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Parental Phubbing, Alienation, and Academic Burnout among Chinese Older Adolescents: The Conditional Role of Perceived Social Support

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Received: 27 April 2026; Accepted: 22 July 2026; Published: 29 October 2026

ABSTRACT: Background: Parental phubbing has become increasingly prevalent in the digital age and has been associated with adolescents' maladjustment. However, less is known about the relational processes through which parental phubbing is associated with academic burnout, particularly among Chinese older adolescents. This study aimed to examine whether alienation was associated with the relationship between parental phubbing and academic burnout and whether perceived social support from different sources moderated these associations. **Methods:** A cross-sectional survey was conducted among 511 Chinese older adolescents ($Mean_{age} = 17.01$, $SD = 0.88$). Participants completed validated measures of parental phubbing, alienation, academic burnout, and perceived social support (PSS) from family, friends, and significant others. Structural equation modeling and PROCESS analyses were conducted. **Results:** Parental phubbing was positively associated with alienation ($\beta = 0.32$, $t = 7.50$, $p < 0.001$) and academic burnout ($\beta = 0.09$, $t = 2.32$, $p = 0.020$). Alienation was positively associated with academic burnout ($\beta = 0.53$, $t = 15.66$, $p < 0.001$) and was found to represent a significant indirect association between parental phubbing and academic burnout based on bootstrap estimation. PSS from family, friends, and significant others moderated the associations involved in this indirect process, with significant interaction effects observed across support sources ($\beta_s = -0.089$ to -0.180 , $p < 0.05$). **Conclusions:** Alienation may represent an important relational process underlying the association between parental phubbing and academic burnout among Chinese older adolescents. PSS functions as a contextual relational resource that may attenuate these associations. Interventions targeting technology-related disruptions in parent-child interactions and promoting supportive relational environments may be beneficial for adolescent academic adjustment.

KEYWORDS: Parental phubbing; academic burnout; alienation; perceived social support; Chinese older adolescents

1 Introduction

The widespread integration of smartphones into everyday life has reshaped patterns of social interaction. While these technologies offer convenience and connectivity, growing concerns have emerged regarding their potential psychological consequences. One such concern is phubbing, defined as the act of ignoring others during face-to-face interactions due to smartphone use [1,2]. As a specific form of this behavior within family contexts, parental phubbing refers to parents prioritizing smartphone use over direct engagement with their children. Such behaviors may disrupt parent-child relationships and alter the quality of family interactions in the digital era.

Parental behavior plays a crucial role in adolescents' psychological and academic development [3]. Emerging evidence suggests that parental phubbing is associated with poorer academic performance and greater psychosocial maladjustment among adolescents [4]. Academic burnout, characterized by emotional exhaustion, cynicism, and reduced academic efficacy, arises from prolonged academic stress and excessive demands [5]. Prior studies have reported a positive association between parental phubbing and academic burnout among younger students (Grades 4–9) [6]. However, less is known about the psychological processes underlying this association during late adolescence, particularly among Chinese older adolescents.

Chinese older adolescents (Grades 10–12 in the present study) may be particularly vulnerable to the adverse effects of parental phubbing due to intensified academic pressure in examination-oriented educational systems, where performance in high-stakes tests plays a decisive role in educational advancement [7]. Importantly, late adolescence represents a developmental transition characterized by identity formation, increasing autonomy, and heightened sensitivity to interpersonal relationships [8,9]. According to Erikson's psychosocial development theory, interpersonal experiences become increasingly important for self-evaluation and psychosocial adjustment during this period [10].

Although older adolescents generally demonstrate greater behavioral independence and self-regulation than younger adolescents, they remain emotionally responsive to parental support and validation. Identity formation and interpersonal evaluation also become increasingly important during late adolescence [8–10]. Consequently, subtle forms of parental disengagement, such as parental phubbing, may be particularly relevant to adolescents' subjective perceptions of relational connectedness during this developmental stage.

In addition, older adolescents often experience the coexistence of academic pressure and future-oriented uncertainty related to college entrance examinations, career planning, and the transition to adulthood [11]. Under these conditions, disruptions in parent-child interactions may be associated with adolescents' emotional well-being and academic functioning. Therefore, examining these associations among Chinese older adolescents may provide important developmental insights.

Interpersonal factors have increasingly been recognized as important correlates of academic burnout. Among these, alienation has been consistently associated with burnout in children and adolescents [12]. Alienation refers to a psychological state characterized by feelings of meaninglessness, detachment, and disconnection from significant social contexts, including family, school, and peers [13]. Unlike loneliness, which primarily reflects subjective social isolation, alienation involves broader perceptions of weakened connectedness to social systems and interpersonal relationships.

Parental phubbing has been associated with reduced quality of parent-child engagement [14], which may relate to heightened perceptions of relational disconnection. Empirical studies have further demonstrated a positive association between phubbing experiences and alienation [15]. Importantly, alienation reflects adolescents' broader perceptions of relational disconnection across multiple social contexts rather than a specific parenting behavior, distinguishing it conceptually from parental phubbing. Thus, alienation is conceptualized as a broader psychological construct rather than a direct reflection of parenting behavior. Taken together, these findings suggest that alienation may represent a potential relational process associated with parental phubbing and academic burnout. However, this association remains underexplored among Chinese older adolescents.

In addition to risk-related processes, protective factors warrant consideration. Perceived social support, defined as individuals' perception that support is available from family members, friends, and significant others, plays an important role in adolescent adjustment [16]. Previous research has consistently linked higher levels of perceived social support to lower academic stress and burnout [17]. Rather than functioning solely as a protective factor, perceived social support may also shape how adolescents interpret and respond

to relational difficulties [18]. Developmental and ecological perspectives similarly suggest that supportive interpersonal relationships influence adolescents' vulnerability to emotional maladjustment.

It is therefore plausible that perceived social support may moderate the associations between parental phubbing and alienation, as well as between alienation and academic burnout. This perspective may be particularly relevant during late adolescence, when increasing autonomy coexists with continued emotional dependence on close interpersonal relationships. Adolescents with stronger perceived support may possess greater emotional resources for coping with relational disruptions, whereas those with lower support may be more vulnerable to feelings of disconnection and academic maladjustment. At the same time, perceived social support may not necessarily be associated with lower levels of alienation in all contexts. Adolescents with stronger relational expectations or greater interpersonal sensitivity may simultaneously report higher levels of perceived support and heightened awareness of relational difficulties [19]. Accordingly, social support may function less as a uniformly protective factor and more as a contextual condition influencing adolescents' responses to relational experiences.

To address these gaps, the present study focused on Chinese older adolescents and examined the associations among parental phubbing, alienation, and academic burnout within a conditional indirect association framework. Specifically, we investigated whether alienation is associated with the relationship between parental phubbing and academic burnout and whether perceived social support from family, friends, and significant others moderates these associations. Because different support sources may operate through distinct interpersonal processes, family support, friends support, and significant others support were examined separately. By focusing on older adolescents, introducing alienation as a relational construct, and distinguishing among multiple sources of perceived social support, this study extends previous research by providing a more nuanced understanding of the relational processes linking parental phubbing to academic burnout.

2 Literature Review and Hypotheses Development

2.1 Parental Phubbing and Academic Burnout

Parental phubbing has become increasingly prevalent in the digital era and has been associated with a range of adverse psychological outcomes among adolescents [1]. Existing evidence suggests that excessive parental smartphone use during interactions is linked to internalizing and externalizing difficulties, including depressive symptoms, social withdrawal, aggression, and cyberbullying behaviors [1,20,21]. These difficulties may undermine academic engagement and motivation, thereby increasing vulnerability to academic burnout.

