

Relational Foundations of Mental Health: Exploring the Influence of Parents, Peers, and Teachers on Chinese Boarding School Students across Developmental Stages

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Abstract: This study investigated how the quality of parent, peer, and teacher relationships predicts mental health difficulties—including emotional symptoms, conduct problems, hyperactivity/inattention, and peer problems—among students in Chinese boarding schools. Using a cross-sectional design and hierarchical multiple regression analysis, data were collected from 992 students across grades 4, 7, and 10. Relationship quality was assessed via validated subdimensions of trust, communication, and alienation. The results showed that relational alienation, conceptualized as emotional disconnection and perceived rejection, emerged as the most robust and consistent predictor of psychological difficulties across all relationship domains. This pattern held across developmental stages, challenging the assumption that early adolescence is uniquely vulnerable. Gender moderation analyses revealed that boys were particularly sensitive to teacher trust, whereas girls responded more strongly to teacher communication, reflecting culturally situated relational dynamics. These findings underscore the need for continuous, culturally sensitive, and gender-responsive strategies to strengthen relational support and reduce psychological difficulties in residential school settings.

Keywords: Student mental health; Relationship quality; Chinese boarding schools; Developmental stages; Gender differences.

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1. Introduction

Late childhood and adolescence are critical developmental periods marked by rapid cognitive, emotional, and social transformations [1,2]. During this time, the quality of interpersonal relationships—particularly with parents, peers, and teachers—plays a pivotal role in shaping psychological well-being [3,4]. Among the many facets of relational experience, trust, communication, and alienation have consistently emerged as key predictors of emotional resilience and vulnerability [5–7]. These relational processes influence how young people interpret social cues, regulate emotions, and build internal working models of support and self-worth.

In recent decades, the number of boarding schools in China has expanded significantly, driven by large-scale rural-to-urban migration, the increasing number of left-behind children, and government reforms aimed at promoting educational equity and access [8]. By 2016, an estimated 16.7 million students, representing 58.6% of all rural junior secondary school students, were enrolled in boarding schools. These schools create a distinctive relational ecology, where students are physically separated from their caregivers, live in close quarters with peers, and engage intensively with teachers across both academic and nonacademic settings [9]. The immersive structure of boarding school life magnifies the emotional salience of peer and teacher relationships while simultaneously attenuating familial contact, making relational quality a central factor in students' psychological adjustment [10,11]. These dynamics raise important questions about how multiple relational experiences—across parents, peers, and teachers—interact to shape adolescent mental health in boarding contexts.



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The present study begins with a comprehensive literature review. Drawing on attachment theory [12] and ecological systems theory [13], this study develops a multidimensional theoretical framework to examine how trust, communication, and alienation within parent, peer, and teacher relationships collectively influence adolescent mental health while also exploring the moderating roles of grade level and gender. Building on this foundation, this review identifies key theoretical gaps in existing research. In light of the findings of this study, the rationale for focusing on the context of Chinese boarding schools will be articulated, emphasizing the importance of adopting culturally sensitive and contextually embedded perspectives in understanding adolescent psychological mental health.

2. Literature Review

2.1. Theoretical Framework

Two interrelated theoretical frameworks underpin this research: attachment theory and ecological systems theory. Attachment theory, first proposed by Bowlby [14,15] and extended by Ainsworth [16], posits that the quality of early relational bonds—characterized by dimensions such as trust, communication, and emotional availability—plays a critical role in shaping psychological development and emotional regulation. As children grow, these attachment bonds are internalized as mental representations or "working models," influencing how individuals perceive and navigate future relationships. Importantly, attachment theory has been extended to encompass relationships beyond the parent-child dyad, including peers [17] and teachers [18], especially in caregiving contexts such as boarding schools.

A complement to this intrapersonal perspective is Bronfenbrenner's Ecological Systems Theory [13], which conceptualizes development as being embedded within multiple environmental layers. This model conceptualizes human development as shaped by interacting systems, ranging from immediate interpersonal relationships to broader institutional and societal structures. Martin et al. [19] further argued that the boarding school environment exemplifies the nested ecological layers described in this model, which include 1) the microsystem level, where students interact directly with peers, teachers, and dormitory staff—forming the core relational experiences examined in this study; 2) the mesosystem, which is the interplay between students' family life and school life, especially relevant in boarding settings where physical separation from parents alters the home-school connection; 3) the exosystem, which comprises indirect social structures, such as dormitory rules or school-wide events, that influence students' emotional well-being without direct interaction; 4) the macrosystem, which reflects the institutional culture, disciplinary ethos, and societal norms that govern expectations of academic achievement and behavior in boarding contexts; and 5) the chronosystem, which accounts for temporal changes, such as developmental transitions across school stages, which may moderate the influence of relational experiences on mental health. **Figure 1** illustrates these layered systems as they apply to the boarding school context.

Of particular relevance are the microsystems of family, school, and peer groups, each exerting proximal influence on the developing individual. In a boarding school environment, these systems become especially salient: parental contact is limited, peer and teacher interactions intensify, and the school becomes the student's primary developmental ecology. This framework highlights the importance of investigating all three relational contexts concurrently rather than in isolation.

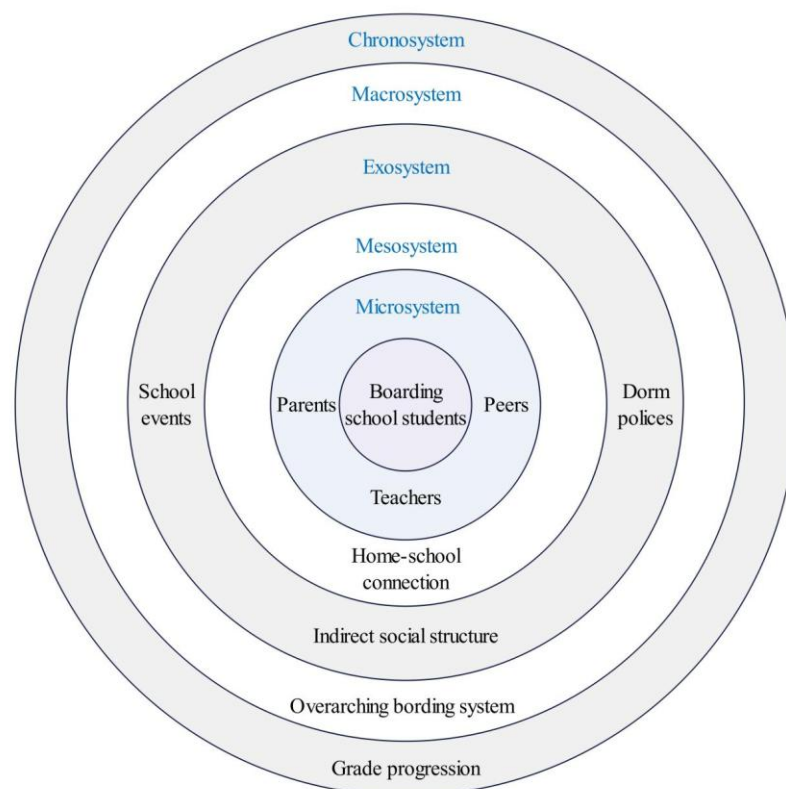


Figure 1. Ecological Systems Framework Adapted for Boarding School Students.

However, Rothbaum et al. noted that while attachment theory has some degree of biological universality, its theoretical framework is deeply rooted in Western individualistic traditions, emphasizing autonomy, exploratory behavior, and emotional openness. In East Asian cultures, interpersonal interdependence, relational obligation, and emotional restraint are emphasized over individual autonomy [20]. For instance, Chinese Confucian values promote filial piety, hierarchical harmony, and role-based duties; shape children's understanding of parental sensitivity, competence, and secure-base behavior in ways that diverge from Western norms [21]. Moreover, CELCIS highlights that Western attachment theory often inadequately addresses attachment formation in group or institutional care settings, where children may develop multiple, overlapping relationships rather than a single, primary attachment figure [22].

The uncritical application of Western-derived attachment constructs in culturally distinct settings—such as Chinese boarding schools—risks overlooking key relational dynamics that are central to students' psychological well-being. These frameworks, rooted in individualistic values, often fail to account for the complex, culturally embedded nature of interpersonal relationships in collectivist societies such as China. To address this conceptual and contextual gap, the present study examines the relational foundations of adolescent mental health within Chinese boarding schools, adopting an ecologically and culturally sensitive approach that moves beyond Western-centric paradigms.

2.2. Developmental Transitions from Late Childhood to Adolescence

Relational needs and vulnerabilities undergo profound transformation between late childhood and adolescence, driven by concurrent cognitive, emotional, and social developments. In late childhood (typically ages 9–11, Grade 4), children are still largely embedded in the family microsystem, with parents serving as their primary sources of emotional regulation, attachment security, and social learning. Neurodevelopmentally, this stage is characterized by increased executive function and self-regulation skills, but children still

depend on caregivers to scaffold their emotional experiences and provide stability in daily life [23]. While peer relationships begin to acquire importance during this stage, empirical evidence consistently reveals that the quality of parent–child attachment remains a dominant predictor of both internalizing and externalizing symptoms in preadolescents [24,25].

In early adolescence (ages 12–13; Grade 7), significant changes occur across domains. The onset of puberty activates shifts in emotional sensitivity and social motivation, making adolescents more attuned to peer evaluation and social acceptance [26,27]. At this stage, peer relationships become central to adolescents' sense of identity and belonging, serving as both protective buffers and potential sources of emotional distress—particularly in institutional settings such as boarding schools, where peer exposure intensifies and family contact is limited [28]. This transition renders early adolescents particularly vulnerable to anxiety, mood disorders, and peer-related psychological difficulties [29,30].

By mid-to-late adolescence (ages 15–16; Grade 10), adolescents demonstrate greater individuation, autonomy-seeking behavior, and abstract reasoning abilities. This phase corresponds to the identity versus role confusion stage in Erikson's psychosocial theory and to what Arnett describes as the emergence of meta-cognitive and future-oriented identity formation [31]. Although adolescents typically spend less time with their parents during this period, longitudinal research suggests that the quality of parent–adolescent attachment continues to exert indirect effects on mental health by influencing emotion regulation, resilience, and academic motivation [32,33]. Simultaneously, peer relationships consolidate into more stable and emotionally intimate connections, whereas relationships with nonparental adults—such as teachers, mentors, and coaches—are becoming increasingly important [3,34].

Together, these developmental transitions highlight the importance of adopting a developmentally sensitive and relationally integrated framework—one that captures the shifting salience of parents, peers, and teachers as attachment figures across different stages of childhood and adolescence. By including students from Grades 4, 7, and 10—representing late childhood, early adolescence, and mid-to-late adolescence, respectively—this study is uniquely positioned to examine how the predictive value of relational variables evolves in tandem with age-specific psychosocial needs and maturational changes.

2.3. Relational Predictors of Mental Health: The Roles of Trust, Communication, and Alienation

From late childhood through adolescence, individuals experience evolving relational needs and heightened sensitivity to social connections [23]. During this period, the quality of interpersonal relationships within the family, peer, and school environments—the three primary relational systems in an individual's life—become a key determinant of mental health and emotional adjustment.

This section examines how the perceived quality of relationships with parents, peers, and teachers shapes psychological well-being from late childhood through adolescence. It focuses in particular on three empirically supported dimensions of relational experience: trust, communication, and alienation. These constructs are widely recognized in both theory and empirical research as core indicators of relational security and emotional support, each exerting distinct and significant influences on mental health outcomes during adolescence [6,35,36].

2.3.1 Role of Parent–child Relationships in Mental Health

A substantial body of developmental research has demonstrated that the emotional quality of this relationship—shaped by perceived trust, communication, and alienation—plays a central role in how school-aged individuals navigate emotional challenges, social stressors, and identity development throughout late childhood and adolescence [5,24].

Trust in parents refers to one's confidence in caregivers' emotional availability, dependability, and goodwill [37]. This dimension is central to the development of secure attachment representations, which undergird emotion regulation, resilience to stress, and interpersonal competence [25]. During this developmental period, trust also supports autonomy by providing a psychological safety net, enabling young people to explore their environments while maintaining confidence in stable parental support [2]. Trust has been linked empirically to lower rates of depression, anxiety, and conduct problems, particularly during key developmental transitions [38].

Open parent-child communication refers to the perceived openness, emotional tone, and mutual understanding in interactions [39]. Effective communication facilitates the transmission of values, guidance, and emotional support and fosters adaptive coping and identity development [28,40]. Specifically, individuals who perceive communication with parents as warm, reciprocal, and emotionally validating are more likely to report higher life satisfaction and lower psychological distress [35]. However, communication marked by judgment, avoidance, or excessive control can impair help-seeking behavior and exacerbate internalizing symptoms, especially in emotionally vulnerable youth [41].

In contrast, alienation captures feelings of emotional distance, neglect, or rejection in the parent-child relationship. It signals not only the absence of closeness but also the presence of active disconnection, anger, or mistrust [42]. High levels of perceived alienation are consistently associated with depressive symptoms, anxiety, loneliness, and externalizing behaviors, including aggression and rule-breaking [36]. In late childhood and early adolescence—a period marked by increasing individuation and emotional volatility—alienation from caregivers may reflect unaddressed emotional needs or relational misattunement, which can become exacerbated in high-stress environments [43].

In Chinese cultural settings, parent-child relationships are shaped by Confucian values of filial piety, emotional restraint, and hierarchical familial roles [44,45]. Parents may express care through instrumental means—such as academic investment or discipline—rather than through overt emotional expression. While such behaviors may be interpreted by adults as responsible caregiving, young people may perceive them as emotional distance or misattunement [46]. This cultural dynamic complicates the interpretation of trust, communication, and alienation in East Asian contexts and calls for culturally sensitive frameworks of relational assessment.

