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Relationships Between the Three Stages of Internet Addiction and Its Risk Factors, and the Mediating Effect of Negative Affect

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Abstract. Internet addiction has been largely understood as a psychological disorder with severe consequences to individuals. Many of its correlations with potential risk factors like school climate and stress have been discovered and evaluated, yet few studies have applied its three-stage-cycle explanation to these correlations to reach a deeper understanding. This study aims to analyze the effect of risk factors like school climate and perceived stress on each stage of Internet addiction among adolescents, and offer a comparison. The study also examines the mediating effect of negative affect on these correlations, and takes a look at gender differences on this topic. 205 valid questionnaires were collected, assessing the participants by variables of school climate, perceived stress, negative affect, withdrawal and craving symptoms, and Internet addiction severity. Results and analysis demonstrate that the two risk factors were more significantly correlated with changes in severity of the Negative Affect/Withdrawal stage. A significant negative correlation and mediating effect of negative affect was found between school climate and Internet addiction, while no significant ones were found between perceived stress and Internet addiction. No significant differences were found between the two genders. In addition, no significant differences were found between genders. This study suggests potential new research directions of applying theoretical explanations to reach further understandings of Internet addiction, unexpected correlational and gender-related findings also suggest new explanations to the relationships between the different variables.

Keywords: Internet Addiction, Addiction Cycle, Stress, School Climate, Negative Affect

1. Introduction

Internet addiction has become a serious occurring issue. Müller et al.[1] reported a 2.1% rate of Internet addiction among the samples in a representative survey of the German population. Similary, a study in the Netherlands found a 3.7% prevalence of potential addicts among adolescents[2]. Although some positive effects of improving academic performances have been reported, severe negative impacts like physical aches and depression[3] and the prevalence of Internet addicts in large populations urge for studies on Internet addiction to reach higher understanding on the topic and prevent certain negative consequences.

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The three-stage addiction cycle model, proposed by Koob and Volkow[4], including binge/intoxication, withdrawal/negative affect, and preoccupation/anticipation stages, has been helpful in understanding substance addictions, but it hasn't been fully applied to Internet addiction. Few studies have looked at how these stages connect to risk factors for Internet addiction, like stress and school climate, or how they affect the development of the addiction.

This study will look at how different stages of Internet addiction contribute to its development in correlation with risk factors like perceived stress and school climate, and whether negative emotions exist as a mediating factor.

2. Literature review

2.1. Internet addiction

Addiction to the Internet often develop from "over-involvement of the Internet"[5]. Shaw and Black[6] define Internet addiction as a condition characterized by excessive or poorly regulated cravings and behaviors relating to computer and Internet use, which subsequently lead to negative consequences. Common symptoms associated with Internet addiction include depression, hostility, as well as social phobia[7][8]. Suhail and Bargees[3] suggested that the excessive use of the Internet negatively impacts various aspects of life, including educational, physical, psychological, and interpersonal dimensions, resulting in issues such as social isolation, reduced sleep, and migraine or headache. A study conducted on Malaysian young adults found that excessive Internet use correlates with interpersonal, behavioral, physical, psychological and work problems, which have been confirmed to be effects of Internet addiction in previous literature[9]. Specifically, these negative consequences include reduction in productivity, body aches, psychological disorders, withdrawal from social activities, and sleep disturbances. Internet addiction prevail in many populations.

2.2. Behavioral addictions and substance addictions

Traditionally, the term "addiction" was exclusively associated with addictive drugs and substances, which induce some similar mechanisms in the brain's reward system[10]. However, diagnostic criteria similar to these substance addictions have been applied to many problematic behaviors as well, such as pathological gambling and Internet use[11]. Within the two categories of addictions, a strong neurobiological link has been established[12]. These "behavioral addictions" are similar to the substance addictions except for the object one is addicted to, and similar etiological development mechanisms have been suggested[13].

2.3. Three-stage model

The development of addiction can be conceptualized as a cyclical process consisting of different stages. Various models have been proposed to describe this cycle, such as Griffiths'[14] six-stage model of "Salience, Euphoria, Tolerance, Withdrawal, Conflict, Relapse" and Koob's three- stages model of "Binge/Intoxication, Withdrawal/Negative Affect, Preoccupation/Anticipation". For the purposes of this study, we focus on Koob's three-stage model, as it provides a more streamlined interpretation that is directly relevant to our research.