Self-Determination Theory (SDT) posits that satisfaction of the basic psychological needs for autonomy, competence, and relatedness is essential for optimal functioning and well-being [22]. Within this framework, parental phubbing may signal reduced emotional availability and responsiveness, potentially undermining adolescents' sense of relatedness. Such experiences may also be associated with lower perceived competence and autonomy in academic contexts. Persistent frustration of these needs has been linked to academic stress, emotional exhaustion, and disengagement, which are core features of academic burnout [23,24].

These associations may be particularly relevant during late adolescence, a developmental period characterized by ongoing identity formation and increasing sensitivity to interpersonal evaluation [25,26]. Consistent with Erikson's psychosocial perspective, adolescents increasingly rely on interpersonal feedback when evaluating themselves and navigating developmental challenges during late adolescence [8–10]. Although older adolescents generally demonstrate greater autonomy and self-regulation, they continue to rely on parental emotional responsiveness and validation [11,27]. Consequently, parental inattentiveness

during everyday interactions may be perceived as relational disengagement, with implications for both emotional well-being and academic functioning.

Consistent with this perspective, adolescents who perceive greater parental neglect, lower parental warmth, or reduced parental involvement tend to report higher levels of academic burnout [25,26,28]. More directly, previous empirical studies have consistently reported positive associations between parental phubbing and poorer academic adjustment, including higher levels of academic burnout, among children and adolescents [4,6,25]. Drawing on both theoretical considerations and existing empirical evidence, the present study proposes the following hypothesis:

Hypothesis 1: *Parental phubbing is positively associated with academic burnout among older adolescents.*

2.2 Alienation as an Indirect Relational Process

From the perspective of SDT, chronic frustration of basic psychological needs may contribute to alienation, a psychological state characterized by detachment, powerlessness, and social disconnection [22]. In the present study, alienation is conceptualized as a broad perception of relational disconnection across social contexts rather than a direct reflection of parental behavior [29]. Although the alienation measure includes a family alienation dimension, the construct also encompasses interpersonal alienation and social isolation, reflecting broader experiences of relational disconnection across multiple social contexts [13,29,30]. Accordingly, parental phubbing and alienation are theoretically distinct constructs: parental phubbing refers to a specific parenting behavior, whereas alienation reflects adolescents' subjective psychological experiences arising from disrupted relational processes. Unlike parent-child attachment, which reflects the quality of enduring emotional bonds between parents and adolescents [29], and perceived neglect, which concerns adolescents' perceptions of insufficient parental care or responsiveness [26], alienation refers to a broader psychological state characterized by feelings of relational disconnection, estrangement, and lack of belonging across multiple social contexts. Therefore, although parental phubbing may contribute to alienation, the two constructs remain conceptually distinct.

When parents are persistently distracted by smartphones, the quality of parent-child interactions may be reduced, limiting emotional responsiveness and meaningful communication [31]. Such experiences may weaken adolescents' sense of belonging and relational security, thereby increasing feelings of alienation [32].

This process may be particularly salient during late adolescence, when adolescents place increasing importance on identity validation, emotional reciprocity, and interpersonal recognition [9,33]. As parent-child relationships gradually become more reciprocal, parental inattentiveness may be experienced as a significant relational disruption [11]. Empirical studies have shown that parental neglect or rejection, including technology-related inattentiveness, is positively associated with adolescents' alienation [34].

Alienation has also been linked to lower academic engagement, reduced persistence, and higher levels of academic burnout [35,36]. Importantly, alienation is conceptually distinct from both loneliness and academic burnout. Whereas loneliness primarily reflects perceived deficiencies in social relationships [37], and academic burnout reflects exhaustion, cynicism, and reduced efficacy in academic settings [38], alienation encompasses broader perceptions of interpersonal detachment, meaninglessness, and weakened connectedness across relational domains [39]. This distinction supports the proposition that alienation may represent an indirect psychological process statistically linking parental phubbing and academic burnout.

Hypothesis 2: *Alienation is expected to mediate the association between parental phubbing and academic burnout.*

2.3 The Conditional Role of Perceived Social Support

Perceived social support is widely recognized as a protective factor in adolescent development [40]. Although perceived social support has traditionally been examined within the stress-buffering framework [18], the present study conceptualizes it primarily as a contextual interpersonal resource that may influence how adolescents interpret and respond to relational difficulties [41].

Perceived social support reflects adolescents' perceptions that emotional and interpersonal resources are available from family members, friends, and significant others [42]. When adolescents experience parental phubbing as relational inattentiveness, perceived social support may influence the extent to which these experiences are internalized as emotional disconnection [43].

Supportive relationships may help adolescents maintain a sense of belonging and emotional security despite relational disruptions within the family context [40]. However, perceived support does not necessarily indicate the absence of relational difficulties. Because perceived social support reflects adolescents' subjective evaluation of interpersonal relationships, individuals with stronger relational expectations or heightened interpersonal sensitivity may simultaneously perceive available support and report greater relational concerns [19,44].

This possibility may help explain why perceived social support is not always negatively associated with alienation. Rather than representing a simple protective factor, perceived social support may function as a contextual resource that shapes adolescents' responses to relational experiences.

Empirical evidence indicates that social support may weaken the association between adverse family experiences and adolescent maladjustment [45,46]. For example, adolescents exposed to parental neglect report fewer depressive symptoms when strong peer support is available [45]. Social support has also been found to attenuate the association between alienation and psychological distress and to promote school adjustment [17], suggesting that it may reduce the strength of the association between alienation and academic burnout.

Importantly, the influence of different sources of support may vary across cultural contexts. In collectivist settings such as China, family relationships remain central to adolescents' socialization and emotional development. At the same time, family support may coexist with parental monitoring, achievement expectations, and academic pressure, potentially producing complex emotional experiences [47]. Consequently, support from family, friends, and significant others may operate differently.

Furthermore, support from friends and significant others may become increasingly important during late adolescence [40]. Although peer relationships provide emotional resources, peer interactions within competitive educational environments may simultaneously involve comparison and performance concerns. Significant others, including teachers, mentors, relatives, or trusted adults, may provide alternative sources of emotional validation beyond the family context. However, empirical evidence comparing the roles of family, friends, and significant-other support remains limited. Examining these distinctions may provide a more nuanced understanding of adolescent adjustment within the Chinese cultural context.

Accordingly, the present study examines whether perceived social support from different sources moderates the associations among parental phubbing, alienation, and academic burnout.

Hypothesis 3: *Perceived social support from family, friends, and significant others is expected to moderate the associations between parental phubbing, alienation, and academic burnout, although the magnitude of these buffering effects may vary across support sources.*

The present study examined the associations among parental phubbing, alienation, and academic burnout among Chinese older adolescents within a conditional indirect association framework. Building on the preceding literature, this study aimed to examine whether alienation was statistically associated with the link between parental phubbing and academic burnout and whether perceived social support from different sources moderated these associations between parental phubbing and alienation, as well as between alienation and academic burnout. By focusing on older adolescents within the context of examination-oriented education, the present study seeks to extend understanding of how developmental and sociocultural factors jointly shape adolescents' vulnerability and adjustment in the digital era. The proposed model is presented in Fig. 1.