2.3.2 Role of Peer Relationships in Mental Health

As individuals develop from late childhood into adolescence, peers become increasingly central to their psychological adjustment, even as parents remain key attachment figures [53]. Trust in peers reflects the perceived reliability, emotional support, and loyalty provided by close friends or peer groups [47]. In adolescence, trusted peer relationships serve as secondary attachment figures, providing a secure base for exploration, emotional disclosure, and validation—particularly when parental support is limited or absent [17,48]. Research has shown that adolescents who report high levels of peer trust are less likely to experience depression, anxiety, and loneliness [49,50]. This protective function may be especially salient in collectivist cultures, where social harmony and relational belonging are integral to well-being [51].

Open and reciprocal communication with peers is central to the development of a sense of social competence and identity. Supportive peer communication allows for emotional processing, conflict negotiation, and the coconstruction of shared meanings, all of which contribute to psychological resilience [52]. Conversely, peer interactions marked by superficiality, secrecy, or miscommunication are associated with social withdrawal and internalizing symptoms, particularly in socially anxious youth [53].

Peer alienation—feelings of rejection, exclusion, or emotional distance within peer relationships—represents a significant psychosocial stressor during late childhood and adolescence. Extensive research has linked peer alienation to increased risk for depression,

school disengagement, behavioral problems, and even suicidal ideation [54,55]. In Chinese collectivist contexts, peer relationships are not only emotionally salient but also socially normative, with emphasis placed on group belonging, mutual responsibility, and conflict avoidance [51]. Within this cultural framework, peer alienation may be experienced not just as interpersonal loss but also as a violation of social harmony and face (i.e., *mianzi*), further intensifying its psychological impact [56].

However, despite the growing recognition of peers as attachment figures in young people's lives, most empirical research continues to prioritize parent-child relationships as the primary focus of relational and developmental studies [57]. Few studies have systematically examined peer trust, communication, and alienation within an integrated relational framework or explored how these dimensions vary by developmental stage and gender, particularly in institutional settings, where peer interactions are both intensified and socially significant [56,58].

2.3.3 Role of Teacher-Student Relationships in Mental Health

Teachers frequently serve as nonparental attachment figures, offering structure, emotional support, and relational stability within school-based and institutional settings [59]. When students perceive their teachers as trustworthy and supportive, they are more likely to feel safe, respected, and understood—conditions that facilitate academic engagement, emotional regulation, and psychological well-being [60,61]. This is especially relevant during the transition from late childhood to adolescence, a period marked by growing social evaluation sensitivity and a heightened need for affirmation from respected adults [26]. In addition, effective teacher-student communication extends beyond instructional clarity to include emotional tone, responsiveness, and perceived accessibility. Students benefit from interactions with teachers who listen actively, validate their perspectives, and offer constructive guidance—particularly during times of stress or academic pressure [62]. Research indicates that open, respectful communication with teachers is associated with lower levels of depression, better school belonging, and increased prosocial behavior [63,64].

Conversely, perceived alienation from teachers—feelings of rejection, misunderstanding, or emotional distance—can contribute to academic disengagement, behavioral problems, and internalizing symptoms such as anxiety and low self-worth [65]. This is especially critical in cultures where teachers are accorded high moral and social status, such as in China, where Confucian values position teachers as authoritative yet benevolent figures [66]. When students experience alienation from teachers, it can be interpreted not just as interpersonal disconnection but also as a failure to meet relational and cultural expectations, thereby intensifying the psychological burden.

While research on teacher-student relationships is expanding, empirical studies within non-Western cultural contexts remain limited [67]. The literature in China has largely focused on teachers' roles in academic motivation and classroom management, often neglecting the relational and emotional dimensions of teacher-student interactions—particularly in residential school settings, where teachers may also serve as attachment figures [62,66].

2.4. Chinese Boarding School Contexts

Boarding schools—educational institutions that integrate academic instruction with residential life—have a long-standing global presence shaped by diverse historical, cultural, and sociopolitical forces [68]. Traditionally, they have existed in various forms, ranging from elite private institutions in Europe and North America to publicly funded schools serving children from geographically isolated or economically disadvantaged communities [69]. In many rural or migratory contexts, boarding schools function not only as educational settings but also as surrogate environments that replace, or supplement, the familial home.

In China, the development of boarding schools over the past six decades has been closely aligned with national educational and socioeconomic priorities. Since the 1980s, rapid industrialization and urbanization have fuelled large-scale internal migration, contributing to the rise of “left-behind children”—rural youth who are geographically and emotionally separated from their migrant worker parents [9]. In response, government policies introduced in the early 2000s have supported the consolidation of rural education through the expansion of township- and county-level boarding schools. These reforms aim to increase educational equity and resource efficiency by relocating students from dispersed villages into centralized, better-resourced institutions.

Unlike day schools, the immersive structure of boarding schools creates a distinct relational ecology. Students reside with peers and engage with teachers and staff not only in formal classroom settings but also in everyday routines, fostering close-knit, self-contained communities with unique interpersonal dynamics [69]. These environments profoundly influence students’ psychological development and social-emotional adjustment by reshaping the structure, accessibility, and function of relational support systems—particularly in relation to parents, peers, and teachers. This section explores how these boarding school contexts transform traditional relational roles and impact students’ mental health within these three key domains.

2.4.1 Effects of Boarding Schools on Mental Health

A growing body of research has documented the mental health risks associated with boarding school attendance, particularly in rural and underresourced settings. In China, it is reported that rural boarding students face prolonged familial separation, heightened academic pressure, and constrained personal autonomy—factors associated with increased symptoms of anxiety, depression, and social withdrawal. International studies echo these concerns [11]. Mander reported that Australian boarding students reported greater emotional difficulties—such as elevated depression, anxiety, and stress—than their nonboarding peers did following the transition to secondary school [10].

Despite these risks, some studies suggest that boarding environments—when adequately resourced and well managed—can foster positive developmental outcomes. In a longitudinal study, Martin et al. reported that boarding students demonstrated greater academic resilience, goal-setting behavior, and adaptive motivation than their day-school peers did [69]. Notably, some boarding students perceived stronger parental relationships, potentially reflecting increased appreciation for parental support in the context of physical separation. Moreover, boarding schools may provide enhanced structure and psychosocial stability for students from less supportive home environments. Behaghel et al. argued that the predictability and discipline offered by boarding contexts can promote autonomy, self-awareness, and emotional maturity [70]. These benefits, however, are not universally experienced and often depend on students’ background, characteristics, and quality of relationships within the school environment.

Much of the literature on boarding schools has focused on comparative outcomes between boarding and nonboarding students, often neglecting the underlying mechanisms through which boarding environments influence mental health. In particular, limited attention has been given to the relational processes that unfold within residential settings. However, recent research in China indicates that students who experience lower-quality relationships within school—characterized by mistrust, poor communication, or emotional alienation—are significantly more likely to report psychological difficulties such as anxiety, depression, and loneliness [71]. These findings highlight the pivotal role of relational quality in shaping students’ mental well-being within institutional contexts.

2.4.2 Relational Systems in Boarding School Contexts

In boarding school settings, physical separation from parents disrupts the normative attachment environment, particularly during late childhood and early adolescence, when parental support remains developmentally salient [2]. The reduction in day-to-day contact

may magnify feelings of emotional distance or alienation, especially among students with high emotional dependency. Jiang et al. reported that among Chinese boarding students, secure parent–child relationships were protective only when students' emotional needs were moderate; those with stronger dependency needs but limited access to parental support reported greater psychological distress [72]. This highlights the importance of fit between students' relational needs and the availability of emotional closeness, underscoring a potential mismatch in the boarding school context. Conversely, students with secure attachment histories may benefit from internalized parental support even in the absence of regular contact, suggesting that the quality—not just the frequency—of parent–child communication and trust matters. As such, assessing students' perceptions of parental trust and alienation remains crucial for identifying their emotional resilience or vulnerability in residential education settings.

In the absence of parental proximity, peer relationships often become the primary source of emotional support, especially in full-time boarding environments where students live, learn, and socialize with peers around the clock. The intensity and frequency of peer interaction foster highly interdependent social networks that function as surrogate families [64]. Thakkar et al. reported that children living in group homes in India developed significantly stronger attachments to peers than to adult caregivers did [73], whereas Khan and Kamal reported that orphaned youth demonstrated higher levels of peer trust than their nonorphaned peers did—underscoring the adaptability of attachment systems in the absence of traditional familial support [74]. These findings suggest that peer trust and inclusion are not merely social enhancers but critical emotional anchors, particularly in contexts where familial contact is reduced. Pfeiffer et al. reported that students who remained on campus over weekends were more successful in forming close peer bonds than those who returned home, suggesting that immersion enhances emotional investment in peer relationships [75]. However, the centrality of peer relationships also elevates the psychological risks associated with peer alienation, such as loneliness, social anxiety, and identity confusion. In close-knit residential settings, the lack of alternative support systems may exacerbate the effects of peer rejection or exclusion [71].

Similarly, with limited access to parental figures, teachers often assume quasiparental roles in boarding schools, providing structure, discipline, and emotional guidance. This dual role is especially pronounced in Chinese boarding contexts, where teachers frequently function as both academic authorities and pastoral caregivers [76]. Krane et al. argued that in residential settings, teachers become critical adult attachment figures, and their relationships with students have amplified emotional salience [77]. Informal, nonacademic interactions—such as shared meals, dormitory supervision, and pastoral check-ins—can foster emotional closeness and strengthen students' perceptions of relational safety and accessibility [76,77]. In boarding school settings, where parental presence is limited, such interactions often serve as key relational touchpoints between students and adults.

However, when teacher–student relationships are marked by emotional distance or perceived alienation, students may be deprived of one of the few available adult support systems—particularly when peer conflict or familial separation is also present [64]. This is especially critical for emotionally vulnerable students, who may require consistent adult mentorship but are reluctant to seek support from distant or authoritarian figures [59]. In such cases, teacher alienation can function not only as an indicator of relational strain but also as a predictor of psychological withdrawal, depressive symptoms, and reduced academic engagement [78]. Thus, within boarding school environments, teachers must be understood not only as instructional agents but also as relational anchors whose daily interactions carry substantial emotional and developmental significance. Their roles extend beyond pedagogy to include caregiving, emotional regulation, and social scaffolding—especially in residential settings where alternative adult attachments are limited [18].

Taken together, the literature suggests that boarding schools in China function as complex developmental ecologies that simultaneously challenge and reshape the traditional relational foundations of students. While these settings may offer structure, educational opportunities, and psychosocial protection for some students, they also disrupt routine access to familial support and heighten dependence on peer and teacher relationships. These relational shifts render trust, communication, and alienation within the parent, peer, and teacher domains particularly salient for students' psychological adjustment. This underscores the need to examine the underlying mechanisms through which boarding environments influence mental health outcomes.

2.5. Gender as a Moderator of the Psychological Impact of Relational Experiences

Emerging evidence suggests that the psychological impact of relational experiences—particularly trust, communication, and alienation—may differ meaningfully by gender. These differences are often rooted in both developmental trajectories and sociocultural expectations surrounding emotional expression, coping styles, and relational needs [52,79].

Girls, on average, tend to place greater emotional salience on interpersonal closeness and connectedness in their social relationships. They are more likely to seek emotional support, value relational intimacy, and experience distress when communication is perceived as inadequate or when trust is violated [17,80]. As a result, girls may be more psychologically vulnerable to perceived alienation across parent, peer, and teacher relationships, particularly in emotionally charged environments such as boarding schools where relational security is crucial. Studies have shown that alienation from parents or peers is more strongly associated with depressive symptoms and internalizing problems in girls than in boys [81].

In contrast, boys often report fewer interpersonal disclosures and are generally socialized to adopt more independent or emotionally restrained coping strategies [82]. While they may be less likely to verbalize or seek help for emotional distress, boys are not immune to the psychological consequences of poor relational quality. Low levels of trust or emotional alienation—particularly in teacher relationships—may manifest in boys through externalizing behaviors, academic disengagement, or behavioral difficulties [83]. Research also suggests that boys may benefit significantly from warm, communicative teacher relationships, especially in institutional contexts where such adult connections can provide emotional regulation and structure [84].

These gendered patterns may be amplified in boarding school contexts, where the absence of familial buffers elevates the emotional weight of peer and teacher relationships [10,11]. Girls' heightened relational orientation—their greater sensitivity to interpersonal closeness and approval—may render them particularly vulnerable to breakdowns in communication or perceived rejection [52,81]. Conversely, boys' reliance on structured authority figures, shaped by traditional norms of emotional restraint and independence, may mean that emotionally distant or authoritarian teacher interactions have a stronger impact on their psychological functioning, often manifesting through externalizing behaviors or disengagement [60]. Furthermore, the gendered organization of boarding schools—including differences in dormitory culture, peer group hierarchies, and teacher–student dynamics—can shape how relational resources are accessed, distributed, and internalized [85,86]. For example, hierarchical dormitory structures may reproduce gendered norms of social behavior, potentially intensifying the emotional consequences of peer conflict or exclusion.

Despite these important distinctions, gender remains underexamined as a moderator in studies of student mental health within boarding school settings [75]. Most existing research focuses on average differences in psychological outcomes by gender rather than investigating how gender may interact with specific relational dimensions—such as trust,

communication, and alienation—across parent, peer, and teacher relationships. To address this gap, the present study incorporates gender as a moderating variable to better understand how boys and girls differentially experience the psychological effects of relational quality in institutional settings. Such an approach is essential for designing gender-sensitive mental health support and educational policies that reflect the nuanced, developmentally specific ways in which students engage with their relational environments in boarding schools [79,80].

2.6. Gaps in the Literature

Despite growing interest in student mental health and school-based influences, several key gaps remain in the literature—particularly in the context of Chinese boarding schools.

