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Latent subtypes of school refusal behavior and their social-ecological correlates among Chinese adolescents

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ABSTRACT

From an educational social-ecological perspective, this study aimed to explore the latent subtypes, influencing factors, and intervention implications of school refusal behavior (SRB) among Chinese adolescents. A total of 432 junior high school students from Beijing were recruited using cluster random sampling. Latent profile analysis (LPA) was employed to identify latent subtypes based on four functional dimensions of SRB: Avoidance of negative affectivity, escape from aversive social/evaluative situations, pursuit of attention, and pursuit of tangible reinforcement. Differences in ecological variables (family functioning, peer relationships, teacher support, and internet addiction) across subtypes and their predictive factors were further analyzed. The results showed that, (1) Adolescent SRB could be classified into three latent subtypes: High-risk (6%), moderate-risk (33%), and low-risk (61%), showing a severity gradient of "high-medium-low"; (2) analysis of ecological variables revealed that the high-risk group scored significantly higher on internet addiction and peer fear, and significantly lower on peer acceptance, family intimacy, family adaptability, and learning support; (3) logistic regression indicated that internet addiction and peer fear were common significant predictors for both high-risk and moderate-risk groups. Family adaptability played a protective role for the high-risk group, while gender (male) and ninth grade were significant predictors for the moderate-risk group. These findings reveal the heterogeneity of SRB among Chinese adolescents and its social-ecological influencing mechanisms, providing an empirical basis for developing targeted identification and intervention strategies.

Key words: school refusal behavior, latent subtypes, educational social-ecological theory, peer relationships, family functioning, internet addiction

INTRODUCTION

Adolescent school refusal behavior (SRB), as a prevalent and complex phenomenon, has drawn widespread global attention. According to the classic criteria outlined by Berg (1997), school refusal behavior is defined by: An adolescent's refusal to attend school or prolonged absence; parental awareness of the situation; accompanying emotional distress (*e.g.*, somatic complaints); absence of severe antisocial behavior; and

parental attempts to secure the youth's school attendance. This definition provides a critical framework for distinguishing different types of school attendance problems, especially differentiating school refusal behavior from truancy—characterized by concealment of absence from parents and a degree of aggression—and from parent-driven school withdrawal (Berg, 2002; Heyne *et al.*, 2019). In terms of prevalence, rates vary somewhat across regions due to differences in policies, culture, and economic factors, but overall about 1% to

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15% of adolescents have experienced school refusal (Chockalingam et al., 2023; Egger et al., 2003; Havik et al., 2013; Roué et al., 2021).

School refusal behavior has far-reaching and multidimensional detrimental effects on adolescent development. At the academic level, chronic absenteeism directly contributes to academic disengagement and diminished interest in learning, fostering a vicious cycle of "academic underachievement—lower self-efficacy—and increased reluctance to attend school". This pattern, to some extent, predicts future dropout (Bernstein et al., 1999; Chang & Romero, 2008; Flakierska-Praquin et al., 1997). At the psychological/psychiatric level, only 20%-30% of school-refusing adolescents do not meet diagnostic criteria for any psychiatric disorder (Hella & Bernstein, 2012). Common internalizing problems among this population include generalized anxiety disorder, social anxiety disorder, separation anxiety disorder, as well as anxiety-related issues such as health anxiety and obsessive ideation (Finning et al., 2019; Mc McKay & Storch, 2011). Some also exhibit depressive disorders, which in certain cases involve self-harm behaviors or suicidal ideation (Hughes et al., 2010; Slesnick et al., 2008). In addition, the deeper psychological issues underlying school refusal behavior often manifest in somatic forms: These adolescents may report headaches, chest pain, palpitations, tremors, abdominal pain or diarrhea, nausea and vomiting, and pain in the limbs or joints (Inglés et al., 2015; Wang & Wang, 2010). In terms of social adaptation, absenteeism causes adolescents to become isolated from peers and weakens their sense of school belonging. Research has shown that youths with a history of school refusal behavior are more likely to face employment difficulties and interpersonal relationship challenges in adulthood (Mc McShane et al., 2004). Furthermore, school refusal behavior may exacerbate family conflict and elevate parental stress related to child-rearing (Havik & Ingul, 2021).