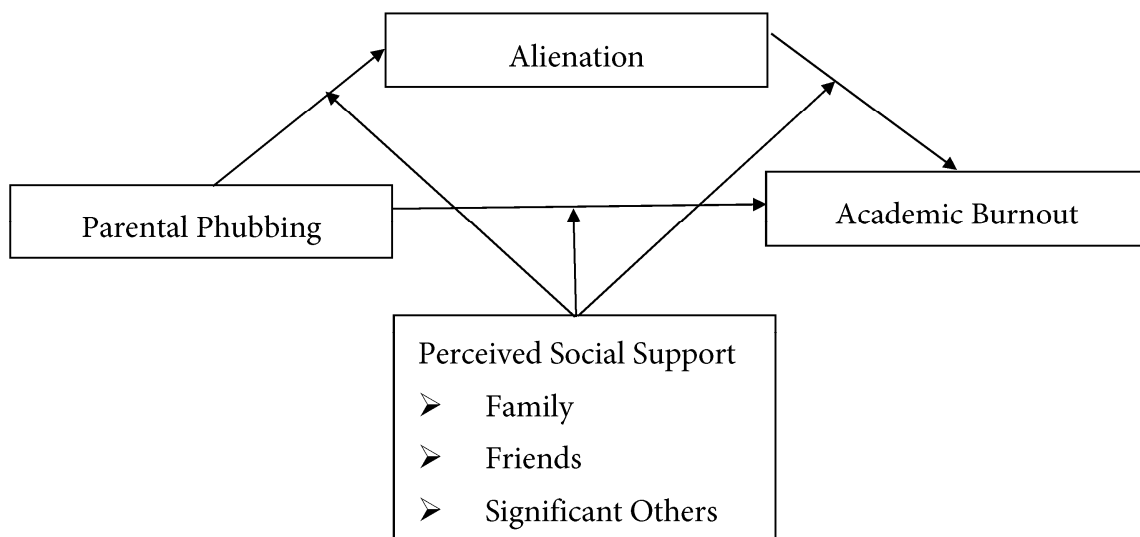


Figure 1: Conceptual model of the associations among parental phubbing, alienation, academic burnout, and perceived social support.

3 Method

3.1 Participants

A total of 600 students were recruited using a purposive convenience sampling approach (non-probability sampling) from mainstream public high schools in Datong (Shanxi Province, central China) and Mudanjiang (Heilongjiang Province, northeastern China). The sampling approach was non-probabilistic due to school accessibility and existing institutional collaborations. Of the 600 distributed questionnaires, 511 valid responses were retained for final analysis (54.40% female; $Mean_{age} = 17.01$, $SD = 0.88$), yielding a valid response rate of 85.20%. Participants were required to be enrolled in regular secondary education and to be living with at least one parent, ensuring sufficient daily parent-child interaction relevant to the assessment of parental phubbing. Questionnaires were excluded if they met any of the following criteria: (a) patterned responding (e.g., identical responses across all items), (b) excessive missing data (>10% of items), or (c) extreme response patterns or statistical outliers. Descriptive statistics for demographic variables are presented in Table 1.

Table 1: The descriptive statistics ($N = 511$).

Variable	Type	Number	Percentage
Gender	Female	278	54.40
	Male	233	45.60
Grade	Ten	191	37.38
	Eleven	163	31.90
	Twelve	157	30.72
Area	Rural	113	22.11
	Urban	398	77.89
Only Child	Yes	199	38.94
	No	312	61.06

3.2 Measures

All instruments used in this study have demonstrated satisfactory reliability and validity in prior research and are appropriate for adolescent populations.

3.2.1 Parental Phubbing

Parental phubbing was assessed using a revised version of the Partner Phubbing Scale originally developed by Roberts and David [48] and adapted for parental contexts by Ding et al. [49]. The scale consists of nine items measuring the extent to which parents engage in smartphone use during interactions with their children. Responses were recorded on a 5-point Likert scale ranging from 1 (never) to 5 (always), with higher scores indicating higher levels of perceived parental phubbing. Although some studies have proposed multidimensional structures of parental phubbing, evidence from Chinese validation studies generally supports the use of an overall score. Therefore, parental phubbing was modeled as a unidimensional latent construct in the SEM analyses. In the present study, Cronbach's α was 0.839.

3.2.2 Academic Burnout

The Academic Burnout Scale developed by Hu and Dai [50] was used in the present study. The original scale consists of 21 items across four dimensions: emotional exhaustion, teacher–student relationship disengagement, low learning efficacy, and physical exhaustion. In the present study, a 20-item version was used after removing one item to improve contextual suitability for older adolescents. The removed item referred to textbook reviewing behavior, which reflects a basic learning activity more typical of earlier educational stages and is less representative of older adolescents in senior secondary education. This item was excluded based on its limited contextual relevance rather than statistical considerations. Consistent with its theoretical framework, the four dimensions were conceptualized as indicators of a higher-order academic burnout construct in the SEM analyses. Items are rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores indicating higher levels of academic burnout. In this study, Cronbach's α was 0.887.

3.2.3 Alienation

Alienation was assessed using the alienation subscale developed by Yang et al. [30], which has been validated in the Chinese cultural context. The scale assesses three related dimensions: interpersonal alienation, family alienation, and social isolation. Consistent with previous validation studies, the three dimensions were conceptualized as indicators of a higher-order alienation construct and were therefore

combined into an overall alienation score for analysis. The 16 items are rated on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), with higher scores indicating greater perceived alienation. In this study, Cronbach's α was 0.847.

3.2.4 Perceived Social Support

Perceived social support was measured using the Chinese version of the Multidimensional Scale of Perceived Social Support (MSPSS). The scale includes 12 items assessing perceived support from family, friends, and significant others. In the present study, significant others refer to important non-parental and non-peer individuals, such as teachers, mentors, relatives, or other trusted adults perceived as emotionally supportive by adolescents [17,42]. Items are rated on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), with higher scores indicating greater perceived support. In the present study, the overall scale demonstrated excellent reliability (Cronbach's $\alpha = 0.930$). Reliability coefficients for family, friends, and significant others were 0.88, 0.89, and 0.84, respectively.

3.2.5 Demographic Variables

Gender, grade, only-child status, and place of residence were included as covariates because previous research has suggested that demographic and family-background characteristics may be associated with adolescents' academic burnout, family relationships, perceived social support, and psychosocial adjustment [7,45,47]. Controlling for these variables helped reduce potential confounding influences.

3.3 Procedure

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Academic Ethics Committee of the School of Educational Science, Mudanjiang Normal University (Approval No. 2023-0103). Written informed consent was obtained from all participants and their legal guardians prior to data collection. Data were collected using paper-and-pencil questionnaires administered in classroom settings. Trained research assistants conducted the survey following standardized procedures and collected all questionnaires immediately after completion. Participants required approximately 15–20 min to complete the questionnaire. No financial incentives or material compensation were provided.

3.4 Statistical Analysis

Data screening procedures were conducted to exclude questionnaires with patterned responses (e.g., identical responses across all items), excessive missing data (defined as more than 10% of items unanswered), or extreme outliers [51], resulting in 511 valid cases. All excluded cases were removed prior to analysis; therefore, no imputation procedures were applied. Remaining missing data within valid cases were negligible and were handled using listwise deletion. Descriptive statistics, reliability analyses, and Pearson correlation analyses were conducted using SPSS 25.0 (IBM Corp., Armonk, NY, USA). To examine potential common method bias, Harman's single-factor test was conducted prior to the main analyses, and the results are reported in Section 4.1. Statistical significance was defined as $p < 0.05$ (two-tailed).

Structural equation modeling (SEM) was conducted using SmartPLS 4.0 as the primary analytical approach. PLS-SEM was selected because the study aimed to simultaneously evaluate both the measurement model and the structural relationships among latent constructs, while accounting for measurement error. In addition, the model incorporated higher-order reflective constructs (i.e., alienation and academic burnout) and multiple interaction effects, making PLS-SEM an appropriate analytical framework for examining the

proposed conditional indirect associations. Consistent with current methodological recommendations, PLS-SEM is particularly suitable for prediction-oriented research and for estimating complex models involving higher-order constructs and interaction effects. The final sample size ($N = 511$) was considered adequate for PLS-SEM analyses based on commonly recommended sample-size guidelines.

The measurement model was evaluated using indicator reliability, composite reliability (CR), convergent validity (AVE), and discriminant validity (HTMT). The structural model was assessed using bootstrapping with 5000 resamples. Model fit and predictive relevance were examined using SRMR and Stone–Geisser’s Q^2 values.