Koob and Volkow[4] explains addiction as a cycle characterized by the reduced activity in brain reward systems and heightened involvement of anti-reward systems. This cycle, in the context of the three-stage cycle model, follows a linear pattern through the three stages. The stages have specific relating symptoms. In Reilly[15]'s examination of alcohol dependence, it is stated that 1. The

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Binge/Intoxication stage is characterized with high emotional response as well as over-consumption, 2. The Withdrawal/Negative Affect stage is characterized with increased stress reactivity, depression, and negative emotions, 3. Some dependent individuals demonstrated higher brain activation during alcohol(the object of addiction)-cue tasks.

Originally, this model was based on neurological studies of substance addiction. However, due to the similarities in underlying mechanisms, the model can be generalized to behavioral addictions, such as Internet addiction. For instance, symptoms of Internet addition, such as excessive mental focus with the Internet, withdrawal syndromes, sleep disturbance, as well as continuous craving for Internet use[16]. These symptoms are all consistent with the specific stage symptoms in the three-stage cycle model, as explained in detail in the previous paragraph. Formerly, little studies about the risk factors and possible results of Internet addiction have adapted this addiction cycle model to reach a more complex conclusion of the mechanism of Internet addiction.

2.4. Mediating factors

Numerous studies on Internet addiction have identified multiple risk factors and mediating factors for Internet addiction. Common risk factors include perceived stress and school climate, which are also the focus of this study. A group of researchers states that Internet addiction is positively correlated with stress and social anxiety among Chinese middle school students, mediated partially by social anxiety[17]. Li et al.[18] suggests a positive association between negative school climate and Internet addiction, which is mediated by association with delinquent peers. Some researchers indicate in their research the positive correlation between stressful life events and Internet addiction, mediated by depression[19]. A positive correlation between academic stress and smartphone dependence has also been stated by Wang et al.[20], which is mediated by distress and moderated by academic resilience.

2.5. Research questions and hypothesis

When considering these findings within the context of the three-stage cycle model of addiction, new research questions arise: Which specific stage of the addiction cycle is most strongly correlated with these risk factors? Furthermore, symptoms associated with the Withdrawal/Negative Affect stage—such as depression, stress, and distress—are frequently identified as mediating factors in the relationship between risk factors and Internet addiction. Given this connection, could other symptoms related to the Withdrawal/Negative Affect stage, for example, negative emotions, also serve as mediating factors for Internet addiction? Currently, little literature focus on the mediating effect of negative affect when studying the correlation between Internet addiction and risk factors like school climate and stress.

This research aims to achieve a more intact understanding of the mechanisms of Internet addiction by studying its risk factors and mediating factors under the context of the three-stage addiction cycle model. This study mainly focuses on school climate and perceived stress as risk factors, and negative emotions as a potential mediating factor. The research questions are: 1. Which stage of the addiction cycle is most strongly correlated with changes in school climate and perceived stress? 2. Does negative affect mediate the correlation between school climate/perceived stress and Internet addiction? For the two questions, the author hypothesizes that 1. The Withdrawal/Negative Affect stage is most strongly correlated with these risk factors; 2. Negative emotions have a mediating effect between school climate/perceived stress and Internet addiction.

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3. Method

3.1. Participants

We recruited 226 Chinese adolescents to complete an online survey, some surveys were identified as invalid due to filling in an invalid age(n=1) or failing in one of four attention-check questions(n=20). Among the valid samples(n=205), 98.05% of the original participants are in high school - grades 10 to 12(n=201), and the 1.95% are in grade 9(n=4). The participants' age range from 15 to 18, with a mean age of 16.47(SD=0.5102). 48.78% are male(n=100), while 51.22% were female(n=105).

3.2. Procedure

In the online survey, the participants report their school climate, and their perceived stress within a month. They also respond to questions about their feelings after using the Internet within a month, including anxiety, depression, stress, positive and negative emotions, their life satisfaction, as well as their feelings of craving and anticipation towards the Internet. Lastly, the participants report their Internet use habits and relating behaviors.