To gain a clearer understanding of the maintenance mechanisms of school refusal behavior, Kearney and Silverman (1990) developed a four-function model—the school refusal behavior model—grounded in reinforcement theory. This model identifies four core motivational functions: First, avoidance of school-related negative emotional stimuli (e.g., anxiety triggered by exam pressure)—a behavior maintained through negative reinforcement *via* absence; second, escape from aversive social or evaluative situations (e.g., bullying) — likewise sustained through negative reinforcement; third, seeking attention from significant others (e.g., feigning illness to elicit parental concern) — a behavior strengthened *via* positive reinforcement; fourth, pursuit of tangible rewards outside of school (e.g., engaging in online activities) — also reinforced positively (Inglés et al., 2015; Kearney, 2001). These diverse functional types

provide a theoretical basis for research on classifying school refusal behavior, as it is unrealistic to simply categorize most students into a single type in practice.

In practical contexts, most adolescents with school refusal behavior exhibit an overlap of two or more functional motivations, rather than fitting a single functional type. A subset of students even score low across all four functional dimensions, manifesting an "atypical refusal" profile (González et al., 2025). To date, only a limited number of studies have employed latent profile analysis (LPA) to systematically investigate this complex phenomenon. However, research findings vary substantially across different countries and populations—a discrepancy that stands in contrast to the relative scarcity of such studies conducted in China. For instance, based on profile data of Spanish adolescents, González et al. (2019) identified four distinct subgroups of school refusal behavior: "High refusal", "moderate-low refusal", "moderate-high refusal", and "non-refusal". The key differences among these subgroups were primarily driven by the combined intensity of each component within the four functional dimensions. In an Ecuadorian study, researchers categorized adolescent school refusal behavior into three subgroups ("non-refusal", "tangible reinforcement-driven refusal", and "multiple reinforcement-driven refusal") according to the sources of positive or negative reinforcement (González et al., 2018). The "multiple reinforcement-driven" subgroup encompassed both positive reward-seeking motives and negative avoidance motives, and exhibited a stronger correlation with emotional problems such as depression and anxiety compared to other subgroups. To date, however, no study has systematically examined the latent profile characteristics of school refusal behavior among Chinese adolescents. In light of China's specific educational ecology, culture-specific classification research is imperative, which leaves ample room for further exploration in this field.

Influential factors of adolescent school refusal behavior in an educational social-ecological context

Educational social-ecological theory holds that an adolescent's school adjustment results from the interaction of the individual and embedded environmental systems (family, school, peers; Bronfenbrenner, 1979). The appearance of school refusal behavior is not determined by a single cause; instead, it involves multiple dysfunctions or conflicts converging on several microsystems—such as teachers, peers, and family. By providing resources, emotional support, and rules, these microsystems affect adolescents' perceptions of the school environment and their willingness to participate; when the system imbalance occurs, they can trigger or maintain school refusal behavior (Havik & Ingul, 2021).

In the family microsystem, extreme patterns of family functioning have been linked to school refusal behavior. Many school-refusing adolescents come from either overly enmeshed families or highly disengaged families (Bernstein & Borchardt, 1996; Nursalim *et al.*, 2018), reflecting low cohesion (intimacy) and support. Such extremes can hinder adolescents' autonomy and coping—overinvolved families may inadvertently exacerbate avoidance by not fostering independence, while disengaged families fail to provide guidance. Poor family adaptability (inflexibility in problem-solving and communication) is also common; when facing school-related issues, some parents either overreact or take no action, lacking effective channels for negotiation (Chockalingam *et al.*, 2023). These dysfunctional family dynamics can precipitate or maintain SRB.

In the school microsystem, teacher support is a crucial factor for student attendance. A lack of clear instruction and effective classroom management is associated with higher absenteeism (Havik *et al.*, 2015), and students who feel "ignored" or misunderstood by teachers may develop anxiety that exacerbates school avoidance (Evans, 2000). In contrast, a supportive teacher-student relationship can foster a sense of belonging and self-efficacy, buffering against SRB (Ingul *et al.*, 2019).