To facilitate interpretation of moderation effects, supplementary analyses were conducted using PROCESS (Version 4.2) [52]. SEM was used as the primary analytical approach to examine the indirect association between parental phubbing and academic burnout through alienation. PROCESS Model 59 was used as a supplementary analysis to examine whether perceived social support moderated the associations between parental phubbing and alienation and between alienation and academic burnout. Bias-corrected bootstrap analyses (5000 resamples) were used to estimate confidence intervals. An effect was considered statistically significant when the 95% CI did not include zero. All analyses controlled for gender, grade, only-child status, and place of residence. All variables were standardized prior to moderation analyses.

4 Results

4.1 Common Method Bias

Common method bias was assessed using Harman’s single-factor test [53,54]. Twelve factors with eigenvalues greater than 1 were extracted, and the first factor accounted for 18.89% of the variance, which is below the recommended threshold of 40%. These findings suggest that common method variance was unlikely to substantially influence the observed associations. Nevertheless, because all variables were assessed using self-report measures, common method bias cannot be entirely ruled out.

4.2 Measurement Model Assessment

Prior to testing the hypothesized relationships, the measurement model was evaluated using SmartPLS 4.0. Parental phubbing was specified as a unidimensional construct, whereas alienation and academic burnout were modeled as higher-order reflective constructs based on their respective dimensions.

As presented in Table 2, all constructs demonstrated satisfactory internal consistency reliability, with composite reliability (CR) values exceeding 0.70. Convergent validity was also supported, as all average variance extracted (AVE) values exceeded 0.50. Furthermore, discriminant validity was established because all HTMT values were below the recommended threshold of 0.85. Taken together, these findings provide strong evidence for the reliability, convergent validity, and discriminant validity of the measurement model.

Table 2: Convergent and discriminant validity of the measurement model.

Construct	CR	AVE	Highest HTMT Value
PP	0.889	0.535	0.385
AL	0.855	0.663	0.799
AB	0.861	0.610	0.799
FaS	0.926	0.757	0.833
FrS	0.914	0.727	0.820

Table 2: Cont.

Construct	CR	AVE	Highest HTMT Value
SOS	0.892	0.674	0.833

Note: Indicator loadings ranged from 0.60 to 0.89. PP = Parental phubbing, AL = Alienation, AB = Academic burnout, FaS = Family support, FrS = Friends support, SOS = Significant others support. AL and AB represent the higher-order constructs of alienation and academic burnout, respectively. CR = Composite reliability. AVE = Average variance extracted. HTMT = Heterotrait-monotrait ratio.

4.3 Structural Model Assessment

The structural model was subsequently evaluated by examining model fit, explanatory power, and predictive relevance. As shown in Table 3, the model demonstrated acceptable fit, with SRMR values of 0.053 (estimated model) and 0.054 (saturated model), both below the recommended cutoff value of 0.08. The explanatory power of the model was supported by the R^2 values, indicating that the model explained 10.3% of the variance in alienation and 31.5% of the variance in academic burnout. The predictive relevance of the model was further supported by positive Q^2 values for both alienation ($Q^2 = 0.152$) and academic burnout ($Q^2 = 0.077$), indicating satisfactory predictive performance.

Table 3: Structural Model Evaluation.

Indicator	Value	Benchmark	Interpretation
SRMR (Estimated Model)	0.053	<0.08	Acceptable fit
SRMR (Saturated Model)	0.054	<0.08	Acceptable fit
Q^2 (Alienation)	0.152	>0	Predictive relevance supported
Q^2 (Academic Burnout)	0.077	>0	Predictive relevance
R^2 (Alienation)	0.103	0.02/0.13/0.26	Weak-moderate
R^2 (Academic Burnout)	0.315	0.02/0.13/0.26	Substantial

4.4 Correlation Analysis

Descriptive statistics and correlation coefficients for all study variables are presented in Table 4. Parental phubbing was positively correlated with alienation and academic burnout. Alienation was also positively correlated with academic burnout. Specifically, perceived support from significant others (SOS) was significantly and negatively correlated with academic burnout, whereas the correlations between academic burnout and perceived support from family (FaS) and friends (FrS) did not reach statistical significance.

Table 4: Descriptive statistics and correlation coefficients for variables.

Variable	Mean	SD	PP	AL	AB	FaS	FrS	SOS
PP	2.55	0.68	1					
AL	3.68	0.96	0.30**	1				
AB	2.60	0.58	0.23**	0.52**	1			
FaS	4.09	1.23	-0.01	0.24**	-0.06	1		
FrS	4.09	1.15	0.14**	0.27**	-0.06	0.61**	1	
SOS	3.91	1.11	0.11*	0.20**	-0.14**	0.70**	0.72**	1

Note: * $p < 0.05$, ** $p < 0.01$. PP = Parental phubbing, AL = Alienation, AB = Academic burnout, FaS = Family support, FrS = Friends support, SOS = Significant others support.

Unexpectedly, all three sources of perceived social support showed small positive correlations with alienation. Given that bivariate correlations do not control for other variables included in the structural

model, these findings should be interpreted with caution and are further examined in the Discussion section in relation to cultural and measurement considerations. Overall, the correlation pattern provided preliminary support for the proposed model.

4.5 Indirect Association Analysis

To examine whether alienation accounted for the association between parental phubbing and academic burnout, SEM analyses were conducted using SmartPLS 4.0 while controlling for key demographic variables. The reported path coefficients are standardized (β). Parental phubbing was positively associated with alienation ($\beta = 0.32$, $t = 7.50$, $p < 0.001$) and academic burnout ($\beta = 0.09$, $t = 2.32$, $p = 0.020$). Alienation was positively associated with academic burnout ($\beta = 0.53$, $t = 15.66$, $p < 0.001$). The indirect effect of parental phubbing on academic burnout through alienation was significant based on 5000 bootstrap resamples ($p < 0.001$), supporting the indirect role of alienation. This indirect association accounted for a substantial proportion of the total effect. Given the cross-sectional design, these results indicate a significant indirect association rather than causal mediation. Fig. 2 presents the standardized path coefficients along with the R^2 values for the endogenous variables (Alienation = 0.103; Academic Burnout = 0.315). These findings supported Hypothesis 1 and 2.

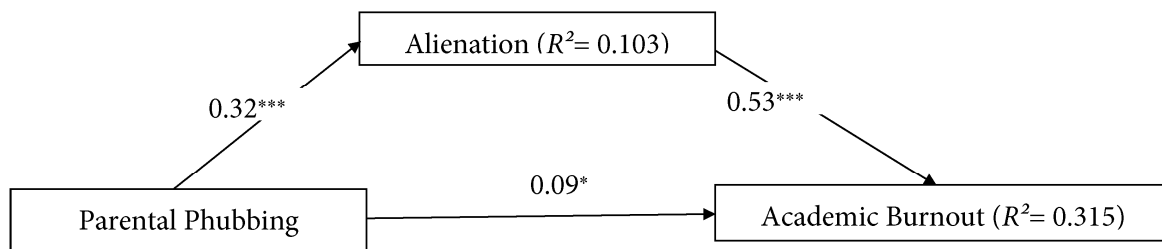


Figure 2: Indirect model of indirect association. Standardized path coefficients (β) are reported. R^2 values for endogenous variables are shown in parentheses. * $p < 0.05$, *** $p < 0.001$.

4.6 Moderated Indirect Association Analysis

The moderated associations were examined using PROCESS Model 59 with 5000 bootstrap resamples as a supplementary analysis to probe the conditional effects identified in the structural equation model. All variables were standardized prior to analysis, and gender, grade, only-child status, and place of residence were included as covariates.

As shown in Table 5, the interaction terms between parental phubbing and perceived social support significantly predicted alienation across all three sources of support. When academic burnout was specified as the outcome, parental phubbing remained positively associated with academic burnout after controlling for alienation, although this direct association reached statistical significance only in the friends support and significant others support models. Alienation consistently showed a positive association with academic burnout across all three models. Moreover, the interaction between alienation and each source of perceived social support significantly predicted academic burnout, whereas the interaction between parental phubbing and the corresponding support source was not significant. These findings indicate that perceived support from family, friends, and significant others moderated the association between parental phubbing and alienation as well as the association between alienation and academic burnout.