First, while extensive research highlights the role of parent–child relationships in the well-being of children and adolescents, few studies adopt a relationally integrated perspective that simultaneously considers parents, peers, and teachers as interacting support systems. Second, although constructs such as trust, communication, and alienation have each been individually associated with mental health outcomes, few studies have examined these dimensions across relational domains within a unified framework. This is particularly limiting in residential settings, where relational strain in one domain (e.g., peer rejection) can be exacerbated by limited support in others (e.g., absence of parental contact). Third, existing research on Chinese boarding schools predominantly compares boarding versus nonboarding students, often overlooking the mechanisms through which the boarding environment influences mental health. However, the effects of boarding are shaped by regional and socioeconomic disparities [8]. Rural students—often from lower-income families with less educated caregivers—tend to be more vulnerable due to limited school resources and weaker support structures. In contrast, urban boarding schools generally offer better infrastructure, living conditions, and staff qualifications. These differences underscore the importance of conducting context-specific investigations into the boarding school experience [8]. Fourth, although psychological development is widely recognized as being stage specific, few studies have investigated how relational predictors of mental health vary across developmental stages. This gap limits our understanding of how the salience of parental, peer, and teacher relationships may shift with age. Finally, while gender differences in psychological outcomes are well documented, gender is rarely examined as a moderator in studies of relational predictors. Given the known gender-based differences in emotional expression, relational sensitivity, and coping strategies, this omission risks overlooking critical patterns of vulnerability or resilience.

To address these gaps, the present study focuses on students in urban Chinese boarding schools and adopts a developmentally informed, gender-sensitive, and relationally integrated framework. Specifically, it investigates how trust, communication, and alienation across parent, peer, and teacher relationships predict psychological outcomes across late childhood and adolescence. By including students from Grades 4, 7, and 10, this study explores how the influence of relational quality shifts across distinct developmental stages. It also incorporates gender as a moderating variable, as boys and girls may differ in their relational sensitivities and mental health risks. Through this multidimensional approach, the study aims to generate nuanced, context-specific insights that can inform both theory and practice in student mental health and residential education.

2.7. Research Aims and Research Questions

The overarching aim of this study is to develop a relationally integrated, developmentally informed, and gender-sensitive understanding of adolescent mental health in Chinese urban boarding schools. It investigates how students' perceptions of trust, communication, and alienation in their relationships with parents, peers, and teachers are related to psychological difficulties. Grounded in a framework that views adolescent devel-

opment as unfolding within interconnected social systems, this study moves beyond isolated relationship analyses to explore the cumulative and comparative effects of these relational domains.

This study is guided by one overarching research question and two subquestions that examine how age and gender moderate these associations. Research indicates that boys and girls differ in coping strategies, help-seeking behaviors, and the emotional importance they assign to relationships [52], whereas relational needs and emotional regulation capacities shift across developmental stages [2]. **Figure 2** presents a conceptual model outlining the hypothesized associations between relationship quality and psychological difficulties, with grade level and gender considered potential moderators.

RQ1: How do the quality of students' relationships—with parents, peers, and teachers—in terms of trust, communication, and alienation relate to their psychological difficulties?

Subquestions:

RQ1a: What is the association between parent–child relational quality and psychological difficulties?

RQ1b: What is the association between peer relational quality and psychological difficulties?

RQ1c: What is the association between teacher–student relational quality and psychological difficulties?

RQ2: Do these associations differ across developmental stages (grades 4, 7, and 10)?

RQ3: Are these associations moderated by gender, reflecting different degrees of relational sensitivity for boys and girls?

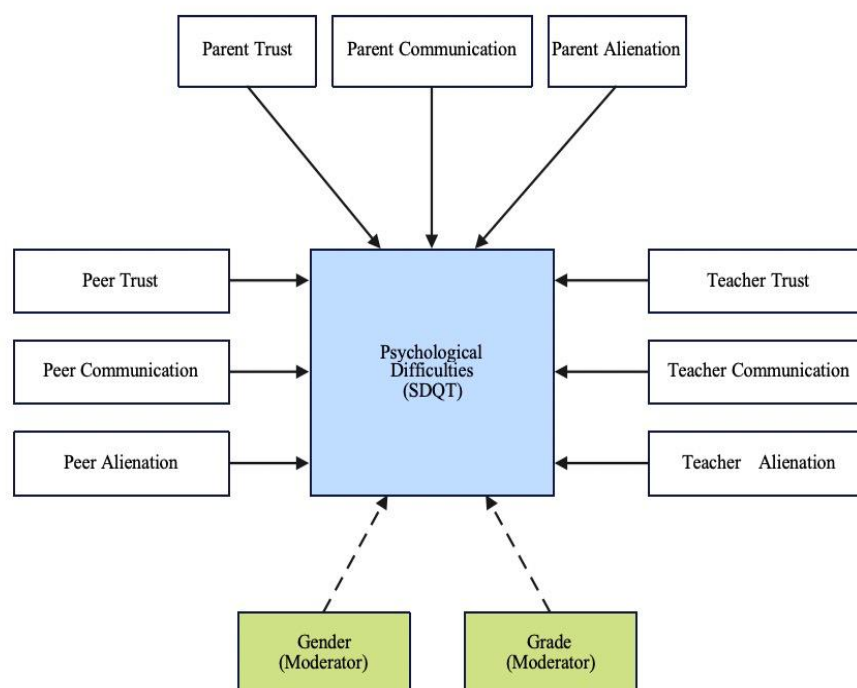


Figure 2. Conceptual Model of the Associations between Relationship Quality and Psychological Difficulties (SDQT).

3. Methodology

3.1. Research Design

This study employs a cross-sectional quantitative design to examine the concurrent associations between relationship quality and mental health outcomes across three developmental stages (grades 4, 7, and 10), with particular attention given to the moderating role of gender. It focuses on three key relational domains—parent–child, peer, and

teacher–student relationships—and explores how students’ perceptions of trust, communication, and alienation within each domain predict psychological difficulties. The use of validated instruments and statistical modeling (e.g., multiple regression, interaction terms) facilitates the identification of subgroup patterns and supports hypothesis testing grounded in developmental and relational theory.

3.2. *Philosophical Paradigm and Approach*

This research is situated within a positivist paradigm, underpinned by the assumption that psychological and social phenomena can be measured objectively and that relationships between variables can be uncovered through systematic empirical investigation [87,88]. The positivist approach emphasizes quantification, objectivity, and generalizability, aligning well with the study’s goal of identifying measurable associations between relational variables and mental health outcomes in a defined population.

The cross-sectional approach reflects a commitment to capturing patterns at a specific moment in time rather than examining developmental change longitudinally. While cross-sectional data cannot establish causality, they provide valuable insights into the strength and direction of associations across subgroups (e.g., by age or gender), particularly in settings such as boarding schools where contextual and relational dynamics are complex and underresearched [89,90].

The study adopts a deductive logic of inquiry, drawing on existing theoretical and empirical literature to generate hypotheses about how trust, communication, and alienation within key relational domains predict psychological difficulties [64]. It then tests these hypotheses via statistical analyses, contributing to the evidence on student mental health in institutional contexts.

3.3. *Participants and Sampling Strategy*

3.3.1. *School Context and Participant Demographics*

This study was conducted at a full-time boarding institution located in Baoshan, Yunnan Province, southwestern China. As a representative boarding school in the region, the institution enrolls students from diverse socioeconomic backgrounds and geographic origins. This heterogeneity enhances the external validity of the study and supports the generalizability of the findings to other boarding contexts within China [91,92].

A total of 992 students participated in the study. All participants had been enrolled at the school for at least one full academic semester, a criterion that ensured adequate exposure to the boarding environment. This sampling condition improves the reliability of students’ self-reports regarding both interpersonal relationships and psychological outcomes by reducing the influence of transitional adjustment or novelty effects [93].

3.3.2. *Grade and Gender Distribution*

To capture developmental variations in relational influences on mental health, the study employed stratified purposive sampling across three key educational stages. The sample is presented in **Table 1**.

Table 1. Demographic characteristics of the sample (N = 992).

Participant Group	N	% of Total	Mean Age (SD)
Male	499	50.3	—
Female	493	49.7	—
Grade 4	161	16.2	10.4 (1.9)
Grade 7	388	39.1	13.0 (0.6)
Grade 10	443	44.7	16.0 (0.6)

These grade levels were selected to represent key developmental transitions. Grade 4 reflects reliance on parental attachment, Grade 7 reflects rising peer influence and identity formation, and Grade 10 represents increased academic pressure and growing dependence on peers and teachers for emotional support [64].

The gender distribution was nearly balanced, with 499 boys and 493 girls. Gender identity was self-reported and later standardized during data cleaning to ensure consistency across entries, including corrections for language discrepancies and symbolic or ambiguous entries. This balanced distribution allows for a robust analysis of gender as a moderating variable, a central focus of the study given the well-documented differences in relational orientation, coping styles, and mental health vulnerability between boys and girls [52,82].

Together, this sampling strategy enables developmental and gender-based comparisons.

3.4. Measures and Instruments: Validity, Reliability, and Cultural Adaptation

This study employed three psychometrically validated instruments to assess the quality of interpersonal relationships and psychological difficulties among students in Chinese urban boarding schools. These instruments were selected for their theoretical grounding in attachment and ecological systems frameworks, their cross-cultural applicability, and their relevance to psychology research [28].

3.4.1. Inventory of Parent and Peer Attachment (IPPA)

The *Inventory of Parent and Peer Attachment* (IPPA) [37] was used to assess students' perceived quality of attachment to their parents and peers across three relational dimensions: trust, communication, and alienation. Grounded in Bowlby's attachment theory [14], the IPPA is widely used with children and adolescents, as it captures both emotional closeness and perceptions of relational strain. Sample items include "I trust my parent to respect my feelings" (Trust) and "My peer doesn't understand me" (Alienation).

In the present study, responses for maternal and paternal figures were combined to create a single composite parent score for each relational dimension. This approach reflects cultural contexts in which caregiving roles are perceived collectively rather than differentiated by parental gender [94].

The IPPA includes three subscales for both parent and peer relationships: trust (20 items for parents/10 items for peers), communication (18 items for parents/8 items for peers), and alienation (12 items for parents/7 items for peers). All the items are rated on a 5-point Likert scale (1 = almost never true to 5 = almost always true). Accordingly, the possible score ranges are as follows: **parent trust** (20–100), **communication** (18–90), and **alienation** (12–60); **peer trust** (10–50), **communication** (8–40), and **alienation** (7–35).

It has demonstrated strong psychometric properties across diverse cultural settings, with Cronbach's α values typically ranging from .82–0.92 [95].

3.4.2. Inventory of Teacher–Student Relationships (ITSR)

To assess teacher–student relational quality, this study employed the *Inventory of Teacher–Student Relationships* (ITSR) [96]. ITSR shares its theoretical foundation with IPPA [37], retaining the three core subdimensions of Trust, Communication, and Alienation. It consists of 5 trust items, 8 communication items, and 4 alienation items, each rated on a 4-point Likert scale (1 = not at all like him/her to 4 = a lot like him/her). Thus, the possible score ranges for each subdimension are Trust (5–20), Communication (8–32), and Alienation (4–16). The items are adapted to reflect the unique nature of adult–student relationships in educational settings, which is particularly relevant in boarding school contexts, where teachers frequently assume quasiparental roles [59]. As a newly validated scale rated on a 4-point Likert scale (1 = not at all like him/her to 4 = a lot like him/her), the ITSR

currently lacks published reliability data. However, in the present study, internal consistency was evaluated via both Cronbach's α and McDonald's ω , with the results indicating strong internal reliability across all subdimensions ($\alpha > .83$, $\omega > .81$).

3.4.3. Strengths and Difficulties Questionnaire (SDQ)

In this study, psychological difficulties were used as a proxy for mental health, operationalized through the Total Difficulties Score of the *Strengths and Difficulties Questionnaire* (SDQT), developed by Goodman [97]. While the term mental health encompasses both positive well-being and the absence of difficulties, this study focuses on the latter as an indicator of student mental health risk. Thus, this composite score includes four subscales—emotional symptoms, conduct problems, hyperactivity/inattention, and peer relationship difficulties—excluding prosocial behavior, which is treated as a separate positive trait. These domains are widely recognized as central to youth psychological adjustment in both clinical and educational research [98,99].

The SDQ has been extensively validated across Western and non-Western populations and is one of the most widely used instruments for assessing child and adolescent psychological adjustment [99]. The SDQ total difficulties score (SDQT) was calculated by summing four symptom subscales, with each item rated on a 3-point Likert scale (0 = not true, 1 = somewhat true, 2 = certainly true), resulting in a total score ranging from 0–40. While Goodman originally classified scores of 0–13 as low, 14–16 as borderline, and 17–40 as high [97], the current study followed Liu et al. in adopting a revised framework better suited to Chinese school-aged populations, defining 0–13 as low, 14–20 as moderate, and scores above 20 as high [100]. The SDQT has demonstrated satisfactory internal consistency in both clinical and educational settings, with Cronbach's α values typically approximately .78 [98].

3.4.4. Cultural Adaptation of Measurement Instruments

To ensure linguistic accessibility and response accuracy, all instruments were administered in Chinese, given participants' potentially limited English proficiency.

Validated Chinese translations were used for both the IPPA and the SDQ (see **Appendix A** and **Appendix B**). The Chinese version of the IPPA has been successfully adapted for use with Chinese school-aged populations. In a large-scale study of migrant and urban Chinese students, Zhang reported high internal consistency across IPPA subscales and confirmed its structural validity across developmental stages [101]. Similarly, Liu et al. validated the Chinese version of the SDQ in both urban and rural school-aged samples, reporting strong predictive validity for psychological distress and satisfactory model fit in confirmatory factor analyses (CFAs) [100].

Because no standardized Chinese version of the *Inventory of Teacher–Student Relationships* (ITSR) (see **Appendix C**) exists, a translated version was developed for this study via Brislin's back-translation method [102] (see **Appendix D**). Independent bilingual translators carried out forward and backward translations, and discrepancies were reviewed and resolved to ensure conceptual and linguistic equivalence with the original English version. Although this procedure enhances cross-cultural validity [103], the translated teacher subscale has not yet undergone formal psychometric validation in Chinese samples. To mitigate this limitation, the study conducted pilot tests to assess item clarity and cultural appropriateness. Nevertheless, further research is recommended to establish the scale's factorial structure, measurement invariance, and external validity within Chinese educational contexts.