3.3. Measures

3.3.1. School climate

Delaware School Climate Survey(DSCS) is a reliable instrument for briefly measuring the school climate[21]. Participants choose, on a scale from 1(strongly disagree) to 4(strongly agree), the extent to which they agree with the statement. There are seven subscales, consisting of 31 total items: teacher-student relations(i.e., Teachers care about their students.), student-student relations(i.e., Students care about each other), student engagement schoolwide(i.e., Most students try their best.), clarity of expectations(i.e., Rules are made clear to students.), fairness of rules(i.e., Classroom rules are fair.), school safety(i.e., Students are safe in the hallways.), and bullying schoolwide(i.e., Students threaten and bully others.). To note, the item "Teachers treat students of all races with respect." was modified to "Teachers treat students of all backgrounds with respect.". This is since all the participants of this study are Chinese, thus making the original item inapplicable. The Cronbach's alpha for the teacher-student relations subscale is 0.68, for the student-student relations subscale is 0.67, for the student engagement schoolwide subscale is 0.72, for the clarity of expectations subscale is 0.71, for the fairness of rules subscale is 0.66, for the school safety subscale is 0.65, for the bullying schoolwide subscale is 0.66. The Cronbach's alpha for the whole survey is 0.94. A total school climate score is derived by summing scores across all subscales. To note, all scales and surveys in this study is scored by this method except for the Positive and Negative Affect Schedule, since this method effectively sums up consistent or similar variables and hence facilitate further analyses of the data.

3.3.2. Perceived stress

Perceived Stress Scale(PSS). This 10-item(i.e., In the last month, how often have you been upset because of something that happened unexpectedly?) questionnaire aims to evaluate the amount of stress in the participants[22]. The participants answer, on a scale of 1(never) to 5(very often), about

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their frequency of certain thoughts and feelings. The final perceived stress score is acquired by summing the scores of all items. The Cronbach's alpha for this scale is 0.83.

3.3.3. Positive and negative emotions

Positive and Negative Affect Schedule(PANAS). The questionnaire aims to assess the participants positive and negative trait affect[23]. It contains two 10-item subscales for positive(i.e., active, excited, strong) and negative affect(i.e., ashamed, guilty, hostile). The participants choose, on a scale of 1(very slightly or not at all) to 5(extremely or very much), the extent to which they feel a certain affect during the past month. The scores for the two subscales are calculated separately by adding up the scores of items. This method of scoring is due to the opposition in the content of the two subscales, as one is about negative affect and the other is about positive affect. The Cronbach's alpha for the positive affect subscale is 0.84, for the negative subscale is 0.88. The average Cronbach's alpha is 0.86.

3.3.4. Depression, anxiety, and stress

Depression Anxiety Stress Scales - Youth Version(DASS-Y) assesses negative emotional states in adolescents[24]. Considering that the participants in this study are all adolescents, the youth version of the scale is used. The 21-item questionnaire contains three subscales: Depression(i.e., I did not enjoy anything.), anxiety(i.e., I felt dizzy, like I was about to faint.), and stress(i.e., I got upset about little things.). Participants choose, on a scale of 1(not true) to 4(very true), the extent to which they have undergone certain thoughts and feelings. A final score is calculated by summing the scores across the three subscales. The Cronbach's alpha for the Depression subscale is 0.78, for the Anxiety subscale is 0.78, and for the anxiety subscale is 0,79. The average Cronbach's alpha is 0.78.

3.3.5. Life satisfaction

Students' Life Satisfaction Scale(SLSS). The 7-item(i.e., My life is going well.) questionnaire aims to assess the students' life satisfaction[25]. The participants respond, on a scale of 1(strongly disagree) to 6(strongly agree), about some of their thoughts and feelings on life in the past month. A final score is calculated by summing the scores for every item. The Cronbach's alpha for this scale is 0.74.

In this study, the DASS-Y and SLSS are both used to measure the intensity of the withdrawal/negative affect stage, as depression, anxiety, stress are common withdrawal symptoms, which are associated with life dissatisfaction[26].