In the school microsystem, peer relationships play an indispensable role in the development of SRB. Adolescents who lack friends or experience peer rejection and bullying often feel a chronic sense of not belonging at school, which heightens their avoidance tendencies (Egger *et al.*, 2003; Havik *et al.*, 2015). Conversely, positive peer acceptance and supportive friendships foster school connectedness and protect against SRB (Kearney, 2008). Thus, peer rejection, loneliness, or an alienating school social environment can be potent contributors to school refusal behavior.

Influence of the online environment on school refusal behavior

In today's digitally connected environment, problematic internet use (PIU) has emerged as a significant external factor in adolescent SRB. Many school-refusing youths engage in excessive online activity as an escape from academic and social pressures (Fujita *et al.*, 2022; Kljakovic *et al.*, 2021). Such prolonged immersion in virtual worlds can erode real-life social skills and increase alienation from the school environment, thereby exacerbating school refusal behavior. Indeed, adolescents with SRB who are also addicted to the internet tend to show disrupted daily routines and poorer adaptive functioning even after controlling for emotional problems (Fujita *et al.*, 2022). Therefore, internet use should be considered a key variable when assessing and intervening in SRB, underscoring the need for integrated family,

psychological, and educational support.

In summary, the online environment exerts a multifaceted and dynamic influence on school refusal behavior. It not only shapes adolescents' behavioral patterns and cognitive orientations but also affects family functioning and the recovery of everyday routines. Therefore, when identifying and intervening in school refusal behavior, internet use should be included as a key variable in the assessment framework, and comprehensive support should be implemented by integrating family, psychological, and educational intervention strategies.

Aims of this study and hypotheses

Building on previous research into the functional types of school refusal behavior and the mechanisms of social environmental factors, the present study aims to further explore the latent heterogeneity of school refusal behavior among Chinese adolescents and to conduct a systematic analysis incorporating key ecological variables. Specifically, the study will use LPA to identify latent subtype patterns of school refusal behavior based on four functional dimensions: "School-related fear", "avoidance of social/evaluative situations", "attention-seeking", and "seeking external rewards/stimulation." This approach is intended to capture the hidden differences in motivational structures and behavioral tendencies among individuals. On this basis, the study will also compare different school refusal behavior subtypes across three types of social support—family support, peer relationships, and teacher support—as well as levels of internet addiction, in order to reveal the commonalities and differences in microsystem resource access and virtual environment use among these subgroups. Furthermore, the study will examine the predictive roles of social support, internet use behaviors, and key demographic variables (such as gender and grade) on subtype membership, with the aim of constructing an explanatory model from a more integrated social-ecological perspective. By achieving these three objectives, this study seeks to deepen our understanding of the complex causes and latent typologies of school refusal behavior, and to provide theoretical and empirical support for developing more targeted strategies for identification, intervention, and support.

METHOD

This study was reviewed and approved by the Institutional Research Ethics Committee (Approval Number: FHW-ER-2425-119). All participants and their parents or legal guardians were fully informed about the purpose, procedures, and confidentiality of the study prior to data collection, and provided written informed consent to participate.

Participants

A total of 464 students were recruited through cluster random sampling from five middle schools in Beijing, China. After excluding incomplete or invalid responses, 432 questionnaires were retained for final analysis, yielding a valid response rate of 93.1%. Prior to participation, all students were informed of the purpose and anonymity of the study and completed the questionnaire voluntarily following standardized instructions. Among the valid participants, there were 248 males and 179 females. In terms of grade distribution, 252 students were in seventh grade, 91 in eighth grade, and 88 in ninth grade. Participants ranged in age from 11 to 16 years (13.18 ± 1.00 year).

Instruments

School refusal assessment scale revised (SRAS-R)
SRAS-R originally developed by Kearney and Silverman (1990) and revised in 2002 (Kearney, 2002). The scale includes 24 items rated on a 6-point Likert scale and consists of four functional dimensions: Fear of school-related stimuli (e.g., teachers, tests), avoidance of aversive social situations, seeking attention from significant others, and pursuit of external reinforcement (e.g., fun activities outside school). Scores for each factor are calculated by averaging responses across six related items, with higher scores indicating greater influence of the corresponding function. The SRAS-R has demonstrated good internal consistency in Chinese samples (Cronbach's $\alpha = 0.89$).