3.5. Data Collection Procedure

The final instrument consisted of 117 items, encompassing demographic information, perceived relationship quality, and psychological difficulties. All the items were presented in simplified Chinese and adapted linguistically to be developmentally appropriate for students across grades 4, 7, and 10.

3.5.1. Pilot Testing

To ensure the clarity, appropriateness, and usability of the survey instruments, a pilot study was conducted in April 2025 with a convenience sample of 30 full-time boarding students from the same school. The sample included 10 students each from grades 4, 7, and 10, reflecting the developmental stages represented in the main study. The pilot aimed to assess item comprehension and clarity, age appropriateness of vocabulary and sentence structure, survey layout and navigation on digital devices, response fatigue and cognitive load (e.g., perceived length or repetition), cultural sensitivity and contextual fit of translated items.

The pilot survey was administered via the same online platform (Wenjuanxing) and digital devices intended for the main data collection phase. Immediately following the survey, structured group interviews were conducted by the researcher and the participating teachers to solicit direct feedback. The interview protocol is provided in **Appendix E**. Students were asked to identify items they found confusing, overly abstract, emotionally uncomfortable, or repetitive. Teachers were also invited to flag any items that appeared developmentally inappropriate or culturally insensitive.

On the basis of the feedback collected during the pilot study, several modifications were made to enhance the clarity and appropriateness of the instruments for younger participants. Two items from the *strengths and difficulties questionnaire* (SDQ) were reworded to improve comprehensibility. For example, the item “I worry a lot” was revised for Grade 4 students to “I often feel worried about many things” to better reflect developmentally appropriate language. Similarly, three items from the Inventory of Parent and Peer Attachment (IPPA) that featured abstract emotional concepts—such as “I feel alone or apart when I am with my peers.”—were rephrased using more concrete and accessible terms suitable for younger respondents.

Minor adjustments were also made to the digital survey interface to improve usability. These included increasing font size, modifying button spacing, and reformatting the item layout to facilitate easier navigation, particularly for students using tablets. Although the Inventory of Teacher–Student Relationships (ITSR) is generally well understood, some Grade 4 students encountered difficulty distinguishing between items measuring “trust” and those measuring “communication.” To support comprehension, brief illustrative examples were added to the section’s introductory instructions.

These revisions collectively ensured that the survey instruments were linguistically accessible, cognitively appropriate, and culturally relevant for students across all participating grade levels. A summary of selected item modifications is shown in **Table 2**.

Table 2. Revisions Made Based on Pilot Feedback.

Instrument	Original Item (English)	Reworded Chinese Version	Justification
SDQ	I worry a lot.	我常常为很多事情感到担心。 (“I often feel worried about many things”)	“A lot” was too vague for younger students; clarified with concrete phrasing.
SDQ	I get very angry and lose my temper.	我有时会生气和发脾气。 (“Sometimes I get angry and lose my temper”)	Rephrased to match age-appropriate emotional expression.
IPPA	I feel alone or apart when I am with my peers.	我和朋友一起时也会感到孤单。 (“I still feel lonely when I’m with friends”)	Made the concept of loneliness more relatable for younger participants.

Note: All final versions were reviewed by homeroom teachers and bilingual experts to ensure consistency with developmental and cultural expectations.

3.5.2. Survey Platform and Administration

Data were collected via Wenjuanxing, a widely utilized online survey platform in China for academic and professional research. The platform offers comprehensive features, including secure response tracking, real-time monitoring, and structured data export.

Surveys were administered in classrooms during regular school hours over a one-week period (3 May 2025 to 10 May 2025). Students completed the questionnaires via school-provided digital devices (e.g., tablets or desktop computers) under the supervision of trained homeroom teachers, who were briefed in advance to minimize the risk of inadvertent influence on responses. The use of an online self-administered survey format minimized interviewer bias, standardized administration procedures across classrooms, and enabled automatic recording of metadata such as time stamps, completion duration, and IP address verification [104].

To ensure data integrity and response validity, several quality control procedures were implemented during the data screening phase. First, responses completed in fewer than 200 seconds were excluded because such a brief duration indicated insufficient time for careful reading and thoughtful engagement with the items [105]. In addition, surveys exhibiting repetitive or uniform response patterns—such as selecting the same option across all items—were flagged and removed as potential indicators of inattention or disengagement [106]. To further safeguard against external or fraudulent participation, each response was cross-verified via IP address data to confirm that it originated from within the approved school network in Baoshan, Yunnan Province. These quality assurance procedures led to the exclusion of a small number of invalid responses. The final analytic sample comprised 992 valid responses, all of which were collected in a consistent and controlled setting, enhancing the overall reliability and traceability of the dataset.

3.6. Ethical Considerations

This study was conducted in accordance with the British Educational Research Association's (BERA) Ethical Guidelines for Educational Research (5th ed., 2024) and received formal ethical approval from the Faculty of Education Ethics Committee at the University of Cambridge. Institutional permission was also obtained from the relevant local educational authorities and the administration of the Shuguang School in Baoshan, Yunnan Province, China.

Prior to data collection, all participants and their legal guardians received comprehensive written information sheets (**Appendix F**) detailing the study's aims, procedures, voluntary nature, data confidentiality, and right to withdraw at any stage without penalty. Informed consent was secured through signed consent forms from parents or legal guardians and verbal or written assent from student participants, depending on their age and literacy level (**Appendix G**). These procedures ensured that participation was fully voluntary and informed.

To protect participant anonymity and confidentiality, all survey responses were collected without identifiable personal information. Immediately after submission, the data were deidentified and securely stored on the researcher's password-protected laptop, which was encrypted and accessible only to the researcher. No data were uploaded to external or cloud-based servers, and all files were used solely for the purposes of this study. The data will be retained in accordance with university data management guidelines and destroyed after the required retention period.

Following survey completion, a brief debriefing statement (see **Appendix H**) was distributed to all participants through their homeroom teachers. This document reiterated the research aims, expressed gratitude for participation, and provided contact information for school-based counseling services in case the survey triggered emotional discomfort or distress. This aligns with ethical recommendations for safeguarding young participants' well-being [107].

No material or financial incentives were provided. The study involved no deception, and all procedures were designed to minimize potential risk. The research was guided by the British Psychological Society's four core ethical principles—respect, integrity, responsibility, and competence—with particular emphasis on protecting the wellbeing of children and adolescents [107].

Cultural and contextual appropriateness was prioritized throughout the research process. All the study materials were translated and back-translated via a rigorous bilingual procedure to ensure both linguistic accuracy and conceptual equivalence [102]. Local educational professionals reviewed all the translated content to ensure cultural relevance and developmental appropriateness for Chinese boarding school students. The use of familiar and trusted personnel (i.e., homeroom teachers) to deliver debriefing and counseling information further enhanced ethical sensitivity and participant comfort in the specific socioeducational context.

4. Data Analysis

4.1. Overview of the Analytical Strategy

This study employed a hierarchical multiple regression framework grounded in attachment theory [12] and ecological systems theory [13], both of which emphasize the multidimensional nature of interpersonal influences on psychological development. The analyses progressed from descriptive statistics and scale reliability checks to correlation analyses and multiple regression models, including tests of main effects and interaction terms. Moderator analyses were conducted to examine whether these effects varied across grade levels and genders, which is consistent with prior research on developmental differences in relational influences [52,64]. See **Appendix I** for the complete R scripts used in the data analysis.

4.2 Preprocessing and Variable Construction

4.2.1. Variable Coding, Standardization and Subscale Construction

Prior to analysis, all the raw survey data were exported from Wenjuanxing and imported into SPSS (Version 29) and R (Version 4.3.1) for cleaning and preprocessing [108,109]. Nominal variables such as gender and grade were inspected for inconsistencies, including mixed-language entries (e.g., English and Chinese labels) or nonstandard symbols, and were recoded to ensure categorical uniformity.

All the Likert-type items were numerically coded in accordance with the original response scales defined by each instrument. Items that were reverse-scored in the original instruments were recoded to ensure that higher scores consistently reflected higher levels of the intended constructs (e.g., trust, communication, alienation, or psychological difficulty) [110].

Composite variables for each relational domain—parent, peer, and teacher—were computed by averaging scores on three theoretically derived subdimensions: trust, communication, and alienation—a method that ensures equal item contribution while preserving scale interpretability [111].

The resulting subscale labels were as follows:

Parent–Child Relationships: PCT (Parent–Child Trust); PCC (Parent–Child Communication); PCA (Parent–Child Alienation)

Peer Relationships: PT (Peer Trust); PC (Peer Communication); PA (Peer Alienation)

Teacher Relationship: TT (Teacher Trust); TC (Teacher Communication); TA (Teacher Alienation)

The primary outcome variable, the *Strengths and Difficulties Questionnaire* (SDQ), uses a 3-point scale (0 = not true, 1 = somewhat true, 2 = certainly true). The total difficulties score (SDQT) was computed by summing four symptom subscales—emotional symptoms, conduct problems, hyperactivity/inattention, and peer problems—while excluding the prosocial behavior subscale, in accordance with established SDQ scoring conventions [97,

98]. The SDQT yields a possible range from 0–40, with higher scores reflecting greater levels of psychological distress.

To facilitate meaningful comparisons across relational predictors measured on different Likert-type scales (e.g., 5-point for the IPPA and 4-point for the ITSR), all continuous independent variables were standardized via z scores prior to inclusion in the regression models. Standardization removed differences in scale range and allowed for direct comparison of standardized beta coefficients, enabling interpretation of the relative predictive strength of each relational subdimension on a common, unit-free metric [108,112].

To assess internal consistency, both Cronbach's alpha (α) and McDonald's omega (ω) were computed for all composite scales. Reliability coefficients of α and $\omega \geq .70$ were interpreted as acceptable, and those $\geq .80$ were considered good, in line with current psychometric guidelines [113,114]. All nine subdimensions of relational quality demonstrated strong reliability, with α values ranging from .78 to .88. The SDQT scale also showed satisfactory internal consistency, with $\alpha = .78$. These results support the psychometric robustness of the composite variables used in the regression analyses.

4.2.2. Outlier Detection and Data Integrity Checks

To identify univariate outliers during preprocessing, standardized z scores were computed for all continuous variables as a diagnostic tool [114]. Responses with z scores exceeding ± 3 were flagged as extreme. Rather than excluding these cases—which could reduce statistical power and introduce bias-winsorization—was applied by replacing extreme values with the 5th or 95th percentile of the respective variable [115]. This conservative procedure preserved the original metric of each variable while allowing retention of the full analytic sample.

Logical consistency checks were performed to identify implausible response patterns (e.g., maximum SDQ scores paired with high relationship trust scores), an approach recommended in quality control for self-reported data [105]. No such inconsistencies were identified following the outlier adjustment.

Furthermore, because all the items were marked as required on the Wenjuanxing platform, the dataset contained no missing values, eliminating the need for imputation procedures. All preprocessing and transformation steps were executed via reproducible R scripts, enhancing the transparency, replicability, and auditability of the analytical workflow [109,116].

4.3. Multiple Linear Regression Analyses (RQ1)

To address the first three research questions—examining the predictive value of trust, communication, and alienation across parent, peer, and teacher relationships—hierarchical multiple linear regression was employed as the primary analytical strategy. This approach allows for the stepwise entry of predictor blocks to assess both the unique and combined contributions of relational dimensions to psychological difficulties [111,112].

4.3.1. Justification for the Modeling Strategy

Alternative modeling approaches were considered to ensure alignment between the research aims, data structure, and statistical rigor. Specifically, structural equation modeling (SEM) and multilevel modeling (MLM) were evaluated but ultimately deemed unsuitable for this study.

Multilevel modeling is commonly applied to hierarchically nested data structures (e.g., students within classrooms or schools) and allows for the estimation of random effects and intraclass correlations [117]. However, the current dataset lacked key nesting variables such as classroom or teacher identifiers, and all the students were drawn from the same school without a meaningful multilevel structure. As a result, the MLM was not appropriate in this context.

Structural equation modeling, while useful for estimating latent constructs and testing mediation or moderation in complex models, requires large sample sizes and often

strong assumptions about measurement invariance when making group comparisons [118,119]. Additionally, *SEM* is less well suited for analyzing models with multiple categorical moderators unless cross-group invariance is established—a limitation given this study's focus on observable predictors and interactions by gender and grade.

Given these constraints, hierarchical multiple regression was selected for its theoretical alignment, interpretability, and flexibility. This method supports the analysis of main effects and interactions, facilitates comparisons across standardized predictors, and enables a robust evaluation of the additive and moderating effects of relational variables on psychological outcomes [120].

Table 3. Comparison of Statistical Modeling Approaches Considered.

Modeling Approach	Advantages	Limitations for This Study
Hierarchical Multiple Regression	Transparent predictor entry Supports moderation analysis- Suited for moderate samples	Requires large samples
Structural Equation Modeling (<i>SEM</i>)	Models latent constructs Captures complex mediation paths	Not optimal for categorical moderators Requires measurement invariance
Multilevel Modeling (MLM)	Accounts for data nesting Estimates random effects	No clustering structure in data Not applicable without school/classroom identifiers

4.3.2. Modeling Procedures and Assumption Testing

The regression analyses were conducted in two stages:

Stage 1: Each relational subdimension (e.g., parent–child trust, peer alienation) was entered into a simple linear regression model individually to examine its isolated association with psychological difficulties.

Stage 2: All nine relational subdimensions were entered simultaneously in a full model to assess their unique contributions while adjusting for shared variance. This step-wise approach allows direct comparisons of predictor strength across domains and is commonly used in psychology research to explore additive and overlapping effects [111,112].

This modeling strategy aligns with the theoretical foundations of the study. Both ecological systems theory and attachment theory emphasize that psychological development is shaped by multiple, interdependent relational contexts that interact across social layers [12,13].

