

PAPER

The Autonomy Paradox in Highly Digital Higher Education: Examining How Mobile Empowerment Affects Psychological Distress in Chinese College Students

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ABSTRACT

The excessive use of artificial intelligence (AI) and mobile learning apps in Chinese universities has changed how students experience their studies and has led to higher levels of psychological distress. Using Self-Determination Theory, this study examines how various aspects of mobile empowerment relate to psychological distress. This study used a quantitative, non-experimental design. Researchers collected data through an online survey from 472 undergraduate and postgraduate students at four universities in Fujian Province, China. The data were analyzed with multiple linear regression and structural equation modelling (SEM) using AMOS. The results show that Confirmatory Factor Analysis (CFA) indicated a strong model fit and good construct validity. The RMSEA values were 0.023 for the independent-variable model and 0.011 for the dependent-variable model. The SEM results showed that digital competence significantly lowered generalised anxiety ($B = -0.435$, $p < .001$) and psychological stress ($B = -0.401$, $p < .001$). Digital relatedness also predicted lower anxiety ($B = -0.306$, $p < .001$) and stress ($B = -0.228$, $p < .001$). These findings suggest that digital competence and supportive peer connections are important protective factors against psychological distress. However, digital autonomy by itself may not reduce stress in highly connected, AI-driven learning environments.

KEYWORDS

mobile empowerment, generalized anxiety, psychological stress, self-determination theory, autonomy paradox

1 INTRODUCTION

Today, higher education is increasingly shaped by the extensive use of artificial intelligence and mobile technology. In China, this digital transformation has changed the academic, social, and psychological experiences of university students [1–2].

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The idea of “*mobile empowerment*” initially appeared as a positive concept, showing how easy access to smartphones and AI-based educational apps gives students new levels of independence, mental growth and ways to connect with others [1]. Mobile empowerment means students feel more confident and in control when they use hand-held devices to manage their schoolwork, find information worldwide, and connect quickly with classmates. These tools move learning beyond the traditional classroom, giving students more freedom and helping them become independent and skilled digital citizens [3].

Nevertheless, this optimistic perspective on technology increasingly confronts a concerning psychological reality on Chinese campuses. Mobile devices expand students’ options and cognitive resources, yet also entrap them in a persistent cycle of digital demands, algorithmic feedback and heightened competition [4]. The adverse effects of global connectivity are evident in the emergence of “AI-driven existential fatigue”, a profound state of psychological exhaustion in which the boundaries between academic obligations, personal identity and digital hyper-connectivity become irreversibly blurred [2].

Rather than promoting genuine autonomy, continuous reliance on AI-driven mobile interfaces diminishes the necessary space for cognitive recovery and meaningful identity development. As a result, technologies intended to empower university students have paradoxically become structural contributors to psychological distress, leading to increased levels of generalised anxiety, existential disorientation, and academic burnout.

Even though there are more digital mental health tools and counselling services available, psychological distress among Chinese university students is still getting worse [3]. A central issue in this context is a technological paradox. While mobile devices provide increasingly advanced AI tools that appear to empower students, these technologies may simultaneously deplete students’ internal psychological resources. Existing research has predominantly examined mobile phone use through simplistic metrics, such as screen time or addiction scales. Such methods overlook the nuanced changes in students’ internal experiences as their reliance on mobile technology increases. The main issue is that mobile empowerment does more than just help students complete task. It changes the basic way students experience their lives. Tools like AI personalisation, academic algorithms, and nonstop communication can lead to serious cognitive overload. Because of this, students often feel they must always be productive, responsive, and focused on self-improvement [6].

When their choices are driven by algorithmic pressure, the result is not self-actualisation but a constant feeling of exhaustion. Current research rarely explores the complex relationship between mobile empowerment and psychological stress. Few studies have examined how perceived mobile autonomy, digital skills, and connectedness may contribute to existential fatigue and anxiety among Chinese college students [6]. Most research on academic anxiety also overlooks the impact of AI-driven mobile environments. This study addresses that gap by examining how mobile empowerment can move from being a helpful resource to a cause of existential fatigue and general anxiety.