3.3.6. Craving

Brief Substance Craving Scale(BSCS). The BSCS is a 8-item, self-report instrument assesses craving substances of abuse over a 24 hour period[27]. Intensity and frequency of craving are recorded on a five-point Likert scale. To note, though the scale was originally designed for assessing substance abuse, due to the fundamental similarity in substance and behavioral addictions as explained in the Literature Review part, this scale is modified to be used to assess Internet addiction. The current scale has only 3 items in the modified scale, focusing on the intensity, frequency, and length of time of craving. The concerned time period in the items was changed from "the past 24 hours" to "the past month" in order to match the other scales and surveys in this study, and to capture more data throughout a longer period. For this reason, the original Item 4 was removed as it

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asked for the number of times of cravings, which would be unreasonable to ask over such a long time period. Items 5 to 8 were also removed, as they were about a second craved drug, which, did not exist in this case of Internet addiction. The Cronbach's alpha for the modified scale is 0.52. Though this value that indicates internal consistency is relatively low, due to the exploratory nature in the modification of this scale, in some studies a relatively low Cronbach's alpha is acceptable[28].

3.3.7. Internet addiction

Chinese Internet Addiction Scale - Revised(CIAS-R) measures the severity of Internet addiction[29]. The CIAS-R is a 26-item self-reported questionnaire. It comprises five subscales: compulsive use(i.e., I have tried to spend less time online but have been unsuccessful.), withdrawal symptoms(i.e., I feel uneasy once I stop going online for a certain period of time.), tolerance symptoms(i.e., I have increased substantially the amount of time I spend online.), interpersonal and health-related problems(i.e., I find myself going online instead of spending time with friends.), and time management problems(i.e., I feel tired during the day because of using the Internet late at night.). Participants respond a four-point Likert scale ranging from 1(Does not match my experience at all) to 4(Definitely matches my experience). Higher scores indicate a more severe level of Internet addiction. The Cronbach's alpha for the compulsive use subscale is 0.74, for the withdrawal symptoms subscale is 0.56, for the tolerance symptoms is 0.41, for the interpersonal and health-related problems is 0.8, for the time management problems is 0.52. The Cronbach's alpha for the whole survey is 0.88.

4. Results

The means and standard deviations for the different variables are calculated. In order to facilitate later analyses, the correlations between these variables are regressed, and their correlation coefficients are compared.

Table 1 below demonstrates means, standard deviations of the variables, and the significance of the correlations between them. Some correlations, for example, the one between negative affect and life satisfaction, are not tested due to their irrelevance to the research questions.

Contrary to former findings[18], a significant positive correlation was found between positive school climate and Internet addiction severity($t=5.04$, $r=0.33$, $p<0.001$). In addition, a significant positive correlation was indicated between school climate and the extent of negative affect($t=7.35$, $r=0.46$, $p<0.001$).

On the other hand, a positive correlation is demonstrated between levels of perceived stress and Internet addiction severity($t=1.11$, $r=0.078$), consistent with former research[17]. However, this positive association is found to be insignificant($p>0.05$). Yet, a significant positive correlation is suggested between perceived stress and the extent of negative affect($t=2.09$, $r=0.15$, $p<0.05$).

Table 1: Means, standard deviations, and correlation significance

Variable	Mean	SD	School Climate	Perceived Stress	Extent of Negative Affect
School Climate	100.38	10.39	/		
Perceived Stress	30.06	2.67	/	/	
Extent of Negative Affect	37.00	7.13	4.87e-12***	0.038*	/
Internet Addiction	83	11.46	1.05e-6***	0.27	1.91e-13***

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Note. *p<0.05, **p<0.01, ***p<0.001.

5. Hypothesis testing

5.1. The significance of correlation between the risk factors and different stage symptoms

In this study, depression, anxiety, stress(which will be referred to as "DAS"), and life dissatisfaction are viewed as symptoms for the withdrawal/negative affect stage, while feelings of craving are viewed as symptoms for the preoccupation/anticipation stage. In order to find out changes in school climate and perceived stress are most significantly correlated with which stage, the correlation between these variables are regressed, and the correlation coefficient as well as the significance are compared. The results are presented in Table 2 below.

For perceived stress, the only significant correlation is its negative correlation with life satisfaction(t=-2.29, r=-0.16, p<0.05). For school climate, there are three significant correlations: a negative correlation with DAS(t=-8.39, r=-0.51, p<0.001), a positive correlation with life satisfaction(t=4.18, r=0.28, p<0.001), and a positive correlation with craving(t=2.73, r=0.19, p<0.01). By comparing the p-values, which indicate the level of significance, of the three correlations, it is suggested that the correlations between school climate and DAS, life satisfaction are of more significance(p<0.001). As decrease in DAS as well as increase in life satisfaction both indicate a reduction in withdrawal/negative affect stage symptoms, it is apparent that changes in perceived stress and school climate are all more significantly correlated to changes in symptoms of the withdrawal/negative affect stage.