To ensure the robustness of the statistical inference, each regression model was systematically evaluated against the classical assumptions of linearity, normality, and homoscedasticity [108]. For Model 1, residual plots showed a linear association between predictors and psychological difficulties; Q–Q plots indicated that standardized residuals followed a normal distribution; and scale–location plots confirmed homoscedasticity (see **Figure 3**). These diagnostic checks were repeated for Model 2, Model 3, and the Grade-Level Moderation Model (see **Figure 4**, **Figure 5**, and **Figure 6**, respectively). All the models met the key assumptions of linear regression, thereby enhancing the validity and reliability of the reported estimates.

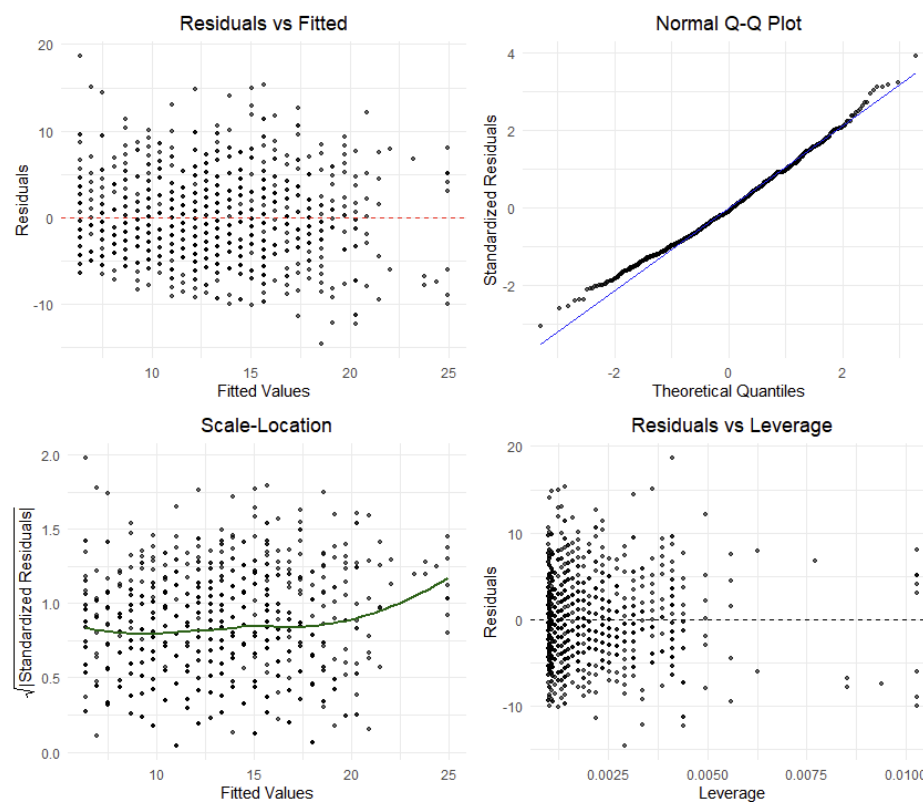


Figure 3. Model 1 Assumption Checks.

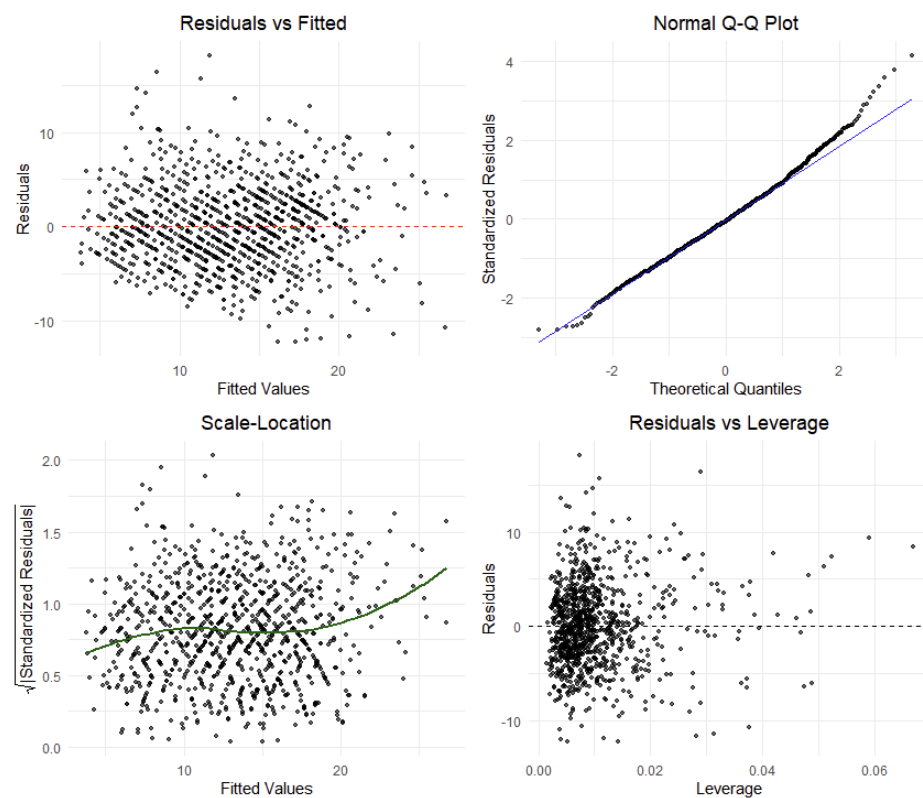


Figure 4. Model 2 Assumption Checks.

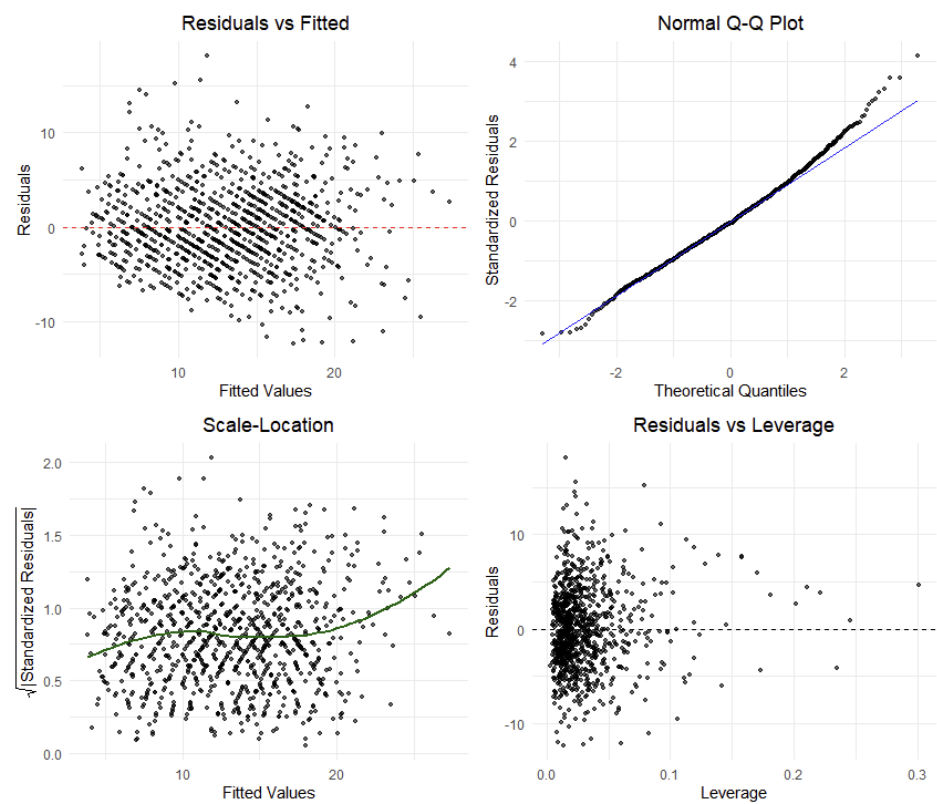


Figure 5. Model 3 Assumption Checks.

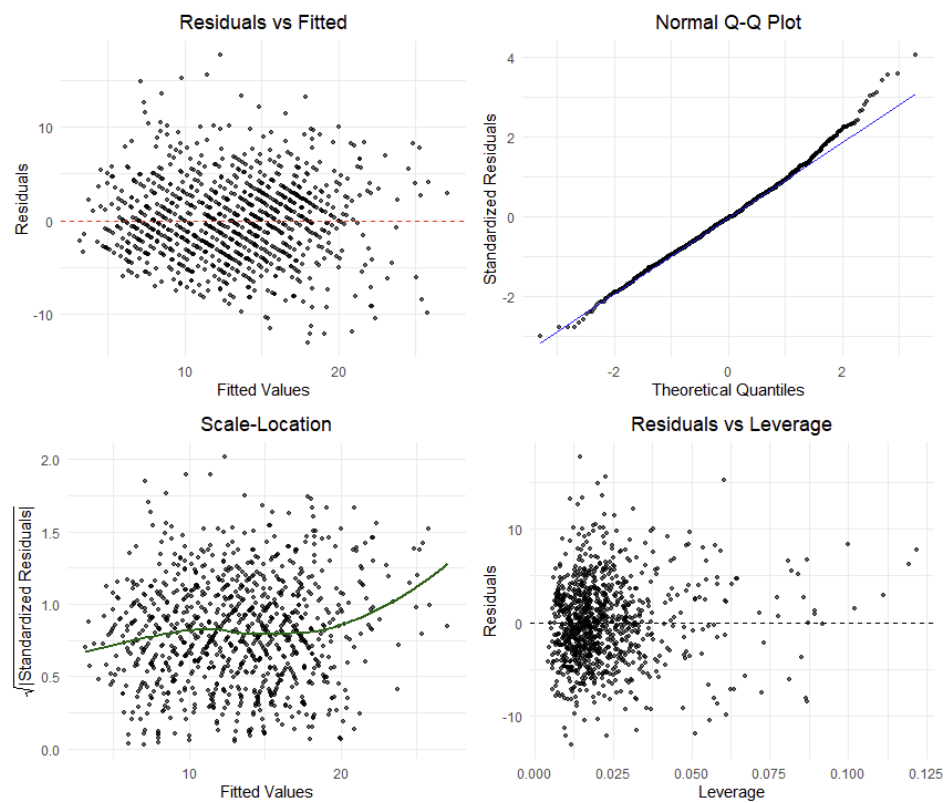


Figure 6. Model 4 Assumption Checks.

Generalized variance inflation factors (GVIFs), adjusted for degrees of freedom, were calculated to assess multicollinearity [121]. All main-effect predictors had $\text{GVIF}^{1/2\text{Df}}$ values below 5 (range = 2.06–3.73), indicating acceptable levels of multicollinearity. Although some interaction terms produced higher GVIFs (up to 14.1), this is not uncommon in interaction models and does not compromise interpretability [122].

All significance tests were two-tailed, with $p < .05$ interpreted as statistically significant. p values between .05 and .10 were treated as marginally significant, in line with common conventions in psychology research [123,124].

4.4. Multigroup Comparison by Grade Level (RQ2)

To assess whether the predictive effects of interpersonal relationship subdimensions on psychological difficulties differed across developmental stages, moderated multiple regression models were conducted using grade level (grades 4, 7, and 10) as a categorical moderator. The grade was dummy-coded, and interaction terms were created between each relational predictor and grade level [120]. Each grade level was used as the reference group in turn, allowing for all pairwise comparisons between educational stages. Gender was included as a covariate in all the models to account for potential confounding effects, as gender differences are known to influence emotional expression and susceptibility to psychological distress during late childhood and adolescence [52].

4.5. Gender Moderation Analysis (RQ3)

To explore whether gender moderated the associations between relational subdimensions and psychological difficulties, a series of moderated multiple regression analyses were performed. Gender was entered as a binary categorical variable (0 = female, 1 = male), and interaction terms were computed between gender and each of the nine relational subdimensions (e.g., $\text{TT} \times \text{Gender}$, $\text{TC} \times \text{Gender}$).

Prior to constructing interaction terms, all continuous predictors were mean-centered to reduce multicollinearity and facilitate interpretation of the main effects [112]. The full model included all the main relational predictors, the gender variable, the interaction terms, and grade level as covariates to control for developmental stage effects [125].

5. Results

5.1. Descriptive Statistics

Descriptive statistics for the key study variables are presented in **Table 4**. The mean total difficulty score (SDQT) from the SDQ was $M = 13.19$, $SD = 6.16$ (range = 0–33), which falls within the low psychological difficulty range (0–13) [97]. However, the wide standard deviation and observed range suggest considerable individual variation, with a proportion of students scoring in the moderate (14–20) or high (>20) range, indicating elevated psychological distress.

At the relational dimension level, teacher alienation (TA) had a relatively high mean score ($M = 13.78$, $SD = 6.69$), with a large standard deviation indicating substantial individual variation in students' perceived alienation from teachers. In contrast, peer alienation (PA) had a comparatively lower mean ($M = 24.56$, $SD = 4.57$), and the smaller standard deviation suggests that students' responses in this dimension were more concentrated. The mean scores for the remaining relational subdimensions were closer to the midpoints of their respective scales, indicating relatively balanced distributions.

Table 4. Descriptive Statistics for the Key Study Variables (N = 992).

Variable	N	Mean	SD	Median	Min	Max	Skewness	Kurtosis
SDQT	992	13.19	6.16	13.00	2.00	33.00	0.36	-0.22
PCT	992	77.04	12.68	78.00	33.00	95.00	-0.47	-0.10
PCC	992	64.25	12.62	65.00	18.00	90.00	-0.35	-0.24
PCA	992	43.67	8.29	44.00	12.00	60.00	-0.47	0.61
PT	992	35.89	6.30	36.00	14.00	50.00	-0.26	0.10
PC	992	29.15	5.94	29.00	8.00	40.00	-0.17	0.09
PA	992	24.56	4.57	25.00	7.00	35.00	-0.78	1.50
TT	992	15.23	6.35	15.00	7.00	18.00	-0.54	0.13
TC	992	24.13	5.99	24.00	9.00	30.00	-0.19	0.13
TA	992	13.78	6.69	14.00	5.00	15.00	-0.27	-0.20

Table 5 presents the means and standard deviations of key variables across different grade and gender groups. Among the parent relationship dimensions, Grade 7 students reported higher scores for both parent trust ($M = 81.25$, $SD = 11.79$) and parent communication ($M = 71.46$, $SD = 11.22$) than did the other grades. Additionally, their average psychological difficulty score (SDQT) was 11.24 ($SD = 6.27$), the lowest among the three grade levels, indicating relatively better mental health status. In contrast, scores across peer and teacher relationship dimensions showed minimal variation between grades, suggesting overall consistency in these domains. With respect to gender, there were no substantial differences in any of the relationships or mental health variables between male and female students.