This study examines the paradoxical relationship between mobile technological empowerment and psychological distress among Chinese university students. It investigates the influence of AI-driven mobile environments on autonomy, competence, and connectivity, and their contribution to stress, anxiety, and existential fatigue. The research further explores mechanisms by which digital competence

and constant connectivity intensify psychological strain. The findings aim to inform evidence-based recommendations for the development of cognitively sustainable digital campus environments. This study introduces a novel idea: psychological distress can stem from high digital empowerment, not just from limited access or low technical skills.

2 LITERATURE REVIEW

2.1 Mobile empowerment

Mobile empowerment (ME) is a personal sense that mobile technologies and AI systems help people feel more capable, effective, and socially connected [3]. Based on Self-Determination Theory (SDT) and digital sociology, mobile empowerment goes beyond just owning devices or knowing how to use them. Instead, it describes a multidimensional state in which people interact with technology in ways that support their needs.

In higher education today, mobile empowerment is measured through three main pillars: autonomy, competence, and relatedness [5–6]. AI-powered educational systems affect student autonomy by shaping learning choices with algorithmic suggestions. A study of [7] found that while digital tools can help students manage their own learning, relying too much on AI may reduce their ability to make independent decisions and limit their sense of control.

In digital learning environments, ‘autonomy’ refers to students’ perceived freedom to direct their learning and to interact independently with algorithmic systems. Competence reflects their sense of mastery and self-efficacy in managing both academic and technological demands. Relatedness encompasses feelings of social connection and belonging facilitated by mobile communication and digital networks. In educational technology research, these dimensions are regarded as psychological resources that support academic performance, adjustment, and well-being [7].

2.2 Psychological stress and anxiety

Psychological distress among modern university populations is primarily characterised by the twin constructs of psychological stress and generalised anxiety. Psychological stress is conceptualised as a state of internal systemic strain that arises when environmental demands, academic expectations, and socio-technological pressures outstrip an individual’s adaptive cognitive resources [8].

Academic stress and generalised anxiety are closely linked in university students. Xiao [8] found that ongoing academic pressure, uncertainty and mental overload play a major role in causing psychological distress and lowering emotional well-being. College students have often faced mental health challenges because of institutional pressures and financial worries [2]. As educational campuses become more digital, stress and anxiety are shaped by changes in how students manage their time, surroundings and mental workload. Frequent notifications, instant grading, and online comparisons turn these feelings from occasional reactions into ongoing parts of student life [9]. A study showed that hyper-connected digital

environments lead to more cognitive overload, constant responsiveness and anxiety among users [10]. [9] Found that while digital engagement and AI-supported academic systems make learning more accessible and connected, they also increase mental fatigue.

2.3 AI-Driven existential fatigue

“*AI-Driven Existential Fatigue*” is a new idea that describes the deep psychological and philosophical exhaustion people feel from constant, highly efficient use of AI and mobile technology [11]. Traditional technostress often comes from technical issues or complicated systems. In contrast, existential fatigue can happen even when technology runs smoothly and is used often.

[11] Found that depending on algorithms can make people feel less in control, more uncertain about their lives and less able to manage their thoughts, even though technology can be efficient. It also argued that relying too much on AI-heavy decisions can disturb our mental balance and lead to psychological fatigue. As AI systems become more proficient at predicting user preferences, automating cognitive tasks and personalising information streams, they inadvertently strip away the organic friction, ambiguity, and reflective pauses necessary for authentic human identity formation [12].

Students are pushed into an endless cycle of optimisation where they have to deal with algorithmic notifications, meet real-time social and academic needs, and keep up a well-curated digital image. This constant push to improve oneself, along with the distorting of efficiency. The person feels less and less like they have control over their life, even though the systems are meant to give them more freedom and growth efficiency.

2.4 Conceptual framework and hypothesis

A conceptual model is drawn to find a link between mobile empowerment and psychological discomfort among Chinese college students. The paradigm conceptualises mobile empowerment in terms of three dimensions: autonomy, competence and relatedness, drawing on self-determination theory. These aspects have usually been associated with better educational and psychological outcomes, but our study suggests that the impacts might be different in AI-powered and hyper-connected mobile contexts. Students with higher digital competence are more likely to develop stronger self-regulation, information-filtering capacity and coping strategies, which may reduce cognitive overload and psychological strain. Similarly, relatedness reflects feelings of social connection, emotional support and belonging established through digital communication networks. Strong interpersonal connectedness may function as a psychological protective factor that alleviates anxiety and stress.