Hence the withdrawal/negative affect stage is more significantly correlated to changes in the two risk factors.

Table 2: Means, standard deviations, and correlation significance

Variable	Mean	SD	School Climate	Perceived Stress
Depression, Anxiety, Stress	47.41	12.71	8.443-15***	0.47
Life Satisfaction	26.07	3.07	4.40e-5***	0.023*
Craving	11.75	2.46	0.007**	0.41

Note. *p<0.05, **p<0.01, ***p<0.001.

5.2. The mediating effect of negative affect on the correlation between the risk factors and internet addiction severity

The proposed mediation model between the risk factors(School climate and Perceived stress), negative affect, and Internet addiction is presented in the drawn diagram Figure 1 below.

5.2.1. School climate and internet addiction

To test if negative affect mediates the correlation between school climate and internet addiction and to examine the potential mediation model, regression analyses were proceeded on the sample data.

Initially, as presented in the Results section, school climate significantly predicts higher levels of severity of Internet addiction(b=0.33, p<0.001). school climate also significantly predicts higher

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extent of negative affect(b=0.46, p<0.001).

To determine whether negative affect mediates the relationship between school climate and internet addiction, a mediation analysis using the "mediation" package in R with 1000 bootstrapped resamples is conducted. The results showed that negative affect significantly mediated this relationship (indirect effect ab = 0.21, 95% CI [0.10, 0.32]). Additionally, the direct effect of school climate on internet addiction was non-significant (c = 0.16, p>0.05).

These findings suggest that negative affect fully mediates the connection between school climate and internet addiction. This confirms the hypothesis that negative affect is a mediator for the association between school climate and Internet addiction.

5.2.2. Perceived and internet addiction

To test if negative affect mediates the correlation between perceived stress and internet addiction and to examine the potential mediation model, regression analyses were proceeded on the sample data.

Initially, as presented in the Results section, perceived stress does not significantly predict severity of Internet addiction(b=0.078, p>0.05). To note, although the correlation between the two variables is suggested to be insignificant, the mediation analysis is still proceeded in order to examine further potential mediating relationships.

However, perceived stress significantly predicts higher extent of negative affect(b=0.15, p<0.05).

To determine whether negative affect mediates the relationship between perceived stress and internet addiction, a mediation analysis using bootstrapping with 1000 resamples is conducted. The results showed that negative affect did not significantly mediate this relationship (indirect effect ab = 0.30, p>0.05). Additionally, the direct effect of perceived stress on internet addiction was also non-significant (c = 0.03, p>0.05).

These findings confirm that there is no found significant correlation between perceived stress and Internet addiction severity, and that negative affect does not affect this correlation. This denies the hypothesis that negative affect is a mediator for the association between perceived stress and Internet addiction.

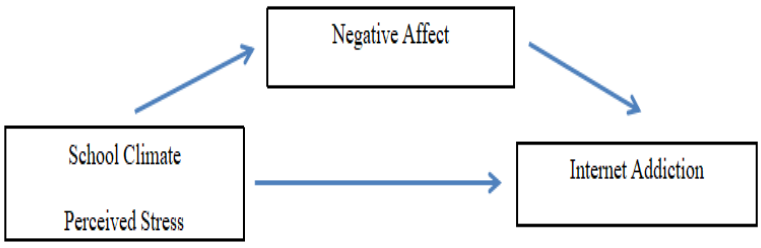

Figure 1: Mediation Model

5.3. Exploratory research

As many existing studies about the correlation of Internet addiction and risk factors or consequences consider gender to be a risk factor of Internet addiction, this study conducts an Welch t-test to test for equal means of the different variables within the two gender groups. The means, standard deviations and test significance are presented in Table 3 below.

By comparing the data for the whole sample, the results do not demonstrate any significant disparities in terms of the means and distributions of the four different variables. This means that

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observed differences between the groups are by chance.