Table 5. Mean (SD) by Grade and Gender.

Variable	Mean (SD) of Grade			Mean (SD) of Gender	
	Grade 4	Grade 7	Grade 10	Female	Male
PCT	75.36 (12.79)	81.25 (11.79)	77.21 (12.51)	76.42 (12.86)	77.65 (12.48)
PCC	61.58 (12.61)	71.46 (11.22)	64.31 (12.02)	63.13 (13.19)	65.36 (11.94)
PCA	41.87 (8.14)	47.59 (8.19)	44.09 (7.91)	43.43 (8.24)	43.9 (8.35)
PT	35.86 (6.11)	35.75 (6.28)	35.96 (6.53)	36.66 (6.22)	35.12 (6.29)
PC	29.25 (5.89)	28.59 (6.02)	29.25 (5.96)	29.87 (5.79)	28.42 (6.0)
PA	24.29 (4.54)	24.96 (4.81)	24.7 (4.5)	24.91 (4.3)	24.21 (4.81)
TT	14.82 (6.30)	15.61 (6.58)	15.32 (6.18)	15.08 (6.27)	15.42 (6.40)
TC	23.85 (5.90)	24.25 (6.04)	24.30 (6.10)	24.55 (6.10)	23.71 (5.88)
TA	13.40 (6.40)	14.28 (7.00)	13.65 (6.65)	13.61 (6.60)	13.93 (6.75)
SDQT	14.09 (6.17)	11.24 (6.27)	12.97 (5.91)	13.23 (6.15)	13.14 (6.17)

5.2. Predicting Psychological Difficulties from Relational Factors (RQ1)

5.2.1. Model 1: Individual Effects of Relational Subdimensions

In the first stage, each relational subdimension (e.g., parent–child trust, peer alienation) was entered into a separate simple linear regression model to examine its individual association with psychological difficulties. These models provide preliminary insights into the strength and direction of each relational predictor in isolation. The full model explained 50.7% of the variance in the SDQT scores, $R^2 = .507$, adjusted $R^2 = .501$, $F(9, 982) = 111.97$, $p < .001$. For detailed results, see **Table 6**.

Table 6. Individual Effects of Relational Subdimensions.

Predictor	B	SE	95% CI	β	t	p
PCT	-0.22	0.01	[-0.24, -0.19]	-0.22	-15.58	$p < .001$
PCC	-0.21	0.01	[-0.24, -0.18]	-0.21	-15.00	$p < .001$
PCA	-0.43	0.02	[-0.46, -0.39]	-0.43	-22.09	$p < .001$
PT	-0.28	0.03	[-0.34, -0.22]	-0.28	-9.49	$p < .001$
PC	-0.26	0.03	[-0.32, -0.19]	-0.26	-8.01	$p < .001$
PA	-0.73	0.04	[-0.80, -0.66]	-0.73	-20.21	$p < .001$
TT	-0.36	0.03	[-0.41, -0.30]	-0.36	-12.49	$p < .001$
TC	-0.27	0.03	[-0.33, -0.21]	-0.27	-8.65	$p < .001$
TA	-0.58	0.02	[-0.63, -0.54]	-0.58	-25.59	$p < .001$

All three dimensions of the parent–child relationship, namely, trust (PCT), communication (PCC), and alienation (PCA), were significant predictors of SDQT. PCT was negatively associated with psychological difficulties, $\beta = -0.216$, $SE = 0.014$, $t(990) = -15.58$, $p < .001$, indicating that greater trust was linked to fewer difficulties. Similarly, the PCC showed a significant negative association, $\beta = -0.210$, $SE = 0.014$, $t(990) = -15.00$, $p < .001$. PCA emerged as the strongest parent-related predictor, $\beta = -0.427$, $SE = 0.019$, $t(990) = -22.09$, $p < .001$, suggesting that emotional disconnection from parents substantially increased the risk for psychological distress.

Similarly, all the peer relationship subdimensions were significant predictors. Peer trust predicted lower levels of psychological difficulty, $\beta = -0.282$, $SE = 0.030$, $t(990) = -9.49$, $p < .001$. Similarly, peer communication had a protective effect, $\beta = -0.256$, $SE = 0.032$, $t(990) = -8.01$, $p < .001$. Peer alienation was the strongest peer-based predictor, $\beta = -0.728$, $SE = 0.036$, $t(990) = -20.21$, $p < .001$, emphasizing the importance of peer inclusion in psychological well-being.

Teacher trust negatively predicts psychological difficulties, $\beta = -0.358$, $SE = 0.029$, $t(990) = -12.49$, $p < .001$. Teacher communication was also inversely associated with SDQT, $\beta = -0.272$, $SE = 0.032$, $t(990) = -8.65$, $p < .001$. Teacher alienation was the single strongest predictor across all the domains, $\beta = -0.581$, $SE = 0.023$, $t(990) = -25.59$, $p < .001$, accounting for a substantial proportion of the explained variance (adjusted $R^2 = .398$). This finding indicates that students who experienced emotional distance from teachers were particularly at risk for psychological difficulties.

In summary, while higher levels of trust and communication across all relationship domains were associated with lower levels of psychological difficulty, alienation consistently had the strongest negative effect. Teacher alienation was the most powerful predictor, followed by peer and parent–child alienation, highlighting the critical role of perceived emotional distance—particularly from institutional adults—in shaping student well-being in boarding school contexts (see **Figure 7**).

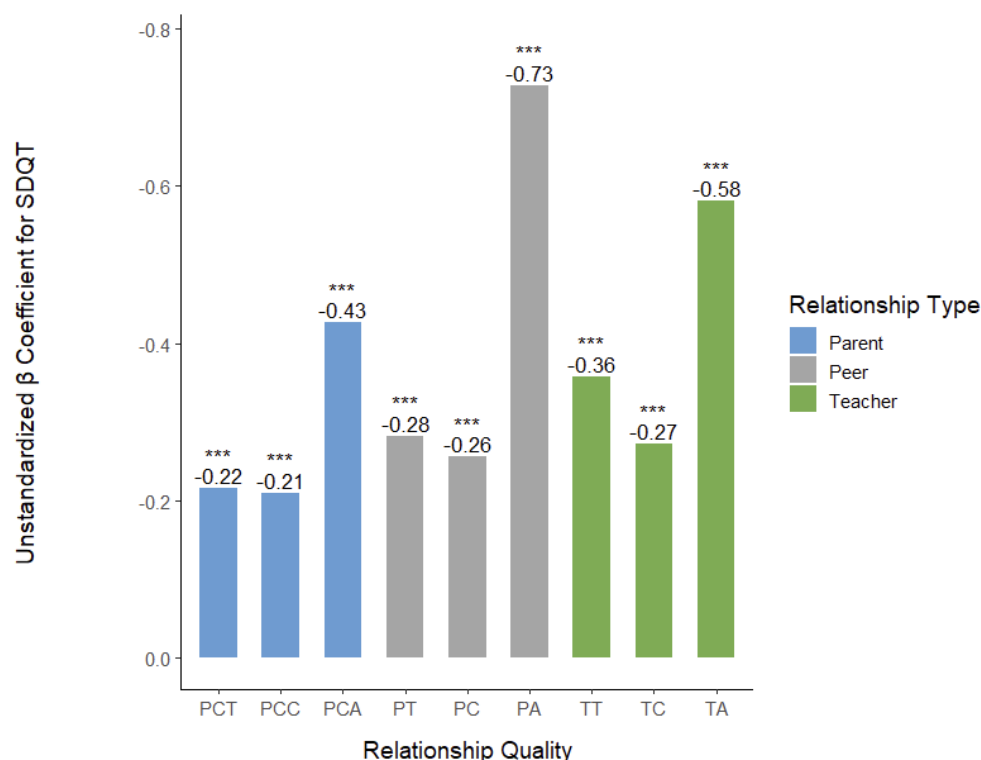


Figure 7. Associations between Relationship Quality and Psychological Difficulties (SDQT).

5.2.2. Model 2: Unique Effects in the Full Multivariate Model

To assess the unique effects of each relational subdimension on psychological difficulties (SDQT), a multiple linear regression model was run with all nine predictors entered simultaneously. The model was statistically significant, $F(9, 982) = 106.70, p < .001$, explaining 49.4% of the variance in the SDQT ($R^2 = .494$, adjusted $R^2 = .490$). This reflects a moderately strong fit, indicating that interpersonal relationship dimensions jointly account for substantial variation in students' mental health. For detailed results, see **Table 7**.

Communication across all three relational domains did not emerge as a significant predictor in the full model (PCC: $\beta = -0.003, p = .910$; PC: $\beta = 0.023, p = .664$; TC: $\beta = 0.076, p = .135$). These findings suggest that once the emotional quality of relationships is accounted for, the mere frequency or clarity of communication does not meaningfully predict psychological outcomes.

In contrast, alienation remained a strong and consistent predictor across all domains. Teacher alienation (TA) had the largest unique effect ($\beta = -0.301, p < .001$), indicating that emotional disconnection from institutional adults poses a particularly salient risk to students' mental health. Peer and parent alienation also demonstrated significant associations with greater psychological difficulties (PCA: $\beta = -0.118, p < .001$; PA: $\beta = -0.267, p < .001$).

Trust continued to be negatively associated with SDQT, although its effects were attenuated in the presence of other predictors (PCT: $\beta = -0.055, p = .018$; PT: $\beta = -0.097, p = .049$; TT: $\beta = -0.087, p = .084$). These results suggest that while trust offers some protection, its predictive power is comparatively weaker when emotional alienation is concurrently modeled.

Table 7. Regression on Relationship Subdimensions.

	Dependent variable
	SDQT (Psychological Difficulty)
PCT (Parent Trust)	-0.055** (0.023)
PCC (Parent Communication) -0.003	-0.003 (0.023)
PCA (Parent Alienation)	-0.118*** (0.027)
PT (Peer Trust)	-0.097** (0.049)
PC (Peer Communication)	0.023 (0.052)
PA (Peer Alienation)	-0.267** (0.042)
TT (Teacher Trust)	-0.087* (0.050)
TC (Teacher Communication) 0.076	0.076 (0.051)
TA (Teacher Alienation)	00.301*** (0.032)
Constant	40.917*** (1.189)
Observations	992
R ²	0.494
Adjusted R ²	0.490

Note: *p<0.1; **p<0.05; ***p<0.01.

In summary, alienation in all three relational domains—especially from teachers and peers—was the most consistent and powerful predictor of students' psychological difficulties after we adjusted for shared variance. Trust showed weaker but generally protective associations, whereas communication did not contribute uniquely to the model (see **Figure 8**). This coefficient plot shows unstandardized regression estimates (β) and 95% confidence intervals for each relationship quality predictor in the full model. The black dots indicate significant effects ($p < 0.05$); the gray dots represent nonsignificant effects. The plot highlights emotional alienation, especially from teachers and peers, as the strongest predictor of psychological difficulties after controlling for shared variance. These findings suggest that emotional disconnection, rather than communication frequency or quality, is a more salient factor in understanding mental health challenges among students in Chinese boarding schools.

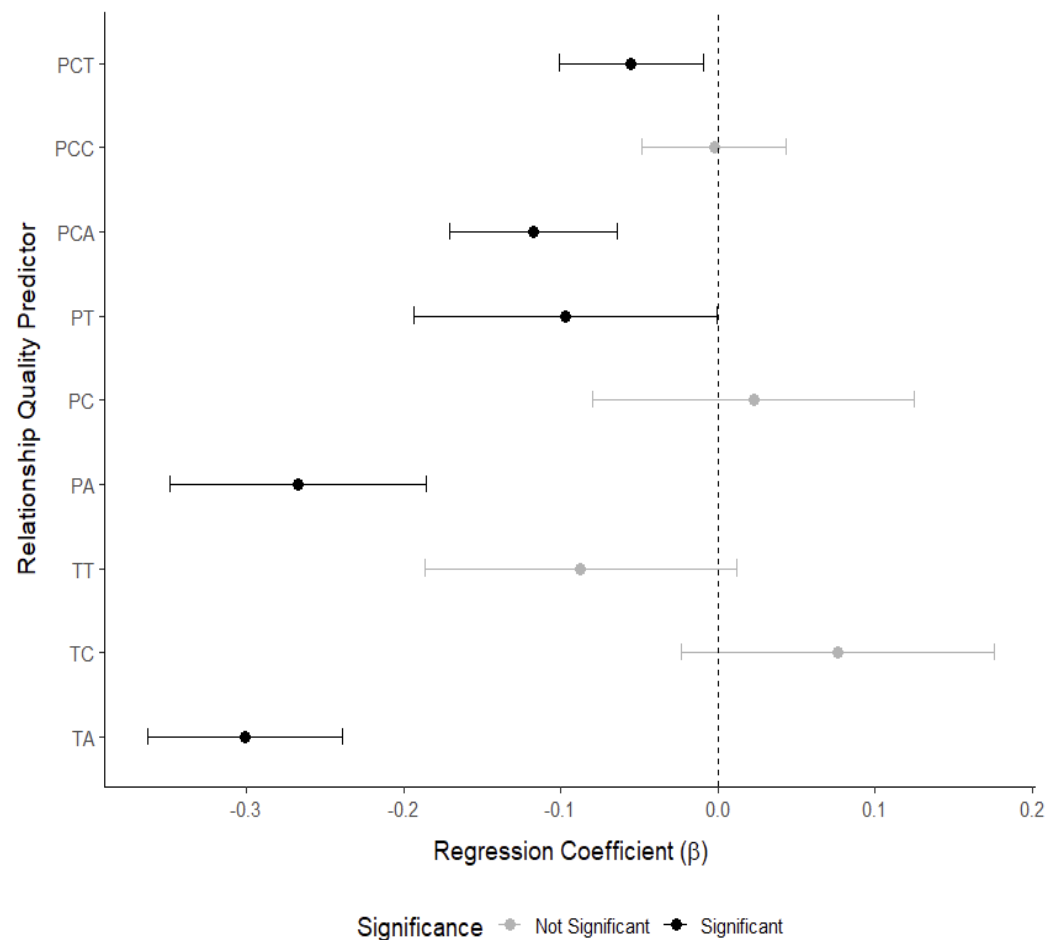


Figure 8. Independent Contribution of Relationship Quality Dimensions to SDQT.