As a result, this study suggests, as shown in Figure 1, a conceptual framework and six hypotheses that the different aspects of mobile empowerment have different impacts on psychological distress. In particular, digital autonomy is positively related to anxiety and stress, while competence and relatedness are negatively related to anxiety and stress.

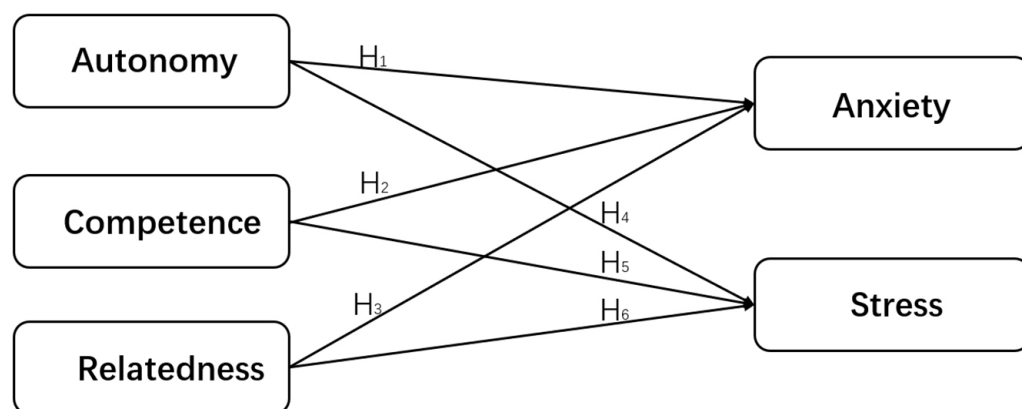


Fig. 1. Conceptual framework

H1: Digital autonomy is positively associated with anxiety among college students.

H2: Digital autonomy is positively associated with stress among college students.

H3: Digital competence is negatively associated with anxiety among college students.

H4: Digital competence is negatively associated with stress among college students.

H5: Digital relatedness is negatively associated with anxiety among college students.

H6: Digital relatedness is negatively associated with stress among college students.

3 METHODOLOGY

3.1 Research design

This study used a quantitative, non-experimental correlational research method to look at how Chinese college students' psychological distress is related to different aspects of mobile empowerment. A stratified random sampling technique was used, and participants were chosen from four universities in Fujian Province, China.

3.2 Participants, sample size and sampling technique

This study focused and targeted undergraduate and postgraduate students enrolled at the four target universities in Fujian Province, China, as they are the main users of advanced AI educational tools and mobile campus platforms. Data were collected via a cross-sectional online survey distributed through several university administrative networks. In total, 472 valid responses were included in the analysis. We collected data with a structured questionnaire that used validated scales to measure autonomy, competence, relatedness, anxiety and stress. The questionnaire also included demographic questions about gender, academic year and field of study.

3.3 Instrumentation

The survey used a single, psychometrically tested instrument that was translated into Chinese. Each question was rated on a standard five-point Likert scale from 1 (strongly disagree/never) to 5 (strongly agree/always). This consistent format helped reduce confusion and bias when respondents answered the questions. The instrument is grounded in self-determination theory and has been widely applied in higher education and psychological research. This questionnaire is based on “*self-determination theory*”, which has been widely used in higher education and psychological research studies.

The questionnaire was developed using the Basic Psychological Need Satisfaction Scale (BPNS) developed by Deci and Ryan [13]. The scale consisted of 21 items, including how to use the balanced sub-scale questionnaire design using six items for digital autonomy, six items for digital competence and six items for digital relatedness. Generalised anxiety and psychological stress were assessed using the Depression Anxiety Stress Scales-21 (DASS-21) developed by Lovibond and Lovibond [14]. Generalised anxiety (14 items) and psychological stress (14 items) were considered.

3.4 Ethical consideration statement

Participation was entirely voluntary, and respondents were free to withdraw from the study at any time without providing any reason. This study received ethical approval from the Human Research Ethics Committee of Srinakharinwirot University (Approval No.: SWUEC-682619) and was conducted in accordance with the principles outlined in the Declaration of Helsinki.