Table 3: Means, standard deviations, and test significance

Variable	Mean	SD	Significance
School Climate	100.38	10.59	0.074
Perceived Stress	30.06	2.67	0.082
Negative Affect	37.00	7.13	0.159
Internet Addiction	83.64	11.46	0.719

Note. *p<0.05, **p<0.01, ***p<0.001.

In advance of these insignificant findings, deeper regression analyses were proceeded to seek for hidden differences between the two genders and potential associations between the the three variables of stress, negative affect and Internet addiction. In order to analyze the effect of gender and another independent variable(Stress or negative affect) on the dependent variable(Negative affect or Internet addiction), this study employs dummy coding in R for the categorical variable of gender, where 0 resembles males and 1 resembles females.

5.3.1. Gender differences in the relationships between stress and negative affect

A linear regression analysis was conducted to explore the effect of gender and perceived stress on the extent of negative effect.

From the results, there is a positive and significant correlation between perceived stress and negative affect($b=1.18$, $p<0.05$). This indicates that the extent of negative affect increases as perceived stress increases.

However, there is no significant correlation found between the variables of gender and extent of negative affect($b=14.25$, $p>0.05$).

The interaction term between perceived stress, gender and negative affect was also insignificant($b=-0.53$, $p>0.05$). This result suggests that the association between perceived stress and negative affect do not differ by gender.

5.3.2. Gender differences in the relationship between negative affect and internet addiction

To analyze gender differences among this relationship, an linear regression analysis was also performed.

The results reveal no significant correlations between negative affect and Internet addiction($b=0.54$, $p>0.05$), the correlation between gender and Internet addiction($b=-5.11$, $p>0.05$), and the interaction term between negative affect, gender and Internet addiction($b=0.15$, $p>0.05$). These finding suggest that the variable Internet addiction is not significantly associated with negative affect or gender, and that the relationship between negative affect and Internet addiction do not differ by gender.

5.3.3. Conclusion

In summary, through equal means Welch t-test and linear regression analysis, the findings and results suggest that in this study, the samples do not demonstrate significant differences for scores

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among the two genders. Similarly, the relationships between other variables, namely, Internet addiction, perceived stress, and negative affect, do not differ based on gender.

6. Discussion

6.1. Significance comparison

This study compared the significance of the correlations between the risk factors of school climate and perceived stress, and the Negative Affect/Withdrawal, the Preoccupation/Anticipation stage(both stages were represented by their common symptoms). The results revealed that these two risk factors are more significantly correlated with changes in the Negative Affect/Withdrawal stage. Formerly, few studies have used the three-stage explanation of Internet addiction in its correlational analysis with other risk factors to reach a more in-depth understanding. The findings of this study highlight the importance of withdrawal symptoms in the development of Internet addiction and suggest that future research could build on these correlations to establish potential causal relationships. As these factors are more significantly correlated with the Negative Affect/Withdrawal stage and withdrawal symptoms in adolescents, the role of the Withdrawal stage in the development of Internet addiction is highlighted. This confirms the hypothesis of this study, and may suggest a possible explanation for the connection between these risk factors and Internet addiction severity: It may be that these factors increase Internet addiction severity by leading to increase in Internet withdrawal symptoms; or that greater levels of Internet addiction change adolescents' perception of stress and school climate through enhancing the Negative Affect/Withdrawal stage. Practically, schools and parents can address school environment management and stress adjustments to mitigate these negative effects of Internet addiction.

6.2. Mediation and correlation analysis

By regressing the relationships between the measured variables, the results of this study demonstrate a significant positive correlation between school climate and Internet addiction, meaning that more positive school climate leads to higher severity of Internet addiction, contrary to previous studies[30]. This may be due to that a more positive school climate may be more open towards use of electronics and the Internet in the campus. Moreover, schools with a more positive perceived school climate may be more respectful of students' extracurricular activities and hobbies, which may include Internet use, which is a main predictor for Internet addiction[31].

In addition, an insignificant positive correlation between perceived stress and Internet addiction was observed, suggesting that this pattern is likely attributable to chance. This is also contrary to previous studies[17], which identified perceived stress as a significant predictor of Internet addition. This discrepancy highlights the potential influence of unexamined variables, such as individual differences in coping strategies or the context in which Internet use occurs. While perceived stress may contribute to certain addictive behaviors, other factors such as coping methods and the specific context in which Internet use occurs may play a more significant role in different backgrounds and populations. This emphasizes the importance of considering diverse populations and contextual factors when examining the links between stress and Internet addiction, as well as the need for further research to clarify these relationships.