Table 5: Conditional indirect association analysis (PROCESS Model 59).

Predictor	β	SE	t	p-Value
Panel A. Family Support (FaS)				
PP → AL	0.287	0.041	6.982	<0.001
FaS → AL	0.212	0.042	5.054	<0.001
PP × FaS → AL	−0.143	0.041	−3.480	0.001
PP → AB	0.070	0.039	1.812	0.071
AL → AB	0.521	0.041	12.814	<0.001
FaS → AB	−0.218	0.039	−5.637	<0.001
PP × FaS → AB	−0.014	0.039	−0.349	0.727
AL × FaS → AB	−0.110	0.038	−2.904	0.004
R ² (AL)	0.172			
R ² (AB)	0.341			
Panel B. Friends Support (FrS)				
PP → AL	0.259	0.042	6.210	<0.001
FrS → AL	0.207	0.042	4.911	<0.001
PP × FrS → AL	−0.131	0.042	−3.104	0.002
PP → AB	0.105	0.039	2.723	0.007
AL → AB	0.536	0.040	13.419	<0.001
FrS → AB	−0.223	0.038	−5.813	<0.001
PP × FrS → AB	0.008	0.040	0.196	0.845
AL × FrS → AB	−0.089	0.037	−2.421	0.016
R ² (AL)	0.162			
R ² (AB)	0.345			
Panel C. Significant Others Support (SOS)				
PP → AL	0.269	0.042	6.424	<0.001
SOS → AL	0.141	0.042	3.341	0.001
PP × SOS → AL	−0.172	0.042	−4.066	<0.001
PP → AB	0.097	0.037	2.604	0.009
AL → AB	0.496	0.039	12.745	<0.001
SOS → AB	−0.289	0.036	−7.940	<0.001
PP × SOS → AB	0.016	0.038	0.413	0.680
AL × SOS → AB	−0.180	0.035	−5.077	<0.001
R ² (AL)	0.150			
R ² (AB)	0.392			

Note: PP = Parental phubbing, AL = Alienation, AB = Academic burnout. β = Standardized regression coefficient. Control variables included.

As shown in Table 6, the positive association between parental phubbing and alienation, as well as the positive association between alienation and academic burnout, became weaker as perceived social support increased. The conditional effects of family support, friends support, and significant others support are further illustrated in Figs. 3–5, respectively. Conditional indirect effect analyses further showed that the indirect association between parental phubbing and academic burnout became progressively weaker as perceived support increased. For friends support and significant others support, the conditional indirect association was no longer statistically significant at high levels of support, as the corresponding bootstrap confidence intervals included zero.

Overall, higher levels of perceived support from family, friends, and significant others attenuated the indirect association between parental phubbing and academic burnout through alienation. Although the magnitude of the buffering effects differed across support sources, the overall pattern of findings supports Hypothesis 3.

Table 6: Simple slopes and conditional indirect effects.

Panel A. Conditional Effects				
Moderator	Path	Low (−1 SD) β [95% CI]	Mean β [95% CI]	High (+1 SD) β [95% CI]
FaS	PP → AL	0.430 [0.319, 0.541]	0.287 [0.206, 0.368]	0.144 [0.027, 0.261]
FaS	AL → AB	0.631 [0.533, 0.729]	0.521 [0.441, 0.600]	0.410 [0.291, 0.530]
FrS	PP → AL	0.389 [0.274, 0.505]	0.259 [0.177, 0.341]	0.128 [0.011, 0.245]
FrS	AL → AB	0.625 [0.527, 0.723]	0.536 [0.458, 0.615]	0.448 [0.333, 0.562]
SOS	PP → AL	0.441 [0.325, 0.556]	0.269 [0.187, 0.351]	0.097 [−0.022, 0.215]
SOS	AL → AB	0.675 [0.585, 0.766]	0.496 [0.419, 0.572]	0.316 [0.201, 0.431]

Panel B. Conditional Indirect Effects			
Moderator	Low (−1 SD)	Mean	High (+1 SD)
FaS	0.271 [0.191, 0.356]	0.150 [0.100, 0.200]	0.059 [0.004, 0.120]
FrS	0.243 [0.161, 0.333]	0.139 [0.088, 0.189]	0.057 [−0.001, 0.113]
SOS	0.298 [0.214, 0.387]	0.133 [0.088, 0.178]	0.031 [−0.012, 0.073]

Note: PP = Parental phubbing, AL = Alienation, AB = Academic burnout, SS = Social support, FaS = Family support, FrS = Friends support, SOS = Significant others support. CI = Confidence interval. All variables were standardized prior to analysis. Gender, grade, only-child status, and place of residence were included as covariates. Bootstrap confidence intervals were estimated using 5000 resamples.

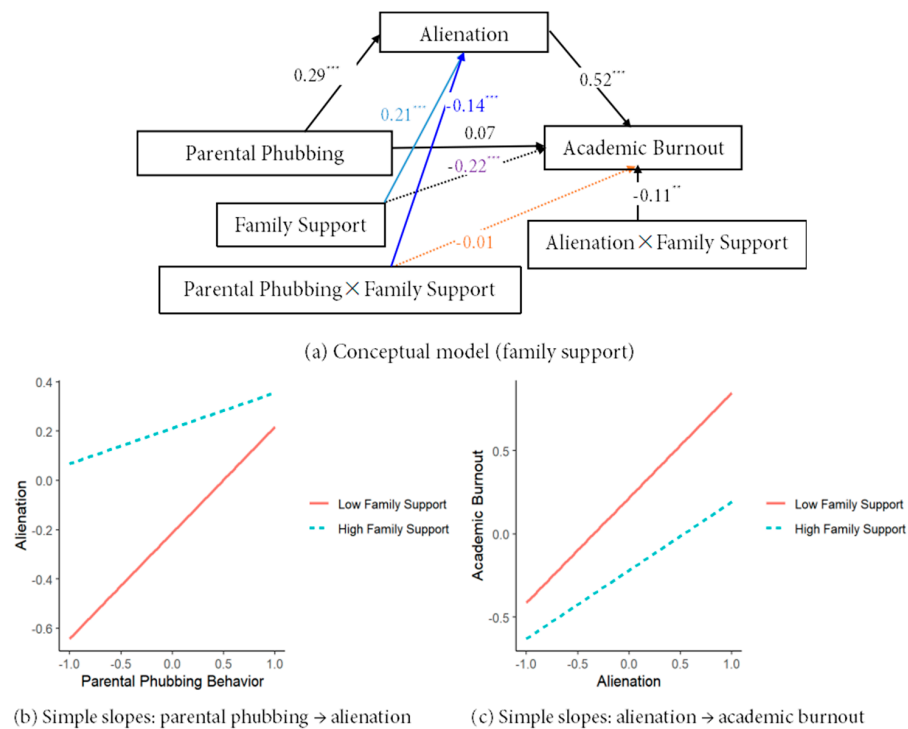


Figure 3: Conditional processes of perceived family support on the associations among parental phubbing, alienation, and academic burnout ($N = 511$). **(a)** Conceptual model (family support). **(b)** Simple slopes: parental phubbing → alienation. **(c)** Simple slopes: alienation → academic burnout. ** $p < 0.01$, *** $p < 0.001$.