3.5 Data analysis

The analysis used a two-stage statistical approach with IBM SPSS Statistics (Version 27.0) and IBM SPSS AMOS (Version 24.0). In the first stage, SPSS was used to calculate descriptive statistics, check internal scale reliability with Cronbach’s alpha (α), and examine bivariate relationships using a Pearson correlation matrix. In the second stage, Covariance-Based Structural Equation Modelling (CB-SEM) was performed in AMOS using maximum likelihood estimation. First, a Confirmatory Factor Analysis (CFA) was done to check the validity of the measurement model. Then, a full Structural Equation Model (SEM) was used to assess the directional path coefficients and overall model fit.

4 RESULTS AND DISCUSSION

4.1 Descriptive statistics

Table 1 presents the descriptive analysis, and findings indicated that participants reported moderately high levels of digital autonomy ($M = 3.55$, $SD = 1.10$), competence ($M = 3.53$, $SD = 1.00$), and relatedness ($M = 3.55$, $SD = 1.06$). They also showed higher levels of anxiety ($M = 3.45$, $SD = 1.03$) and stress ($M = 3.46$, $SD = 1.02$), which suggests that many students in the sample experienced psychological strain.

Table 1. Descriptive statistics of study variables (N = 472)

Variables	Mean	SD
Autonomy (AU)	3.547	1.100
Competence (CO)	3.528	1.002
Relatedness (RE)	3.552	1.064
Anxiety (AN)	3.452	1.033
Stress (ST)	3.462	1.022

Table 2 presents the results of the Pearson correlation analysis, which found significant relationships among all study variables. Anxiety and stress were strongly and positively correlated ($r = .531$, $p < .001$), showing that these two aspects of psychological distress often occurred together in participants. On the other hand, autonomy, competence, and relatedness were each negatively linked to anxiety and stress. Among these, competence had the strongest negative correlation with anxiety ($r = -.588$, $p < .001$) and stress ($r = -.402$, $p < .001$). Overall, these results suggest that when participants felt more digitally empowered, they tended to experience less psychological distress.

Table 2. Pearson correlation matrix (N = 472)

Variables	1	2	3	4	5
1. Autonomy (AU)	1.000				
2. Competence (CO)	.513**	1.000			
3. Relatedness (RE)	.490**	.204**	1.000		
4. Anxiety (AN)	-.519**	-.588**	-.488**	1.000	
5. Stress (ST)	-.337**	-.402**	-.293**	.531**	1.000

Note: ** $p < .01$ significant.

4.2 Scale reliability and internal consistency

Table 3 shows generalised anxiety had the highest reliability ($\alpha = 0.967$), with psychological stress close behind ($\alpha = 0.963$). In the mobile empowerment group, digital autonomy had a Cronbach's alpha of 0.938, digital relatedness had 0.930, and digital competence had 0.910. These results suggest that all constructs are measured reliably and that the questionnaire items effectively capture the intended variables.

Table 3. Scale reliability and internal consistency (N = 472)

Construct	Number of Items	Cronbach's Alpha (α)
Digital Autonomy (AU)	6	0.938
Digital Competence (CO)	6	0.910
Digital Relatedness (RE)	6	0.930
Generalized Anxiety (AN)	14	0.967
Psychological Stress (ST)	14	0.963
Total items	42	

4.3 Confirmatory factor analysis

We used CFA in AMOS with Maximum Likelihood Estimation to check the construct validity and measurement fit of the proposed latent variables before testing the structural model.

Table 4 shows that both measurement models had excellent goodness-of-fit. The independent variables model had an RMSEA value of 0.023, and the dependent variables model had an RMSEA value of 0.011. Both values are well below the recommended threshold of 0.05. Both models also had a PCLOSE value of 1.000, which indicates an excellent fit between the models and the data. The Akaike Information Criterion (AIC) values for both models were much lower than those for the independence models, showing that the models are more efficient. The Hoelter Index was 452, which is above the minimum needed, so the sample size of 472 was enough for reliable model estimation.

These CFA results indicated that the constructs were valid and the measurements were adequate, so it was appropriate to proceed to SEM for hypothesis testing.

