the final model, both self-transcendence ($\beta = .20$, $p < .001$) and nature connectedness ($\beta = .30$, $p < .001$) remained significant independent predictors, and the model explained 30% of the variance. H3 was supported. The drop in the self-transcendence coefficient from .32 to .20 when nature connectedness was entered pointed to a possible indirect pathway, which was tested next.

Mediation Analysis

Table 5: Mediation of the Self-Transcendence–Healthy Digital Engagement Relationship by Nature Connectedness

Path	B	SE	t	p	95% CI
a: Self-transcendence → Nature connectedness	0.55	0.06	9.17	< .001	[0.43, 0.67]
b: Nature connectedness → Healthy digital engagement	0.33	0.05	6.60	< .001	[0.23, 0.43]
c: Total effect	0.47	0.07	6.71	< .001	[0.33, 0.61]
c': Direct effect	0.29	0.07	4.14	< .001	[0.15, 0.43]
Indirect effect (a × b)	0.18	0.04	—	—	[0.11, 0.26]

Note. Unstandardised coefficients. Covariates: age, gender, daily screen time. Bootstrap samples = 5,000.

Self-transcendence significantly predicted nature connectedness (path a), and nature connectedness significantly predicted healthy digital engagement while controlling for self-transcendence (path b). The indirect effect was significant because the bootstrap confidence interval did not include zero ($B = 0.18$, 95% CI [0.11, 0.26]). The direct effect remained significant ($B = 0.29$, $p < .001$), which indicates partial mediation. The indirect effect accounted for about 38% of the total effect. H4 was supported.

DISCUSSION

This study examined whether self-transcendence and nature connectedness predict healthy digital engagement. All four hypotheses were supported. Both constructs were positively

associated with intentional, self-regulated, and balanced technology use, both predicted healthy engagement beyond age, gender, and screen time, and nature connectedness partly explained the link between self-transcendence and healthy engagement.

The association between self-transcendence and healthy digital engagement fits the view that self-transcendence reduces self-focus (Levenson et al., 2005; Yaden et al., 2017). Much compulsive digital behaviour, such as checking for likes, comparing oneself with others, and curating online identity, is organised around the self. People who find meaning in relationships, in their own life story, and in broader purposes may depend less on digital validation. This is consistent with Kardefelt-Winther's (2014) compensatory model: when psychological needs are met through meaningful connection and purpose, the need to seek them compulsively online is lower.

Nature connectedness was the stronger of the two predictors. This result matches Attention Restoration Theory (Kaplan, 1995). People connected to nature may have regular access to restorative experiences that replenish the attentional resources needed to resist the pull of notifications and infinite feeds. Nature connectedness may also offer an alternative source of positive emotion and meaning (Capaldi et al., 2014), which makes offline life more rewarding and reduces reliance on screens for stimulation.

The partial mediation finding adds to existing research. Self-transcendence involves expanding the self beyond its usual boundaries, and one direction of this expansion is toward the natural world. People who experience this sense of belonging to nature appear to benefit in terms of digital habits. The significant direct effect shows that self-transcendence also works through other pathways, which may include prosocial values, a sense of meaning, or mindful awareness.

Daily screen time remained a significant negative predictor in all models, but its association with healthy engagement was moderate ($r = -.34$). Many participants with high screen time still reported intentional and balanced use. This supports the argument by Orben and Przybylski (2019) that quantity alone is a limited indicator, and that the manner and motive of engagement deserve closer attention.

Implications

The findings have practical value for digital well-being programmes. Most current interventions focus on restriction,

such as app timers, screen-time limits, or digital detoxes. The present results suggest that building positive psychological resources may complement these strategies. Nature-based activities that emphasise emotional connection, noticing beauty, and meaning, following the pathways described by Richardson et al. (2020), could support healthier digital habits. Practices that encourage self-transcendence, such as reflective journaling, volunteering, awe-inducing experiences, and meditation, may also help. Universities, workplaces, and mental health practitioners could combine these approaches with conventional digital hygiene advice. Technology designers could also consider features that encourage outdoor activity or reflective use rather than maximising time on platform.

LIMITATIONS AND FUTURE RESEARCH

The study has several limitations. The cross-sectional design does not allow causal conclusions, and the mediation results should be read as consistent with, but not proof of, the proposed pathway. It is possible that healthy digital habits leave more time for nature and reflection, which would reverse the direction of the relationships. Longitudinal and experimental studies are needed to test the direction of effects. All measures were self-reported, and screen time estimates in particular may be inaccurate; future research should use device-logged usage data. The sample was relatively young, educated, and mostly urban, which limits generalisation to older adults, rural populations, and other cultural settings. The Healthy Digital Engagement Scale showed good psychometric properties but requires further validation across samples. Future research could also examine moderators such as mindfulness, personality traits, and access to green space, and could test whether nature-based or self-transcendence interventions improve digital engagement over time.

CONCLUSION

This study shows that self-transcendence and nature connectedness are meaningful predictors of healthy digital engagement. Together they explained substantial variance in intentional, self-regulated, and balanced technology use beyond demographic factors and screen time. Nature connectedness partly explained the effect of self-transcendence, which suggests that feeling part of the natural world is one route through which a self-transcendent orientation supports healthier digital habits. The findings support a shift from a purely restrictive view of technology use toward a strengths-based approach. Helping people build connection with something larger than themselves, including the natural world, may help them relate to their devices with greater purpose and balance.

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