5.3. Grade-level Moderation Model (RQ2)

To examine whether the strength of the associations between interpersonal relationship dimensions and psychological difficulties varied across developmental stages, a series of moderated multiple regression models were estimated with school grade (grades 4, 7, and 10) as a categorical moderator. The three models yielded nearly identical fit statistics, each explaining approximately 50.1% of the variance in psychological difficulties (SDQT) scores ($R^2 = .501$, adjusted $R^2 = .485$). This indicates a consistent and well-fitting model structure across grade levels. Moreover, an initial comparison of models with and without the gender covariate revealed no substantive differences in the results, further supporting the robustness of the findings. For detailed results, see **Table 8**.

Table 8. Grade-Level Moderation Model.

Predictor	Reference Group	B	SE	95% CI	β	t	p
Intercept	Grade 4	40.31	3.14	[34.16, 46.45]	40.31	12.85	< .001
Grade 7	Grade 4	0.44	3.67	[-6.76, 7.64]	0.44	0.12	.905
Grade 10	Grade 4	1.57	3.61	[-5.50, 8.64]	1.57	0.44	.663
Gender (Male)	Grade 4	-0.35	0.29	[-0.93, 0.22]	-0.35	-1.21	.228
PCT × Grade 7	Grade 4	0.1	0.07	[-0.05, 0.24]	0.1	1.32	.188
PCT × Grade 10	Grade 4	0.07	0.07	[-0.07, 0.21]	0.07	0.92	.358
PCC × Grade 7	Grade 4	-0.1	0.07	[-0.24, 0.04]	-0.1	-1.41	.159
PCC × Grade 10	Grade 4	-0.07	0.07	[-0.21, 0.07]	-0.07	-0.98	.328
PCA × Grade 7	Grade 4	0.01	0.09	[-0.16, 0.18]	0.01	0.13	.899
PCA × Grade 10	Grade 4	0.05	0.08	[-0.11, 0.22]	0.05	0.6	.546
PT × Grade 7	Grade 4	0.04	0.14	[-0.23, 0.31]	0.04	0.28	.778
PT × Grade 10	Grade 4	0.06	0.14	[-0.23, 0.34]	0.06	0.4	.692
PC × Grade 7	Grade 4	0.0	0.15	[-0.28, 0.29]	0.0	0.02	.982
PC × Grade 10	Grade 4	-0.04	0.15	[-0.32, 0.25]	-0.04	-0.24	.809
PA × Grade 7	Grade 4	-0.06	0.13	[-0.31, 0.19]	-0.06	-0.47	.637
PA × Grade 10	Grade 4	-0.05	0.13	[-0.30, 0.20]	-0.05	-0.4	.690
TT × Grade 7	Grade 4	-0.26	0.18	[-0.62, 0.10]	-0.26	-1.43	.153
TT × Grade 10	Grade 4	-0.17	0.18	[-0.53, 0.18]	-0.17	-0.94	.346
TC × Grade 7	Grade 4	0.08	0.18	[-0.27, 0.42]	0.08	0.44	.663
TC × Grade 10	Grade 4	0.02	0.17	[-0.32, 0.35]	0.02	0.1	.922
TA × Grade 7	Grade 4	0.14	0.1	[-0.04, 0.33]	0.14	1.51	.132
TA × Grade 10	Grade 4	0.02	0.1	[-0.16, 0.21]	0.02	0.25	.801
Intercept	Grade 7	40.75	1.94	[36.94, 44.55]	40.75	20.98	< .001
Grade 4	Grade 7	-0.44	3.67	[-7.64, 6.76]	-0.44	-0.12	.905
Grade 10	Grade 7	1.13	2.65	[-4.06, 6.32]	1.13	0.43	.669
Gender (Male)	Grade 7	-0.35	0.29	[-0.93, 0.22]	-0.35	-1.21	.228
PCT × Grade 4	Grade 7	-0.1	0.07	[-0.24, 0.05]	-0.1	-1.32	.188
PCT × Grade 10	Grade 7	-0.03	0.05	[-0.13, 0.07]	-0.03	-0.59	.555
PCC × Grade 4	Grade 7	0.1	0.07	[-0.04, 0.24]	0.1	1.41	.159
PCC × Grade 10	Grade 7	0.03	0.05	[-0.07, 0.14]	0.03	0.63	.528
PCA × Grade 4	Grade 7	-0.01	0.09	[-0.18, 0.16]	-0.01	-0.13	.899
PCA × Grade 10	Grade 7	0.04	0.06	[-0.08, 0.16]	0.04	0.67	.503
PT × Grade 4	Grade 7	-0.04	0.14	[-0.31, 0.23]	-0.04	-0.28	.778
PT × Grade 10	Grade 7	0.02	0.11	[-0.20, 0.24]	0.02	0.16	.875
PC × Grade 4	Grade 7	-0.0	0.15	[-0.29, 0.28]	-0.0	-0.02	.982
PC × Grade 10	Grade 7	-0.04	0.12	[-0.27, 0.19]	-0.04	-0.33	.743
PA × Grade 4	Grade 7	0.06	0.13	[-0.19, 0.31]	0.06	0.47	.637
PA × Grade 10	Grade 7	0.01	0.09	[-0.17, 0.19]	0.01	0.11	.912
TT × Grade 4	Grade 7	0.26	0.18	[-0.10, 0.62]	0.26	1.43	.153
TT × Grade 10	Grade 7	0.09	0.11	[-0.12, 0.30]	0.09	0.85	.395
TC × Grade 4	Grade 7	-0.08	0.18	[-0.42, 0.27]	-0.08	-0.44	.663
TC × Grade 10	Grade 7	-0.06	0.11	[-0.28, 0.16]	-0.06	-0.54	.588
TA × Grade 4	Grade 7	-0.14	0.1	[-0.33, 0.04]	-0.14	-1.51	.132
TA × Grade 10	Grade 7	-0.12	0.07	[-0.26, 0.02]	-0.12	-1.71	.088
Intercept	Grade 10	41.88	1.82	[38.31, 45.44]	41.88	23.04	< .001
Grade 4	Grade 10	-1.57	3.61	[-8.64, 5.50]	-1.57	-0.44	.663
Grade 7	Grade 10	-1.13	2.65	[-6.32, 4.06]	-1.13	-0.43	.669
Gender (Male)	Grade 10	-0.35	0.29	[-0.93, 0.22]	-0.35	-1.21	.228
PCT × Grade 4	Grade 10	-0.07	0.07	[-0.21, 0.07]	-0.07	-0.92	.358
PCT × Grade 7	Grade 10	0.03	0.05	[-0.07, 0.13]	0.03	0.59	.555
PCC × Grade 4	Grade 10	0.07	0.07	[-0.07, 0.21]	0.07	0.98	.328
PCC × Grade 7	Grade 10	-0.03	0.05	[-0.14, 0.07]	-0.03	-0.63	.528
PCA × Grade 4	Grade 10	-0.05	0.08	[-0.22, 0.11]	-0.05	-0.6	.546
PCA × Grade 7	Grade 10	-0.04	0.06	[-0.16, 0.08]	-0.04	-0.67	.503
PT × Grade 4	Grade 10	-0.06	0.14	[-0.34, 0.23]	-0.06	-0.4	.692
PT × Grade 7	Grade 10	-0.02	0.11	[-0.24, 0.20]	-0.02	-0.16	.875
PC × Grade 4	Grade 10	0.04	0.15	[-0.25, 0.32]	0.04	0.24	.809
PC × Grade 7	Grade 10	0.04	0.12	[-0.19, 0.27]	0.04	0.33	.743
PA × Grade 4	Grade 10	0.05	0.13	[-0.20, 0.30]	0.05	0.4	.690
PA × Grade 7	Grade 10	-0.01	0.09	[-0.19, 0.17]	-0.01	-0.11	.912
TT × Grade 4	Grade 10	0.17	0.18	[-0.18, 0.53]	0.17	0.94	.346
TT × Grade 7	Grade 10	-0.09	0.11	[-0.30, 0.12]	-0.09	-0.85	.395
TC × Grade 4	Grade 10	-0.02	0.17	[-0.35, 0.32]	-0.02	-0.1	.922
TC × Grade 7	Grade 10	0.06	0.11	[-0.16, 0.28]	0.06	0.54	.588
TA × Grade 4	Grade 10	-0.02	0.1	[-0.21, 0.16]	-0.02	-0.25	.801
TA × Grade 7	Grade 10	0.12	0.07	[-0.02, 0.26]	0.12	1.71	.088

Emotional disconnection demonstrated a stable and pervasive impact on students' SDQT across educational stages. Parent-child alienation (PCA) showed a marginal negative association with psychological difficulties ($\beta = -0.14$, $p = .058$), peer alienation (PA) was a significant predictor ($\beta = -0.21$, $p = .049$), and teacher alienation (TA) emerged as the strongest relational predictor ($\beta = -0.37$, $p < .001$).

Crucially, none of the interaction terms between relationship subdimensions and grade level reached statistical significance, indicating that the strength of these associations did not vary meaningfully by developmental stage. When Grade 4 was used as the reference group, no significant differences were observed for students in Grade 7 or 10. For instance, the interaction between parent-child trust and Grade 7 was nonsignificant ($\beta = 0.10$, $p = .188$), as was the interaction between parent-child alienation and Grade 10 ($\beta = 0.05$, $p = .546$). Similarly, no significant interactions were found for peer or teacher relationships.

Using Grade 7 as the reference category yielded consistent results. While most interaction effects remained far from significant, a marginal trend was noted for the interaction between teacher alienation and Grade 10 ($\beta = -0.12$, $p = .088$), suggesting a possible—but inconclusive—strengthening of this association in older students. (see **Figure 9**).

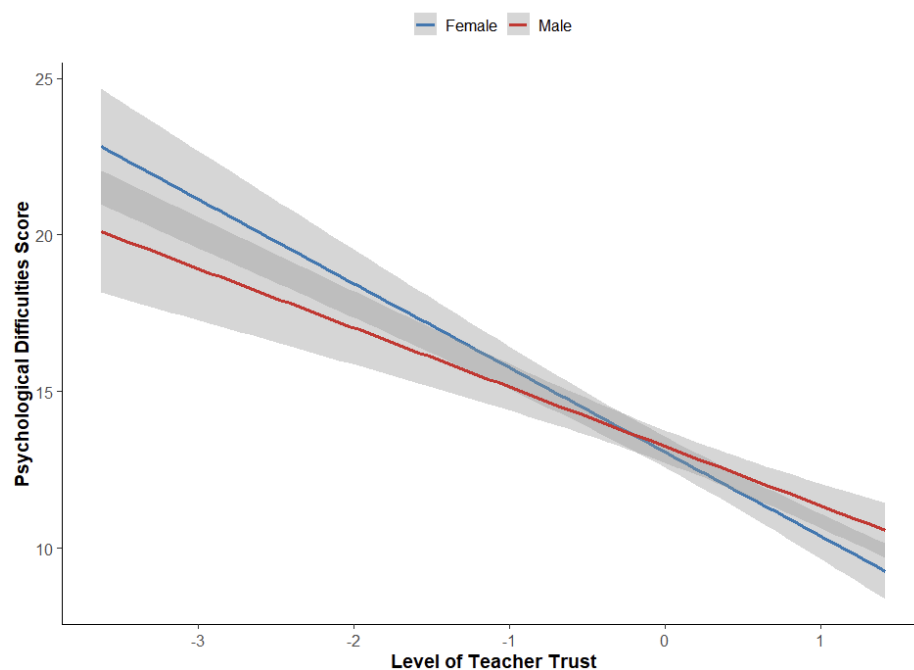


Figure 9. Interaction between Teacher Trust (TT) and Gender.

In summary, these findings indicate that while alienation from parents, peers, and teachers is a consistent predictor of psychological difficulties, the strength of these associations does not significantly differ across grade levels. The relational risk factors appear developmentally stable from late childhood (Grade 4) through early adolescence (Grade 10).