Family adaptability and cohesion evaluation scales II-Chinese version (FACES II-CV)

Family functioning was measured using the Chinese version of the FACES II-CV, originally developed by Olson *et al.* (1982) and translated by Fei & Shen (1991). This 30-item scale evaluates two dimensions of family relationships: Cohesion (emotional closeness among members) and adaptability (flexibility in role and rule adjustments). Items are rated on a 5-point Likert scale ranging from 1 (never) to 5 (always). Higher scores reflect better family emotional bonding or adaptability, respectively. The scale has shown strong internal reliability in Chinese adolescent populations (Cronbach's $\alpha = 0.95$).

Peer relationship questionnaire

Peer relationships were assessed using a revised version of the Peer Relationship Questionnaire developed by Zou *et al.* (1998). The scale includes 30 items with two dimensions: Peer acceptance (items 1-20) and social anxiety with inferiority (items 21-30). Participants responded using a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Some items are reverse-coded. Higher peer acceptance scores indicate better integration into the peer group, while higher anxiety scores reflect greater interpersonal difficulties.

The internal consistency of the scale was acceptable (Cronbach's $\alpha = 0.70$).

Internet addiction test (IAT)

Internet addiction was measured using the IAT (Young, 1998), which was developed based on the criteria for pathological gambling outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). The scale contains 20 items rated on a 5-point Likert scale (1 = not at all, 5 = always), assessing the degree of PIU in daily life (e.g., "I lose sleep due to being online"). Total scores range from 20 to 100, with higher scores indicating more severe symptoms. Previous research has demonstrated high reliability in Chinese adolescents (Cronbach's $\alpha = 0.94$).

Perceived teacher support questionnaire

Teacher support was assessed using the Perceived Teacher Support Questionnaire developed by Ouyang (2005). The scale includes 19 items across three subscales: Learning support (e.g., structured instruction and high expectations), emotional support (e.g., empathy and warmth), and competence support (e.g., encouragement of autonomy). Items are rated on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). Higher scores reflect greater perceived support from teachers. The scale has shown strong internal consistency in previous studies (Cronbach's $\alpha = 0.91$).

Data analyses

All statistical analyses were conducted using R (Version 4.4.3) in RStudio. After data cleaning and preparation using the tidyverse package, we performed the following analyses. Common method bias was assessed *via* two approaches: Harman's single-factor test (exploratory factor analysis) and confirmatory factor analysis (CFA) with the lavaan package; LPA was employed to identify subtypes of SRB based on the four functional dimensions of SRB using the tidyLPA package; one-way analysis of variance (ANOVA) with Tukey's HSD post-hoc tests was used to examine differences in ecological variables across identified SRB profiles; multinomial logistic regression was conducted to determine predictors of profile membership. Statistical significance was set at $\alpha = 0.05$, with annotations in subsequent tables and figures as follows: * $P < 0.05$; ** $P < 0.01$ and *** $P < 0.001$.

RESULTS

Common method bias test

A Harman's single-factor test was conducted to assess potential common method bias. The results showed that the first principal component accounted for only 18.7% of the total variance, which is well below the critical threshold of 40%. Thus, it can be concluded that there is no serious common method bias in the data used in this study.

Latent profile analysis of school refusal behavior

Table 1 presents the fit indices for the six estimated models. The Akaike information criterion (AIC), Bayesian information criterion (BIC), and adjusted BIC (aBIC) values decreased steadily as the number of profiles increased, suggesting improved model fit. However, the six-, five-, and four-profile solutions were rejected for various reasons. Specifically, the four-profile model was excluded because it included a class with only two participants, representing less than 5% of the total sample ($N = 432$), which compromises model stability. The five- and six-profile models were also not retained due to reduced interpretability and only marginal improvements in fit indices. Considering these statistical indicators, together with the interpretability of the profiles, the three-profile solution was selected as the most appropriate and parsimonious model, with an entropy of 0.822 indicating good classification accuracy. The first profile classified 26 participants (6%) who showed high scores across all four SRB dimensions and was labeled the high-risk SRB group. The second profile included 142 participants (33%) with moderate elevations on the SRB dimensions, defined as the moderate-risk SRB group. The third profile comprised 263 participants (61%) with consistently low SRB scores, referred to as the low-risk SRB group. ANOVA results (Figure 1) confirmed significant differences between profiles on all SRB dimensions (all $F > 100$, $P < 0.001$). Post-hoc tests further indicated a severity continuum: High-risk > moderate-risk > low-risk.