Table 4. Measurement model goodness-of-fit summary (N = 472)

Fit Index Metric	Independent Variables Model	Dependent Variables Model
Absolute Fit Parameters		
RMSEA	0.023	0.011
RMSEA (90% Lower Bound)	0.009	0.000
RMSEA (90% Upper Bound)	0.034	0.020
PCLOSE	1.000	1.000
Information Criteria		
Model AIC	244.248	481.846
Saturated Model AIC	342.000	812.000
Independence Model AIC	6534.585	12052.796
Cross-Validation Indices		
Model ECVI	0.519	1.023
Model ECVI (90% Lower)	0.489	0.983
Model ECVI (90% Upper)	0.569	1.129
Sample Sufficiency		
Hoelter Index (0.05 level)	452	452

4.4 Multiple linear regression analysis

We used multiple linear regression to see how different aspects of mobile empowerment predict psychological distress. The first regression model examined the effects of Digital Autonomy (AU), Digital Competence (CO), and Digital Relatedness (RE) on Generalised Anxiety (AN). The overall regression model was statistically significant, $F(3, 468) = 152.90$, $p < .001$, with an R value of 0.704 and an R^2 value of 0.495.

This indicates that the three predictor variables collectively explained 49.5% of the variance in generalised anxiety among the respondents.

Table 5. Multiple regression results for generalised anxiety (N = 472)

Predictor Variable	Unstandardized B	Std. Error	Beta (β)	t-Value	p-Value
Constant	6.676	0.155	–	43.127	< .001
Digital Autonomy	–0.112	0.040	–0.119	–2.766	.006
Digital Competence	–0.473	0.040	–0.458	–11.957	< .001
Digital Relatedness	–0.326	0.037	–0.335	–8.894	< .001

Table 5 shows that all three aspects of mobile empowerment had significant negative effects on generalised anxiety. Digital competence was the strongest predictor ($\beta = -0.458$, $p < .001$), followed by digital relatedness ($\beta = -0.335$, $p < .001$). Digital autonomy also had a significant negative link with anxiety ($\beta = -0.119$, $p = .006$), but its effect was weaker. These results suggest that college students with higher digital competence, autonomy, and relatedness tend to have lower anxiety levels.

Table 6. Regression model predicting psychological stress

Predictor Variable	Unstandardized B	Std. Error	Beta (β)	t-Value	p-Value
Constant	5.528	0.191	–	28.907	< .001
Digital Autonomy	–0.074	0.050	–0.080	–1.479	.140
Digital Competence	–0.329	0.049	–0.322	–6.727	< .001
Digital Relatedness	–0.181	0.045	–0.189	–4.000	< .001

Table 6 shows that digital competence and digital relatedness both had a significant negative effect on psychological stress. Digital competence had the strongest protective effect ($\beta = -0.322$, $p < .001$), followed by digital relatedness ($\beta = -0.189$, $p < .001$). Digital autonomy, however, did not have a significant effect on stress ($\beta = -0.080$, $p = .140$). This means that competence and relatedness are stronger protective factors against stress in digital learning environments, while digital autonomy does not seem to reduce stress when other factors are considered.

4.5 Structural equation model

Figure 2 shows that the SEM path network overall fits the data very well.

The Root Mean Square Error of Approximation (RMSEA) was 0.011, well below the recommended threshold of 0.05, which indicates an excellent fit. These results confirm that the proposed structural model closely matched the observed covariance structure in the sample.