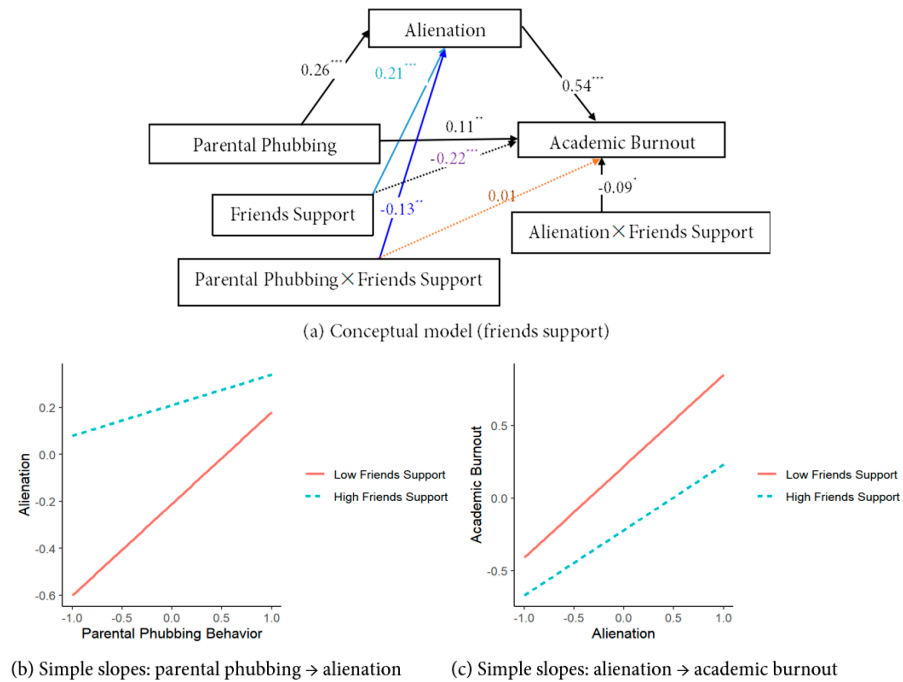


Figure 4: Conditional processes of perceived friends support on the associations among parental phubbing, alienation, and academic burnout ($N = 511$). (a) Conceptual model (friends support). (b) Simple slopes: parental phubbing → alienation. (c) Simple slopes: alienation → academic burnout. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

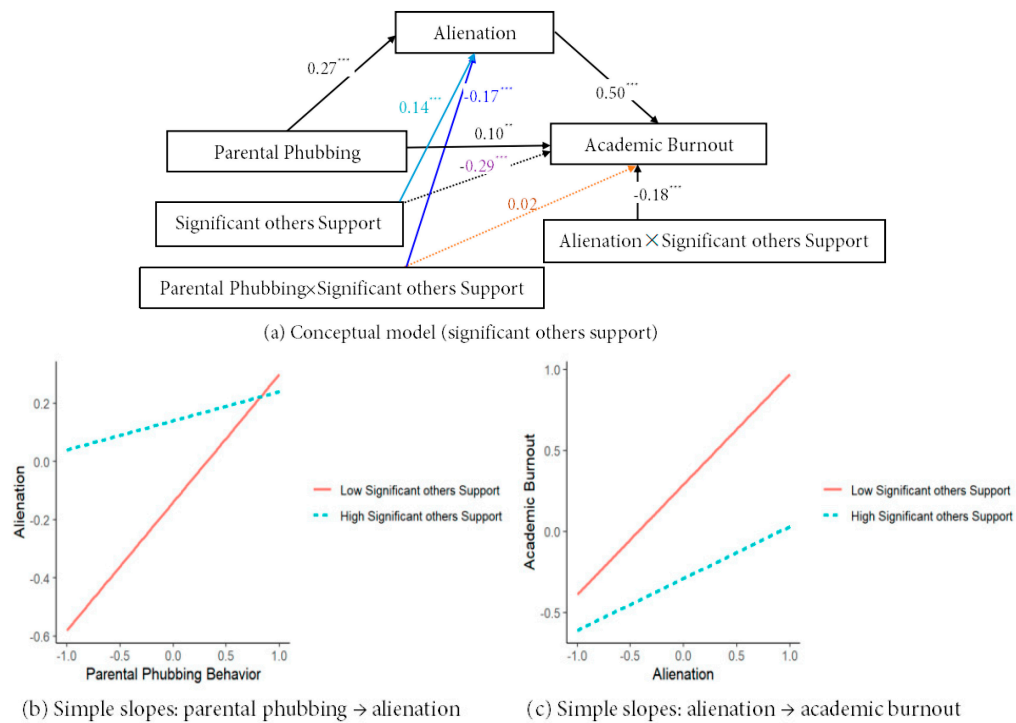


Figure 5: Conditional processes of perceived significant others support on the associations among parental phubbing, alienation, and academic burnout ($N = 511$). (a) Conceptual model (significant others support). (b) Simple slopes: parental phubbing → alienation. (c) Simple slopes: alienation → academic burnout. ** $p < 0.01$, *** $p < 0.001$.

5 Discussion

This study examined the associations among parental phubbing, alienation, academic burnout, and multiple sources of perceived social support among Chinese older adolescents. By integrating developmental and relational perspectives, the study further explored whether alienation represented an indirect psychological process linking parental phubbing to academic burnout and whether perceived social support functioned as a contextual relational resource that shaped these associations. Overall, the findings generally supported the proposed hypotheses. Parental phubbing was positively associated with academic burnout, and this association was linked to higher levels of alienation. In addition, perceived social support moderated the associations between parental phubbing and alienation as well as between alienation and academic burnout, with variations observed across different sources of support. Importantly, the findings suggest that perceived social support operated primarily as a contextual relational resource that altered the strength of these associations rather than as a uniformly protective factor directly associated with lower maladjustment. Taken together, these findings should be interpreted as evidence of statistically significant associations and conditional indirect associations rather than causal or directional relationships, given the cross-sectional design of the present study.

5.1 Associations among Parental Phubbing, Alienation, and Academic Burnout

Consistent with prior research, parental phubbing was positively associated with both alienation and academic burnout [55,56]. When parents divert their attention to smartphones during interactions, adolescents may experience reduced emotional responsiveness and diminished communication quality. Such interaction patterns may undermine adolescents' psychological well-being and academic engagement. This finding aligns with previous evidence suggesting that disruptions in face-to-face parent-child communication are associated with poorer emotional adjustment and learning-related functioning.

Importantly, the present findings extend previous research by demonstrating that these associations are also evident among older adolescents. Although adolescents in late adolescence generally exhibit greater autonomy and self-regulatory capacities than younger adolescents, this developmental period is also characterized by heightened concerns regarding identity formation, interpersonal evaluation, and future educational pathways [8,9]. Consequently, parental responsiveness may remain psychologically salient despite increasing behavioral independence. In this context, parental phubbing may be experienced not merely as a momentary interruption in communication but as a signal of relational disengagement, thereby being associated with both emotional and academic adjustment difficulties.

From a developmental perspective, these findings are consistent with the proposition that interpersonal experiences become increasingly relevant for identity formation and self-evaluation during late adolescence. When parental attention is repeatedly diverted to smartphones, adolescents may interpret such experiences as indicators of reduced relational value and emotional availability, which may contribute to poorer psychological adjustment and academic engagement.

5.2 Alienation as a Relational Pathway

The present findings further suggest that alienation represents an important relational psychological process underlying the association between parental phubbing and academic burnout. From the perspective of Self-Determination Theory [22], Parental phubbing may be associated with lower perceived parental responsiveness and emotional availability, which in turn may be linked to reduced satisfaction of adolescents' need for relatedness. A diminished sense of belonging may be associated with greater feelings of detachment

and social disconnection, which have been linked to reduced intrinsic motivation and greater emotional exhaustion, both of which are core features of academic burnout.

Beyond the frustration of relatedness needs, parental phubbing may also be associated with adolescents' emotional and interpersonal experiences. Repeated perceptions of being ignored or deprioritized during everyday interactions may be experienced as relational insecurity or reduced interpersonal value. Such experiences have been linked to withdrawal, rumination, and negative self-related cognitions, which may in turn contribute to alienation and academic maladjustment [57]. Thus, alienation may represent adolescents' subjective interpretation of relational disconnection that is statistically associated with both parental interaction patterns and academic functioning.