Through mediation analysis, it is revealed that negative affect fully mediates the relationship between school climate and Internet addiction, while it does not significantly mediate the relationship between perceived stress and Internet addiction. These findings underscore that schools

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and parents could try managing and moderating the emotions and affect of students to preclude development.

6.3. Exploratory research: gender differences

Through t-tests and dummy coding analyses of differences in the two genders, results indicated that there are no significant differences in the means of the responses of the two genders, and that there is no significant interaction effect of gender and school climate/perceived stress on Internet addiction. Previous research also pointed out similar results across genders for Internet addiction[32]. These findings may suggest that for a certain population, the effect of other factors like negative affect, school climate, and perceived stress may be more significant factors than gender.

6.4. Limitations and future research directions

This study established a comparison in the significance of correlations between different stages of Internet addiction and its risk factors of school climate and perceived stress, and analyzed for a mediating relationship between the risk factors, extent of negative affect, and Internet addiction severity, attempting to reach a more in-depth understanding of the development of Internet addiction and its association with other factors. Hoever several limitations should be acknowledged.

First, the study’s sample consisted solely of adolescents from China, whose experiences and behaviors may differ significantly from those of adolescents in other cultural or geographical contexts due to major differences in cultural values, societal norms, and educational systems.

Second, because the study relies on self-reported survey data, it may be subject to response biases, such as social desirability bias, in which case participants can overstate good activities in order to fit in with preconceived notions of what is considered normal, or underreport harmful behaviors. This is particularly important when talking about touchy subjects like Internet addiction, which in some societies may be stigmatized by society. Future research could lessen this restriction and produce more reliable assessments by combining self-reports with objective measurements, such as time spent online, academic records, or instructor reports.

Furthermore, this study's cross-sectional design limits its capacity to establish causality. While links have been found, it is hard to determine the time order in which Internet addiction develops and the risk factors associated with it. In order to address this, future studies may use longitudinal designs, which follow the same subjects over time and offer insights into the ways in which Internet addiction varies and interacts with adolescent developmental shifts. Integrating ideas from developmental psychology, such as Bronfenbrenner's ecological systems theory or Erikson's psychosocial stages, may also help these studies better understand how peer pressure, identity formation, and environmental factors affect the development of Internet addiction.

In addition, the utilization of qualitative research techniques like focus groups and in-depth interviews with teenagers, parents, and educators may expand our comprehension of the intricate, real-world factors that contribute to Internet addiction. These techniques could reveal complex familial, emotional, or social elements that quantitative tools could miss. Examining the stories that underlie excessive internet use may offer context-specific insights, particularly when it comes to comprehending how teenagers view and control their online activity in the face of social pressure and scholastic demands.

Lastly, scientific investigations to look into the neurological bases of Internet addiction might be beneficial to the advancement of this field of study. For example, neuroimaging studies could look at

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changes in the structure or function of the brain in teenagers with different degrees of Internet addiction intensity to find potential neurological correlations. Research examining neurotransmitter levels, reward circuits, or cognitive performance may potentially shed light on the ways in which brain systems underlie addiction behaviors. These biological viewpoints might supplement social and psychological aspects to provide a more comprehensive picture of the illness.

7. Conclusion

This study addressed two research questions: 1. Which stage in the addiction cycle is most strongly correlated with changes in school climate or perceived stress? 2. Do negative emotions play a mediating role between Internet addiction and the risk factors of school climate/perceived stress? By collecting results from Chinese adolescents through questionnaires, results reveal that Withdrawal/Negative Affect stage is most strongly associated with these risk factors. Negative emotions mediate the significant positive correlation between school climate and Internet addiction, while it does not mediate the insignificant positive correlation between perceived stress and Internet addiction. By emphasizing the role of the Withdrawal stage, this study's findings provide new possible understandings and explanations for the development of Internet addiction and its relation with risk factors. In addition, the results suggest that improving student stress management and emotion adjustment could be a helpful way of mitigating Internet addiction development and its negative impacts on adolescents.

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