Differences in ecological variables across profiles

Table 2 summarizes the mean differences in ecological variables across the three profiles. For network addiction, the high-risk group scored significantly higher ($M = 3.27 \pm 1.03$) than the moderate-risk (2.56 ± 0.80) and low-risk (1.97 ± 0.85) groups ($F = 43.37$, $P < 0.001$), with large effect sizes (Cohen's $d = 1.30$ between high-risk and low-risk). In terms of peer relationships, the high-risk group reported lower peer acceptance (2.66 ± 0.58) and higher peer fear (2.87 ± 0.72) compared to the other groups (both $P < 0.001$), reflecting a social adaptation gradient (low-risk > moderate-risk > high-risk). For family functioning, the low-risk group scored higher on family intimacy (70.11 ± 12.52) and adaptability (49.89 ± 12.07) than the other groups (both $F > 7$, $P < 0.001$), with the high-risk group showing the lowest functioning. Regarding teacher support, significant differences were only observed for learning support ($F = 3.85$, $P < 0.05$), with the high-risk group scoring lower (4.11 ± 0.89) than the low-risk group (4.69 ± 1.13); emotional and ability support showed no significant between-group differences.

Predictors of subtype membership

Logistic regression results (Table 3) revealed that network addiction strongly predicted membership in the high-risk group ($OR = 3.77$, 95% $CI = 2.01-7.59$, $P < 0.001$) and moderate-risk group ($OR = 1.63$, 95% $CI = 1.15-2.31$, $P = 0.0050$). Peer fear was also a significant predictor for both the high-risk ($OR = 4.42$, $P = 0.0027$) and moderate-risk ($OR = 3.05$, $P < 0.001$) groups. Additionally, gender ($OR = 2.33$, $P = 0.0030$) and ninth grade ($OR = 2.74$, $P = 0.0490$) emerged as significant predictors for the moderate-risk group, while family adaptability ($OR = 0.90$, $P = 0.0320$) significantly predicted high-risk group membership. Teacher support dimensions did not demonstrate significant predictive roles in subtype membership.

DISCUSSION

Compared to prior latent profile findings in other countries, our three-profile solution reveals both similarities and differences. For instance, González *et al.* (2019) identified four distinct SRB profiles among Spanish adolescents (high refusal, moderate-low refusal, moderate-high refusal, and non-refusal), whereas the present Chinese sample yielded a single intermediate "moderate-risk" group encompassing those moderate cases. This discrepancy may reflect cultural or contextual factors that create a more unified mid-level SRB group in China. Moreover, akin to the "multiple reinforcement-driven" high-refusal subgroup reported by González *et al.* (2018) - which showed combined positive reward-seeking and negative avoidance motives along with elevated emotional distress—our high-risk adolescents displayed high scores across all functional dimensions and severe psychosocial impairments. At the same time, Chinese high-risk youth face unique stressors such as intense academic competition and strong familial expectations, which can further intensify their school avoidance motivations. By providing the first latent profile analysis of SRB in a Chinese context, this study extends the international literature and highlights the importance of culture-specific factors in understanding school refusal behavior.

The low-risk group representing over 60% of the sample corresponds with the "non-SRB" or "minimal risk" profiles found previously (González *et al.*, 2019); this group scores low across functional dimensions and shows better psychosocial adjustment, which may reflect successful navigating of the China intensive school environment. The proportion of the moderate-risk group (33%) reflects transitional subgroups who are likely progressing towards chronic SRB without intervention, while those in the high-risk group (6%) display severe impairments resembling the "multiple reinforcement" profile related to increased internalizing symptoms and decreased school functioning (González *et al.*, 2018), also confirmed in a Chinese sample. The