The association between alienation and academic burnout may be particularly relevant in highly performance-oriented educational environments. Within examination-focused educational systems, adolescents experiencing relational disconnection may report greater vulnerability to academic stress, fear of failure, and contingent self-worth [58]. Previous studies have consistently shown that feelings of social disconnection and school-related alienation are associated with greater academic exhaustion, lower engagement, and poorer educational adjustment among adolescents [59,60]. These psychological experiences may contribute to emotional exhaustion and disengagement, which are central components of academic burnout.

Importantly, the significant indirect association observed in this study suggests that alienation may constitute an important relational process underlying the association between parental phubbing and academic burnout. Rather than indicating a causal pathway, these findings suggest that adolescents' perceptions of interpersonal disconnection may provide one possible explanation for why parental interaction experiences and academic adjustment are statistically related. This finding underscores the importance of considering adolescents' subjective relational experiences when examining associations between family communication patterns and academic outcomes.

Moreover, alienation is conceptually distinct from both parental phubbing and academic burnout. Whereas parental phubbing reflects a specific parenting behavior and academic burnout reflects difficulties within the academic domain, alienation represents a broader perception of interpersonal disconnection across relational contexts. The present findings therefore support the proposition that alienation functions as an intervening relational construct rather than merely reflecting conceptual overlap among constructs.

At the same time, the indirect association was identified using cross-sectional data. Although the findings are consistent with the proposed theoretical framework, causal inferences cannot be established. Future longitudinal and prospective studies are needed to clarify the temporal ordering and potential reciprocal relationships among parental phubbing, alienation, and academic burnout.

5.3 Perceived Social Support as a Contextual Relational Resource

The results further indicated that perceived social support functioned as a contextual relational resource within the observed associations. Specifically, perceived family support, friends support, and significant others support moderated the strength of the associations between parental phubbing and alienation and between alienation and academic burnout, although the magnitude of these buffering effects varied across support sources. These findings underscore the importance of considering both relational risk factors and protective resources when examining academic burnout among adolescents.

Notably, the buffering role of social support was reflected primarily in its moderating effects rather than in uniformly negative direct associations. This pattern suggests that perceived social support may act less as a universally beneficial factor and more as a contextual resource that shapes adolescents' responses to

relational challenges. Consistent with stress-buffering theory [18], supportive relationships may reduce the psychological impact of stressful experiences by shaping individuals' interpretations and coping processes. In other words, perceived social support may influence how adolescents interpret and cope with adverse relational experiences rather than directly reducing their negative consequences.

However, the strength and pattern of these moderating effects varied across support sources. Specifically, higher levels of significant others support were associated with a greater attenuation of the indirect association between parental phubbing and academic burnout through alienation, such that this indirect association became non-significant at high levels of significant others support. These findings suggest that supportive relationships beyond the immediate family context may provide important emotional resources and alternative sources of belonging when adolescents experience relational difficulties within parent-child interactions.

Perceived family support also moderated the observed associations, indicating that supportive family relationships may remain an important relational resource by maintaining adolescents' sense of connectedness and emotional security. Given that parental phubbing originates within the family context, family-based support may be particularly relevant in shaping adolescents' perceptions of relational experiences. At the same time, support from other meaningful relationships may provide complementary emotional resources when adolescents encounter difficulties within the family system.

An unexpected finding was the positive zero-order association between perceived social support and alienation. Although this pattern appears inconsistent with conventional expectations, it should be interpreted cautiously. One possible explanation is that perceived social support reflects adolescents' subjective evaluations of their relationships rather than objective availability of support. Adolescents experiencing greater interpersonal concerns may simultaneously seek more support and report higher levels of alienation because of heightened sensitivity to relational experiences. Previous research has also suggested that individuals with greater emotional needs may perceive relationships in more complex ways, such that support availability and feelings of disconnection can coexist [61].

Another possible explanation relates to the cultural and educational context of Chinese adolescents. In Chinese families, supportive involvement is often closely intertwined with academic expectations and future-oriented concerns. Consequently, adolescents may perceive parents as highly involved and supportive while simultaneously experiencing pressure, misunderstanding, or reduced emotional autonomy. Previous research in Chinese contexts has suggested that parental support and achievement-related pressure may coexist within the same family environment, reflecting the coexistence of parental care and high academic expectations that shapes adolescents' psychological and academic adjustment [62,63]. Such relational ambivalence may contribute to the coexistence of perceived support and alienation, particularly within achievement-oriented contexts.

Importantly, despite the positive zero-order correlation, all three sources of support attenuated the indirect association involving parental phubbing, alienation, and academic burnout, although the magnitude of these buffering patterns differed across sources. This finding highlights the importance of distinguishing between direct associations and moderating processes. A relational resource does not necessarily need to show a simple negative correlation with maladjustment to function as a protective contextual factor. Instead, its protective role may emerge by altering adolescents' vulnerability under stressful relational conditions.

Friends support also demonstrated buffering effects, suggesting that peer relationships may provide adolescents with additional emotional resources and interpersonal connection when encountering relational challenges. Support from peers may not fully compensate for difficulties in parent-child relationships

during adolescence; however, it may serve as an additional source of belonging and psychological support. These findings should also be interpreted within the broader sociocultural context. In collectivist societies such as China, family relationships remain central to adolescents' socialization and emotional development [64]. Previous research has shown that family-based relational experiences play an important role in shaping adolescents' psychological adjustment in collectivist contexts. At the same time, although parental phubbing has been documented across diverse cultural contexts, its implications may be particularly salient in contemporary China. Recent studies among Chinese adolescents have shown that parental phubbing is associated with adolescents' psychological and behavioral outcomes, highlighting the importance of examining technology-related family interactions within specific cultural contexts [65,66]. Rapid digitalization, changing family interaction patterns, and high educational expectations may create challenges for maintaining emotionally responsive parent-child communication. Under such conditions, technology-related interruptions in family communication may be associated with adolescents' perceptions of relational disconnection. However, the present findings further suggest that the influence of support depends not only on cultural values but also on the specific source of support and the relational context in which stress occurs.

The findings also extend the growing literature on technoference, referring to technology-related interruptions in parent-child interpersonal interactions [67]. Parental phubbing may represent a form of relational distraction in which physical presence coexists with reduced psychological availability. Such recurring patterns of interaction patterns may contribute to adolescents' perceptions of relational disconnection. However, the present findings further suggest that these associations are not inevitable; supportive relational environments, particularly those involving family members and significant others, may weaken adolescents' vulnerability to such experiences.

From a cross-cultural perspective, the differential buffering effects observed in this study highlight that the effectiveness of social support may depend on relational and cultural contexts. Whereas previous research conducted in Western contexts has often emphasized the importance of peer support [68,69], the present findings underscore the relevance of multiple support sources among Chinese adolescents. More importantly, the findings suggest that social support should be examined according to its specific relational source rather than being treated as a homogeneous construct. This contributes to existing literature by demonstrating that the buffering function of social support is source-specific rather than uniform across support source.

Accordingly, interventions targeting adolescent academic burnout should consider not only reducing relational risks but also strengthening contextually meaningful support systems. For Chinese adolescents experiencing parental phubbing, interventions may benefit from improving parent-child communication quality, increasing parents' awareness of technology-related interruptions, and promoting emotionally responsive interactions. Meanwhile, strengthening adolescents' access to supportive relationships outside the family, including trusted adults, peers, and significant others, may provide additional relational resources that help buffer the negative associations linked to parental phubbing.

6 Implications

6.1 Theoretical Implications

The present study contributes to the literature in several ways.