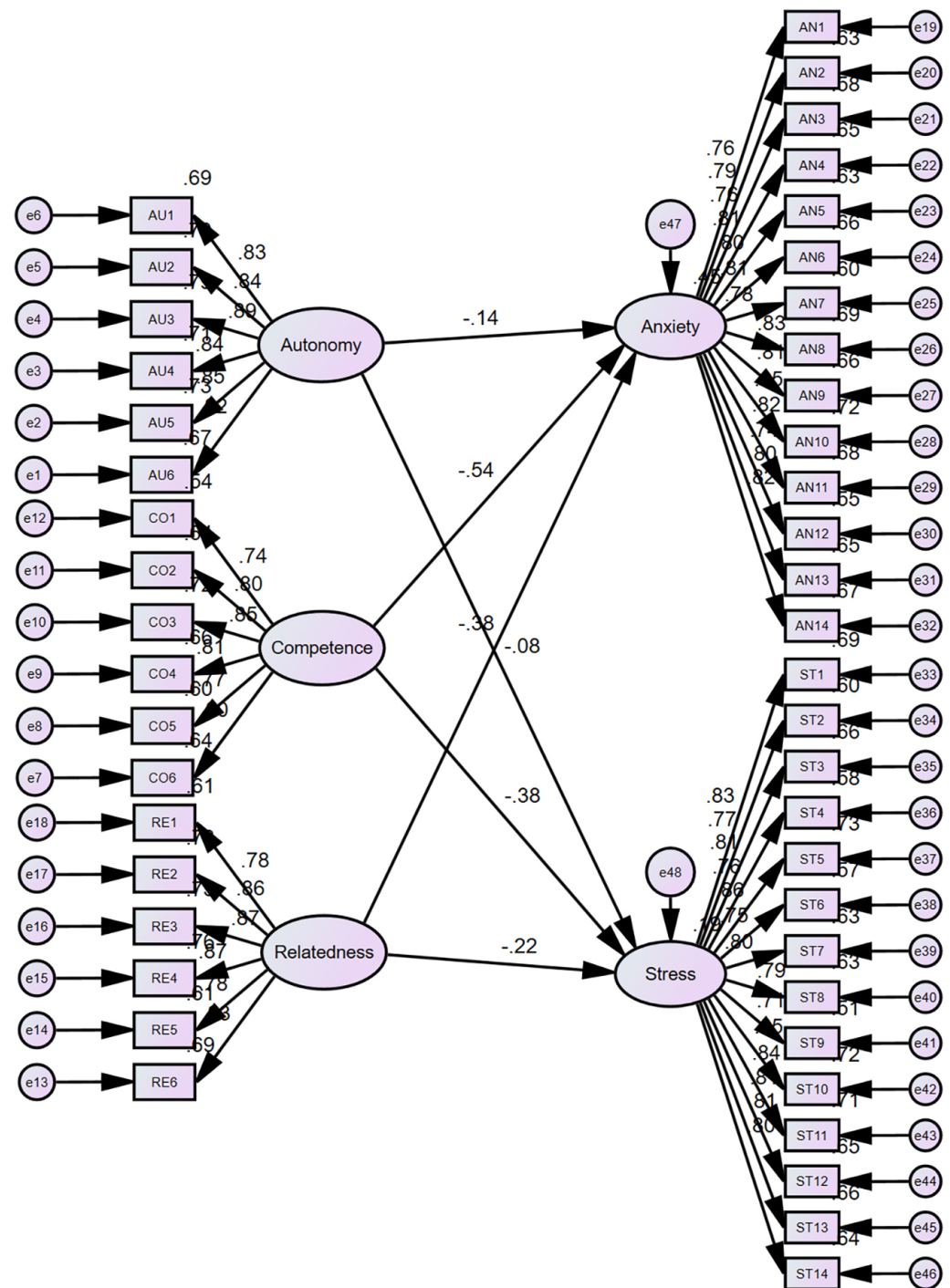


Fig. 2. Structural equation modelling path

4.6 Structural path estimation and hypothesis testing

Table 7 shows the direct structural path coefficients estimated through SEM using AMOS. The SEM results showed that digital competence and digital relatedness both had significant negative effects on anxiety and stress. Digital competence had the strongest effect, predicting lower anxiety ($B = -0.435$, $p < .001$) and stress ($B = -0.401$, $p < .001$). This means students who felt more digitally competent reported less

psychological distress. Digital relatedness also reduced anxiety ($B = -0.306$, $p < .001$) and stress ($B = -0.228$, $p < .001$), suggesting that feeling socially connected and supported online helps protect students' mental health.

Digital autonomy also showed a significant negative relationship with anxiety ($B = -0.121$, $p < .001$), supporting the proposed association between autonomy and reduced anxiety. However, the relationship between digital autonomy and stress was not statistically significant ($B = -0.086$, $p = .085$). Therefore, the hypothesis predicting the effect of autonomy on stress was rejected.