Table 1: Data fit of all models

Models	AIC	BIC	aBIC	LRT	aLRT	BLRT	Entropy
1	4887.362	4919.890	4894.503	-	-	-	-
2	4462.013	4514.872	4473.617	0.3197	0.3275	< 0.001	0.932
3	4257.472	4330.662	4273.541	0.2852	0.2899	< 0.001	0.822
4	4080.641	4174.161	4101.173	0.0001	0.0001	< 0.001	0.862
5	4008.806	4122.658	4033.802	0.1068	0.1113	< 0.001	0.847
6	3939.885	4074.067	3969.344	0.2078	0.2130	< 0.001	0.888

AIC, Akaike information criterion; BIC, Bayesian information criterion; aBIC, adjusted Bayesian information criterion; LRT, Vuong-Lo-Mendell-Rubin likelihood-ratio test; aLRT, adjusted Vuong-Lo-Mendell-Rubin likelihood-ratio test; BLRT, bootstrap likelihood ratio test.

Table 2: Differences in ecological variables across latent profiles of school refusal behavior

Variables	Group 1 (N = 263)	Group 2 (N = 26)	Group 3 (N = 142)	F-value	Trend	Mean difference (Tukey HSD)		
						Group 2 vs. Group 1	Group 3 vs. Group 1	Group 3 vs. Group 2
Net addiction	1.97 ± 0.85	3.27 ± 1.03	2.56 ± 0.80	43.37***	2 > 3 > 1	1.30***	0.59***	-0.71***
Peer acceptance	3.48 ± 0.50	2.66 ± 0.58	3.16 ± 0.58	38.73***	1 > 3 > 2	-0.82***	-0.32***	0.50***
Peer fear	1.60 ± 0.62	2.87 ± 0.72	2.40 ± 0.76	90.99***	2 > 3 > 1	1.27***	0.80***	-0.48**
Family intimacy	70.11 ± 12.52	61.96 ± 11.47	66.64 ± 13.24	7.07***	1 > 3 > 2	-8.13**	-3.46*	4.67
Family adaptability	49.89 ± 12.07	41.81 ± 11.59	46.74 ± 11.45	7.58***	1 > 3 > 2	-8.18**	-3.08*	5.10
Learning support	4.69 ± 1.13	4.11 ± 0.89	4.56 ± 0.91	3.85*	1 > 3 > 2	-0.58*	-0.13	0.45
Emotional support	4.38 ± 1.00	4.01 ± 0.83	4.29 ± 0.79	1.98	-	-0.36	-0.09	0.28
Ability support	4.21 ± 1.34	3.63 ± 0.90	4.11 ± 1.18	2.50	-	-0.57	-0.10	0.47

*P < 0.05; ** P < 0.01; *** P < 0.001.

Table 3: Logistic regression results for predictors of latent profile membership (low-risk group as reference)

Variables	Group 3 <i>vs.</i> Group 1 OR (95% CI)	P-value	Group 2 <i>vs.</i> Group 1 OR (95% CI)	P-value
Net addiction	1.63 (1.15, 2.31)	0.0050	3.77 (2.01, 7.59)	< 0.001
Peer acceptance	0.89 (0.45, 1.35)	0.7250	0.34 (0.11, 1.03)	0.0780
Peer fear	3.05 (1.92, 4.79)	< 0.001	4.42 (1.62, 12.6)	0.0027
Family intimacy	1.01 (0.97, 1.05)	0.7460	1.10 (1.01, 1.20)	0.0350
Family adaptability	1.00 (0.95, 1.05)	0.8760	0.90 (0.82, 0.98)	0.0320
Learning support	0.90 (0.58, 1.41)	0.6530	0.78 (0.35, 1.76)	0.6210
Emotional support	1.03 (0.61, 1.50)	0.9200	1.08 (0.45, 2.55)	0.8870
Ability support	1.02 (0.67, 1.38)	0.9040	0.96 (0.47, 1.83)	0.9080
9 grade	2.74 (1.00, 7.53)	0.0490	3.39 (0.86, 14.0)	0.0900
7 grade	1.65 (0.89, 3.13)	0.2300	6.35 (0.75, 53.0)	0.0900
age	0.98 (0.66, 1.46)	0.9310	2.37 (0.94, 5.96)	0.0670
Gender	2.33 (1.32, 4.20)	0.0030	3.79 (1.10, 13.1)	0.0360

OR, odds ratio; CI, confidence interval.