First, the findings identify alienation as an important relational process associated with the relationship between parental phubbing and academic burnout. Specifically, the findings suggest that alienation may represent a key relational process underlying the observed association between parental phubbing and aca-

ademic burnout, and that this association may vary according to perceived social support. Previous research has primarily focused on the direct associations between parental phubbing and adolescent maladjustment. By demonstrating that parental phubbing is associated with adolescents' subjective experiences of relational disconnection, the present study provides a more nuanced understanding of how technology-related parenting behaviours may be linked to academic functioning.

Second, the study extends existing research by integrating relational risk and protective factors within a single framework. The findings indicate that the strength of the indirect association between parental phubbing and academic burnout through alienation varies according to the level of perceived social support. These findings highlight the importance of considering not only risk exposure but also contextual resources when examining adolescent adjustment. Furthermore, the findings suggest that perceived social support functions primarily as a contextual relational resource that modifies the strength of these associations rather than as a uniformly protective factor. By distinguishing among family support, friends support, and significant others support, the present study further demonstrates that the buffering function of social support may depend on the specific relational source and context.

Third, the findings contribute to the growing literature on technofence in family relationships. By conceptualizing parental phubbing as a form of technology-related relational disruption, the study demonstrates how everyday digital distractions may be associated with adolescents' interpersonal experiences and academic well-being. The present findings further extend technofence research by suggesting that the psychological implications of technology-related interruptions may not occur in isolation but may vary according to adolescents' available relational resources. These findings further suggest that these processes should be understood within broader sociocultural contexts, as the protective role of social support may vary across different cultural settings and relational systems.

Finally, the present study extends the parental phubbing literature by focusing on Chinese older adolescents. Although previous studies have largely examined younger adolescents or mixed adolescent samples, the current findings indicate that parental phubbing remains associated with relational and academic outcomes during late adolescence. These findings contribute to developmental research by showing that parent-child relational experiences remain relevant even during a period characterized by increasing autonomy and independence, highlighting the continuing importance of these relationships while emphasizing the need to consider the unique developmental characteristics of older adolescents, including heightened concerns regarding identity, belonging, and future academic pathways.

6.2 Practical Implications

The findings also provide several practical implications for families, schools, and practitioners.

At the family level, the findings suggest that reducing technology-related interruptions during parent-child interactions may be an important target for improving adolescents' relational experiences. Parents may benefit from increasing awareness of smartphone-related distractions, establishing technology-use boundaries during family communication, and prioritizing emotionally responsive interactions. Given that parental phubbing was associated with adolescents' alienation and academic burnout through an indirect association, strengthening daily communication quality and emotional availability may help alleviate relational difficulties associated with parental phubbing.

At the school level, efforts to reduce academic burnout should address both relational risks and protective resources. Schools may strengthen support systems by promoting positive peer relationships, mentoring programs, and supportive teacher-student interactions. The buffering effects observed for significant others support suggest that trusted adults, including teachers, counsellors, and mentors, may

serve as important alternative sources of emotional support when adolescents experience difficulties in family interactions.

The findings further suggest that interventions should focus not only on academic demands but also on adolescents' relational experiences. Programs aimed at enhancing belongingness, interpersonal connectedness, and help-seeking behaviours may help reduce alienation and promote resilience when adolescents encounter family-related stressors. In particular, interventions should recognize that different sources of support may serve different functions rather than assuming that all support sources provide equivalent protective functions.

Among the three support sources examined, significant others support demonstrated the strongest buffering pattern, followed by family support. Therefore, interventions may benefit from strengthening adolescents' access to multiple supportive relationships. While family-based programs remain important because parental phubbing occurs within the family context, support from trusted individuals outside the immediate family may provide complementary emotional resources and alternative sources of belonging.

Taken together, these findings suggest that addressing technology-related disruptions in parent-child interactions and strengthening supportive interpersonal relationships may represent promising directions for promoting adolescents' psychological well-being and academic adjustment.

7 Limitations

Several limitations should be acknowledged.

First, the cross-sectional design precludes causal inference. Although the findings are consistent with the proposed theoretical framework, the temporal ordering among parental phubbing, alienation, perceived social support, and academic burnout cannot be established. Accordingly, the observed indirect associations should not be interpreted as evidence of causal mechanisms. Future longitudinal and experimental studies are needed to clarify the temporal dynamics and potential bidirectional associations among these variables.

Second, all variables were assessed through self-report questionnaires, which may be subject to shared method variance and reporting biases. Although the common method bias analysis suggested that such bias was not substantial, the possibility of self-report bias cannot be completely excluded. Future studies could incorporate multiple informants, observational approaches, or behavioural measures to obtain a more comprehensive assessment of parent-child interactions and adolescent adjustment.

Third, the sample was drawn from public high schools in Shanxi and Heilongjiang Provinces. Consequently, the generalizability of the findings to adolescents from other regions, educational contexts, or cultural settings may be limited. In addition, schools were selected based on accessibility and existing collaborations rather than probability sampling, which may further limit the representativeness of the sample. Future research involving more diverse samples and probability-based sampling procedures would help improve the generalizability of the findings.

Fourth, although several demographic variables were statistically controlled, other potentially relevant factors were not included. For example, adolescents' own smartphone use, problematic smartphone use, parent-child communication quality, and socioeconomic characteristics may also influence the observed associations and should be considered in future research. In particular, adolescents' digital behaviors and broader family interaction patterns may represent additional contextual factors that further explain variations in parental phubbing experiences and academic adjustment.

Finally, participants were nested within schools and classrooms. Although the present analyses focused on individual-level associations, the potential influence of shared school or classroom environments was not statistically modelled. Future studies may benefit from multilevel approaches that account for clustering

effects within educational settings and examine how contextual factors at the school and classroom level interact with individual relational experiences.

8 Conclusions

This study examined the associations among parental phubbing, alienation, academic burnout, and perceived social support among Chinese older adolescents. The findings indicated that parental phubbing was positively associated with academic burnout and that alienation represented an important relational process associated with this association. Perceived social support from family, friends, and significant others moderated these associations, although the buffering effects varied across support sources, with support from significant others showing the largest moderation effect.

By focusing on older adolescents and distinguishing among multiple sources of social support, this study extends existing research on parental phubbing and academic burnout. Overall, the findings highlight the importance of considering both relational risk factors and contextual protective resources when understanding adolescent academic burnout. Although causal conclusions cannot be drawn from the cross-sectional design, supportive interpersonal relationships may serve as important contextual resources for adolescents' psychological and academic adjustment.

Acknowledgement: The authors sincerely thank the participating students, their parents, and the school administrators for their cooperation and support throughout the study. The authors also appreciate the valuable feedback provided by colleagues during the research design and data analysis stages.

Funding Statement: The authors received no specific funding for this study.

Author Contributions: The authors confirm contribution to the paper as follows: Conceptualization, Qian Wang; methodology, Qian Wang and Amira Najiha Yahya; formal analysis, Qian Wang and Amira Najiha Yahya; validation, Qian Wang, Amira Najiha Yahya and Rafidah Aga Mohd Jaladin; investigation, Qian Wang and Qiushi Zhang; resources, Rafidah Aga Mohd Jaladin; data curation, Rujie Liu and Xing Yi; writing—original draft preparation, Qian Wang; writing—review and editing, Amira Najiha Yahya, Rafidah Aga Mohd Jaladin and Jas Laile Jaafar; visualization, Amira Najiha Yahya; supervision, Rafidah Aga Mohd Jaladin; project administration, Qian Wang. All authors reviewed and approved the final version of the manuscript.

Availability of Data and Materials: The data that support the findings of this study are available from the corresponding authors (Qian Wang and Amira Najiha Yahya) upon reasonable request.

Ethics Approval: This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Academic Ethics Committee of the School of Educational Science, Mudanjiang Normal University (Approval No. 2023-0103). Written informed consent was obtained from all participants and their legal guardians prior to data collection.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

PP	Parental Phubbing
AB	Academic Burnout
AL	Alienation
PSS	Perceived Social Support
MSPSS	Multidimensional Scale of Perceived Social Support
SDT	Self-Determination Theory

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