Table 7. Structural path estimation and hypothesis testing ($N = 472$)

Structural Path	Unstandardized B	S.E.	C.R.	p-Value	Decision
Anxiety $\leftarrow$ Autonomy	-0.121	0.033	-3.688	< .001	Supported
Stress $\leftarrow$ Autonomy	-0.086	0.050	-1.720	.085	Rejected
Anxiety $\leftarrow$ Competence	-0.435	0.038	-11.377	< .001	Supported
Stress $\leftarrow$ Competence	-0.401	0.051	-7.864	< .001	Supported
Anxiety $\leftarrow$ Relatedness	-0.306	0.034	-9.030	< .001	Supported
Stress $\leftarrow$ Relatedness	-0.228	0.048	-4.764	< .001	Supported

In summary, five out of six proposed hypotheses were supported. The results show that competence and relatedness consistently help protect against psychological distress, while autonomy has a weaker and less consistent effect across different types of distress.

4.7 Discussion

This study examines and discusses three main components of the SDT simultaneously: autonomy, competence, and relatedness to see the impact of mobile empowerment on psychological discomfort among Chinese students learning in higher education, who are highly dependent on digitalised learning environments. This study found a clear structural difference in how mobile empowerment interacts with generalised anxiety and psychological stress.

The main conclusion of this research is the structural behaviour of the Digital Autonomy (AU) construct that empirically characterises the processes of the "Autonomy Paradox". In the first bivariate analysis, a statistically significant inverse relationship was found between digital autonomy and both generalised anxiety ($r = -0.519$, $p < 0.001$) and psychological stress ($r = -0.337$, $p < 0.001$). These findings are consistent with traditional techno-optimistic views that more flexibility relieves students' distress [1], [5]. However, when the variables were examined simultaneously within the multivariate models, the direct relationship between digital autonomy and psychological stress became statistically insignificant.

Multiple regression analysis ($t = -1.479$, $p = .140$) and the SEM ($B = -0.086$, $C.R. = -1.720$, $p = .085$) indicated that autonomy did not independently predict stress after controlling for competence and relatedness. Digital competence emerged as the strongest protective factor across both the regression and SEM analyses, demonstrating significant negative effects on generalised anxiety ($B = -0.435$, $p < .001$) and psychological stress ($B = -0.401$, $p < .001$). These findings indicate that students with higher levels of digital self-efficacy and information-management capability

experience lower levels of psychological distress. Students who possess strong digital competence are better able to manage academic demands, filter excessive information and effectively navigate AI-driven learning environments, thereby reducing cognitive overload and technostress [2], [3], [7].

Similarly, digital relatedness demonstrated significant negative relationships with both generalised anxiety ($B = -0.306$, $p < .001$) and psychological stress ($B = -0.228$, $p < .001$). This suggests that social connectedness, emotional support and peer interaction within digital environments function as important psychological protective factors [1], [4]. Supportive communication networks and a sense of belonging may help students manage academic pressures, reduce emotional exhaustion, and minimise feelings of isolation within highly connected digital campus environments [8], [9].

Lastly, counselling frameworks should use mobile technologies to build real, helpful peer networks. Universities can add peer support communities to digital mental health tools, like mindfulness apps or Virtual Reality Hybrid Therapy Programs (VRHTP), as shown in regional pilot trials [15], [16]. If digital tools focus less on academic performance and more on building real skills and connections, institutions can better protect student mental health as technology advances [17].

5 CONCLUSION AND FUTURE STUDIES

This research effectively deconstructs the “Autonomy Paradox” in a hyper-digitised campus by proving that mobile educational technology, while providing complete flexibility, cannot by itself relieve situational stress for students. Structural equation modelling indicates that the straight channel from perceived digital autonomy to psychological stress reduction is statistically insignificant because of border blurring and constant connectivity demands. Conversely, developing internal digital competence and authentic digital-relatedness serve as highly robust protective shields that systematically lower generalised anxiety and stress. Future research could use longitudinal tracking models to see how these needs change during different academic semesters. Researchers should also examine mixed-method interventions, such as adding peer-support structures to Virtual Reality Hybrid Therapy Programs (VRHTP), to help build lasting psychological resilience among university students.

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