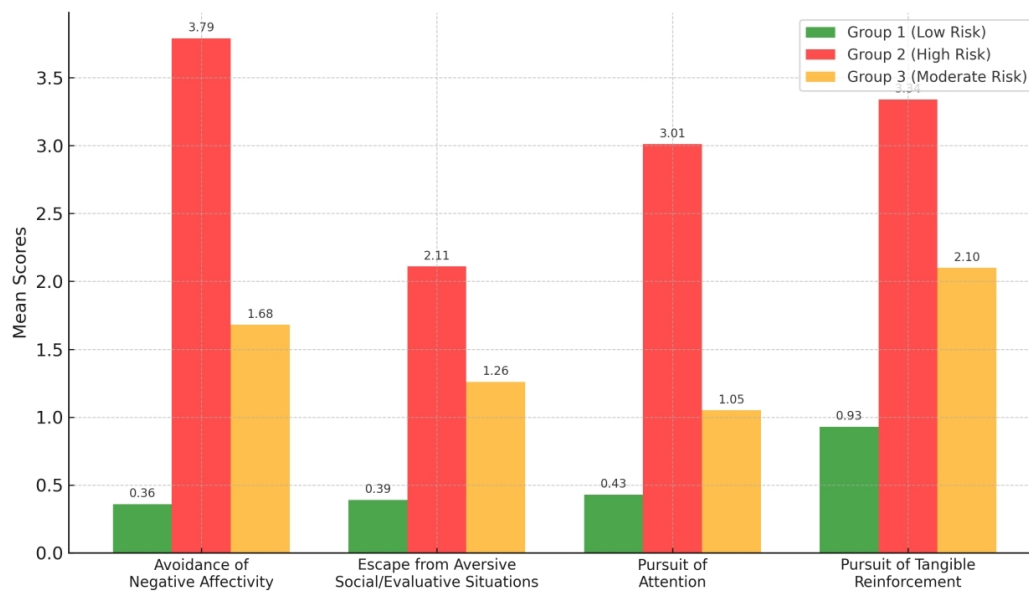


Figure 1. Mean differences across school refusal behavior profiles.

existence of these subgroups underlines SRB as an increasingly pressing issue in local education systems and mental health care facilities in particular during the period when the academic competition intensifies and the emphasis on educational achievements grows in society.

Our ANOVA analysis further clarify how these subgroups differ across ecological variables. Internet addiction, peer fear, and peer acceptance emerged as key distinguishing factors with large effect sizes, highlighting the pivotal role of peer microsystems and digital behaviors in differentiating SRB severity. The high-risk group's significantly higher internet addiction aligns with the notion that excessive internet use serves as a maladaptive coping strategy to escape academic and social pressures (as discussed in the section on the influence of the online environment in the present study), where virtual spaces offer respite from the rigid performance demands of Chinese schools. However, consistent with research suggesting complex interrelations between digital engagement and mental health (Liu *et al.*, 2024), PIU may also function as a symptom rather than a primary cause of school refusal behavior. This potential bidirectional relationship warrants longitudinal investigation to disentangle causal pathways.

Teacher support variables yielded mixed results: While learning support differentiated between the low- and moderate-risk groups, it did not significantly distinguish the high-risk group. This suggests that learning support may primarily function as a protective buffer in the early stages of disengagement but may lose its influence once SRB becomes entrenched. Emotional and competence support, however, showed no significant differences

across the profiles. This finding could potentially be attributed to the cultural emphasis on academic achievement over emotional expression in Chinese educational contexts (as discussed in the teacher support section of this study). Such a cultural backdrop might lead students to underreport or undervalue affective teacher behaviors, or it might reflect teachers' prioritization of academic guidance over socio-emotional nurturing in crowded classroom settings.

Peer acceptance and peer fear demonstrated strong discriminatory power, underscoring peer relationships as a critical factor in adolescent SRB. This resonates with Kljakovic *et al.* (2021), who highlighted that perceived peer rejection or isolation often precedes school withdrawal. The substantial effect sizes (*e.g.*, Cohen's $d = 1.30$ for peer fear between high-risk and low-risk groups) confirm the salience of the peer microsystem in the educational-ecological model, particularly in Chinese contexts where group cohesion and social harmony are culturally emphasized, making peer exclusion more psychologically impactful.

"Family-related variables—intimacy and adaptability—revealed smaller, yet significant, group differences, with the low-risk profile exhibiting higher levels. This modest effect size ($\eta^2 = 0.03$) might reflect collectivist cultural norms that prioritize family harmony, potentially leading to an underreporting of relational difficulties in self-report data (Havik & Ingul, 2021). Specifically, Chinese adolescents may be reluctant to disclose family conflicts due to prevalent societal expectations of filial piety. Alternatively, the relative homogeneity of family functioning in the sample suggests these variables alone may be insufficient to explain SRB variance within this

cultural context, where extended family networks or community influences might also play a role.

Logistic regression analyses complemented the group comparisons by highlighting several important predictors of SRB profiles. Internet addiction, peer-related fear, and family adaptability were consistently associated with higher risk. The significance of peer fear echoes previous findings on the role of social evaluative anxiety in absenteeism (Finning *et al.*, 2019). In contrast, the predictive contribution of family adaptability points to the protective function of flexible parenting, in line with ecological systems theory, which suggests that family flexibility helps buffer the impact of external stressors (Bronfenbrenner, 1992; González *et al.*, 2025). Gender and grade level—particularly being in the ninth grade—also differentiated the moderate-risk group, which may reflect the intense academic demands surrounding China's high school entrance examinations.

Interestingly, some variables that we expected to be protective, such as teacher emotional support or family intimacy, were not significant. This pattern suggests that protective mechanisms may vary depending on the context or the severity of SRB. It is also possible that certain variables, such as internet use, operate more as consequences than as causes of SRB. Such findings underline the complexity of causal pathways in this domain. Future research would benefit from longitudinal designs and the integration of qualitative data, which could help capture the nuanced experiences of Chinese adolescents navigating SRB within their specific educational and cultural environment.

Overall, this study advances understanding of SRB's latent structure in Chinese adolescents and its social-ecological correlates. Identifying a high-risk subgroup with multidimensional impairments provides a foundation for targeted interventions, while the moderate-risk group offers a focal point for early identification and school-based prevention. These findings reaffirm peer dynamics and internet behaviors as salient, culturally relevant indicators of SRB risk, and underscore the need for contextually tailored strategies that address the interplay of academic pressure, family dynamics, and digital engagement in Chinese schools.

LIMITATIONS AND FUTURE DIRECTIONS OF RESEARCH

This study has several limitations. First, the cross-sectional design limits causal interpretations; longitudinal studies are needed to capture developmental trajectories of school refusal behavior. Second, although we employed a social-ecological perspective, interactions between different microsystems (*e.g.*, peer-family or

teacher-peer) were not explicitly modeled. Future research could employ multilevel modeling or person-centered techniques to capture these dynamics. Third, while internet use was identified as a key correlate, its dual nature—both as a coping mechanism and risk factor—was not explored in depth. Mixed-method or diary studies could provide more insight into online behavior patterns. Finally, the reliance on self-report measures may introduce bias; future work should incorporate multi-informant data (*e.g.*, from teachers or parents) for validation.

DECLARATION

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Author contributions

Ren YM: Writing—original draft; Jia SY: Conceptualization (topic determination), Methodology (research framework development); Zheng QY and Liang S: Formal analysis (data analysis); He L: Investigation (data collection). All authors have read and approved the final version of the manuscript.

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Ethical approval

This study was reviewed and approved by the Institutional Research Ethics Committee (Approval Number: FHW-ER-2425-119). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and national research committees and with the 1964 Declaration of Helsinki and its later amendments.

Informed consent

All participants and their parents or legal guardians were fully informed about the purpose, procedures, and confidentiality of the study prior to data collection, and provided written informed consent to participate.

Conflict of interest

None.

Use of large language models, AI and machine learning tools

This work was supported by the DeepSeek large language model (R1) for the purpose of language translation and refinement. The author has thoroughly reviewed, revised, and verified all AI-generated content

and assumes complete responsibility for the entire work.

Data availability statement

The datasets generated and/or analyzed during the current study are not publicly available due to the sensitivity and confidentiality of participant information but are available from the corresponding author on reasonable request.

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