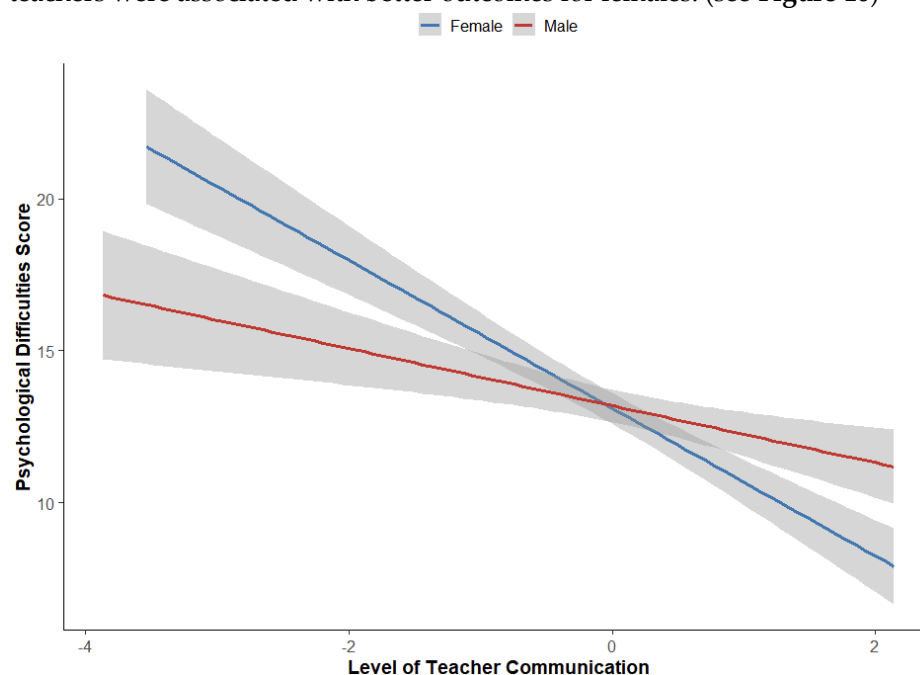
5.4. Gender Moderation Model (RQ3)

To examine whether the strength or direction of the associations between the relational subdimensions and psychological difficulties (SDQT) varied by gender, a moderated multiple regression analysis was conducted. The grade level was included as a covariate to control for developmental variation. The overall model was statistically significant, $F(21, 970) = 46.81$, $p < .001$, accounting for approximately 50.3% of the variance in psychological difficulties ($R^2 = .503$, adjusted $R^2 = .493$), indicating a well-fitting model with substantial explanatory power. For detailed results, see **Table 9**.

Table 9. Gender Moderation Model.

Predictor	B	SE	95% CI	β	t	p
Intercept	42.73	1.75	[39.30, 46.16]	42.73	24.46	< .001
PCT	-0.038	0.03	[-0.10, 0.03]	-0.04	-1.12	.262
PCC	-0.022	0.03	[-0.09, 0.04]	-0.02	-0.67	.506
PCA	-0.167	0.04	[-0.25, -0.08]	-0.17	-4.09	< .001
PT	-0.05	0.07	[-0.19, 0.09]	-0.05	-0.68	.499
PC	-0.015	0.08	[-0.17, 0.14]	-0.02	-0.19	.851
PA	-0.309	0.06	[-0.43, -0.19]	-0.31	-4.96	< .001
TT	0.026	0.07	[-0.12, 0.17]	0.03	0.37	.715
TC	-0.049	0.07	[-0.19, 0.09]	-0.05	-0.68	.496
TA	-0.255	0.05	[-0.35, -0.16]	-0.26	-5.22	< .001
Gender (Male)	-4.167	2.38	[-8.84, 0.51]	-4.17	-1.75	.081
Grade 7	0.054	0.43	[-0.79, 0.90]	0.05	0.12	.901
Grade 10	0.027	0.45	[-0.85, 0.91]	0.03	0.06	.953
PCT $\times$ Gender	-0.035	0.05	[-0.13, 0.06]	-0.04	-0.74	.459
PCC $\times$ Gender	0.053	0.05	[-0.04, 0.15]	0.05	1.13	.260
PCA $\times$ Gender	0.092	0.05	[-0.01, 0.20]	0.09	1.69	.092
PT $\times$ Gender	-0.082	0.1	[-0.28, 0.11]	-0.08	-0.82	.411
PC $\times$ Gender	0.039	0.11	[-0.17, 0.25]	0.04	0.37	.711
PA $\times$ Gender	0.077	0.08	[-0.09, 0.24]	0.08	0.92	.357
TT $\times$ Gender	-0.204	0.1	[-0.40, -0.01]	-0.2	-2.0	.045
TC $\times$ Gender	0.238	0.1	[0.04, 0.44]	0.24	2.33	.020
TA $\times$ Gender	-0.088	0.06	[-0.21, 0.04]	-0.09	-1.36	.175

Although the main effect of gender was marginally nonsignificant ($\beta = -4.17, p = .081$), the interaction terms revealed two significant gender moderation effects, both involving teacher-related relational dimensions. Specifically, the interaction between teacher trust and gender (TT $\times$ Gender) was significant ($\beta = -0.20, p = .045$), suggesting that the protective effect of teacher trust on psychological difficulties was stronger for males than for females. The interaction between teacher communication and gender (TC $\times$ Gender) was also significant ($\beta = 0.24, p = .020$), indicating that higher levels of perceived communication with teachers were associated with better outcomes for females. (see **Figure 10**)

**Figure 10.** Interaction between Teacher Communication (TC) and Gender.

Other interaction effects involving gender and relational subdimensions (e.g., PCA $\times$ Gender, PA $\times$ Gender) were not statistically significant. One exception approached significance: the interaction between parent–child alienation and gender (PCA $\times$ Gender) yielded a marginal effect ($\beta = 0.09, p = .092$), suggesting a potential trend wherein alienation from parents may exert a stronger adverse effect among females, although this did not reach conventional significance thresholds.

Overall, gender did not significantly moderate most associations between relationship quality and psychological difficulties. However, teacher-related dimensions showed meaningful gender differences: males were more sensitive to teacher trust, whereas females benefited more from teacher communication. These findings highlight the importance of gender-responsive teacher–student interactions and suggest that mental health interventions in boarding schools should account for students’ relational needs by gender.

6. Discussion

6.1. Findings

6.1.1. Relational Predictors of Psychological Difficulties (RQ1)

The findings of this study contribute to an increasingly nuanced understanding of how interpersonal relationships shape student mental health across late childhood and early adolescence, especially within high-pressure, collectivist educational contexts such as Chinese boarding schools. While previous research has highlighted the protective roles of positive relational qualities—such as trust and open communication—in fostering psychological well-being [95,126], the present results point to a more complex relational ecology. Specifically, relational alienation emerges as the most potent and consistent predictor of psychological difficulties across parent, peer, and teacher domains. This underscores a key developmental insight: the presence of emotionally aversive relational dynamics may exert stronger psychological effects than the absence of positive dynamics.

This pattern aligns with Bowlby’s attachment theory and is further supported by contemporary sociodevelopmental frameworks that emphasize the student’s evolving need for secure, responsive, and emotionally available relationships [12,127]. Alienation reflects not only the absence of warmth or support but also the presence of emotional withdrawal, mistrust, or social exclusion—factors that may undermine the student’s sense of relatedness, safety, and belonging [128], which are foundational for adaptive self-regulation and resilience [129]. Particularly in Confucian-heritage cultures, where students may be socialized to suppress distress and internalize relational failures [130], the psychological toll of alienation may be amplified, even when overt conflict is absent.

Importantly, the prominence of teacher alienation as a predictor underscores the institutional role of adults in educational contexts, particularly in boarding schools where daily student–teacher interactions are intensified. While previous meta-analyses have shown that teacher support in academic or behavioral domains can buffer against both internalizing and externalizing symptoms—especially when familial or peer support is limited [131,132]—the present findings extend this understanding. Specifically, they suggest that the absence of emotional attunement and affective closeness from teachers can actively impair mental health, potentially exerting greater harm than the lack of instrumental support alone. This distinction underscores that fostering warm, emotionally responsive teacher–student relationships is not merely beneficial but essential for safeguarding student psychological well-being—particularly in residential school settings where teachers often serve as the primary adult attachment figures.

While trust was found to be modestly protective, its influence was attenuated when alienation was accounted for. This asymmetry resonates with the “negativity bias” observed in developmental psychopathology, suggesting that relational threats often carry

greater emotional weight than positive relational experiences do [133,134]. These findings challenge the assumption that promoting a general "warmth" relationship is sufficient for fostering mental health, instead highlighting the need to actively mitigate relational harm. This insight is particularly relevant in East Asian contexts, where hierarchical relationships may constrain students from voicing distress or seeking emotional support from authority figures.

The finding that communication did not independently predict psychological outcomes after controlling for other factors challenges the widely held assumption of its central role in adjustment during late childhood and adolescence [135]. In Confucian-heritage cultures, communication is often shaped by cultural scripts emphasizing harmony, emotional restraint, and deference to authority [136]. Thus, the frequency or clarity of communication may not necessarily translate into perceived emotional closeness or support. In fact, high-frequency communication that lacks emotional attunement may even heighten distress by reinforcing perceived power imbalances or unmet expectations.

6.1.2. Developmental Stability of Relational Effects Across Grades (RQ2)

The finding that the predictive strength of relational alienation remains stable from late childhood (Grade 4) through early adolescence (Grade 10) challenges dominant developmental narratives that emphasize age-differentiated vulnerabilities [137,138]. Rather than indicating stage-specific sensitivity, the results suggest that emotional disconnection operates as a cross-cutting psychological risk factor with enduring salience across school stages.

This challenges traditional notions of adolescence as a uniquely turbulent period of relational reorientation and instead supports emerging perspectives that conceptualize developmental sensitivity as cumulative and contextually contingent [139]. In particular, the absence of grade-based moderation and the consistent strength of alienation effects may reflect what Telzer terms "developmental compression"—a process in which typical social-emotional trajectories are accelerated or distorted by environmental pressures [140]. Specifically, the institutional ecology of boarding schools—characterized by hierarchical authority structures, reduced parental proximity, and regimented peer interactions—may create relational climates that intensify emotional disconnection across age groups [11, 141]. Within such environments, children may prematurely develop relational schemas shaped by institutional detachment, performance expectations, and limited relational agency, thus flattening developmental distinctions and fostering uniformly heightened vulnerability to psychological distress. Even younger students may exhibit forms of relational alienation typically associated with adolescence.

Another plausible explanation lies in the universal and culturally mediated nature of relatedness as a psychological need. While relatedness remains a core need across the lifespan [142], the pathways through which unmet relational needs translate into psychological difficulties may be compressed or intensified by institutional and cultural structures. In collectivist, Confucian-heritage contexts, for example, children are often socialized early into expectations of deference, loyalty, and relational obligation [143]. As a result, experiences of alienation may not only signal interpersonal loss but also evoke feelings of moral inadequacy or shame [144]. This cultural amplification may render even minor relational ruptures psychologically consequential, particularly in school settings that function as both academic and emotional ecosystems for children.

Methodologically, the lack of significant interaction effects may also signal that relational alienation—as a perceived experience—operates more as a subjective emotional state than a developmentally contingent construct. This resonates with recent affective neuroscience findings that show that early emotional schemas around exclusion and rejection become "sticky" neural templates that shape later interpersonal interpretations [145,146].

6.1.3. Gender-Specific Patterns in Relational Sensitivities (RQ3)

While most of the relational predictors of psychological difficulties did not differ significantly by gender, subtle but meaningful divergences emerged in teacher-related dynamics. Specifically, male students were more responsive to teacher trust, whereas female students derived greater mental health benefits from teacher communication. This divergence is not merely a reflection of gendered relational preferences but also an indication of how emotional support is constructed, recognized, and metabolized within gendered cultural scripts and institutional ecologies.

In Confucian-heritage schooling systems, including Chinese boarding schools, masculinity is often tacitly associated with emotional restraint, performance-oriented validation, and hierarchical respect [44,147]. Within this context, trust from a teacher—conveyed through consistency, respect, or autonomy granting—may act as a powerful, nonverbal signal of worth and inclusion for male students, precisely because such emotional cues are scarce and subtle in boys' normative social environments. In contrast, for female students, emotional expressiveness is more culturally sanctioned and relationally expected; hence, affective teacher communication may serve as a key regulator of psychological safety and belonging [148].

Crucially, these patterns underscore not only different preferences but also potentially different pathways to internalizing distress. For boys, a deficit in trust from teachers may contribute to feelings of rejection or inadequacy that remain unspoken yet psychologically corrosive. For girls, the absence of emotionally attuned communication may signal relational rupture more explicitly, leading to heightened anxiety or relational withdrawal. These dynamics align with emerging neuroscience studies indicating gender-based variation in the neural processing of social exclusion and emotional reciprocity during adolescence [149,150], suggesting that the affective architecture of school relationships is neither neutral nor uniform.

Moreover, the institutional structure of boarding schools may further amplify these patterns. Teachers often assume surrogate parental roles in such environments, yet the emotional labor demands of them are rarely gender-responsive. Without intentional training, male students may be left to interpret ambiguous signals of trust in silence, whereas female students may find relational gaps in teacher communication emotionally destabilizing. This suggests that emotional inequity in teacher–student relationships is not a function of access alone but of *attunement to gendered modes of support seeking and meaning making* [151,152].

4.2. Theoretical Contributions and Practical Implications

Practically, the findings challenge widely adopted intervention models that prioritize communication skills or surface-level rapport building while neglecting the deeper, often invisible emotional ruptures that students may carry into school relationships. In boarding school contexts—where teachers often act as surrogate caregivers—interventions must move beyond transactional models of support and instead emphasize the cultivation of psychologically safe interpersonal spaces. Successful examples of this shift can be seen in programs such as the CARE (Cultivating Awareness and Resilience in Education) program in the U.S. and the Mindful Schools initiative, which trains educators to be emotionally present, attentive, and responsive to students' unspoken needs [153,154]. In China, emerging initiatives that integrate teacher emotional literacy training into professional development have also shown promise in reducing student anxiety and promoting relational warmth in classrooms [155]. Moreover, culturally attuned frameworks such as relational mindfulness [156] and emotionally responsive pedagogy [157] offer structured pathways for fostering emotionally attuned teacher–student interactions. These approaches involve practices such as greeting students by name, validating their emotional experiences, using restorative rather than punitive discipline, and modeling empathy in everyday interactions. Evidence from U.S. elementary schools shows that classrooms

characterized by high emotional responsiveness not only reduce internalizing behaviors but also enhance academic engagement and peer relationships [157].

Moreover, the developmental stability of relational effects across grades underscores that relational health in schools should not be treated as a developmental checkpoint but rather as a continuous public good. Policies and practices must reflect this continuity by embedding emotional safety, sustained adult availability, and inclusive peer cultures as structural features of the school environment. Relational wellbeing should be considered a core component of educational infrastructure—integral to student development rather than supplemental. For example, the “looping” model, where a teacher remains with the same group of students across multiple years, has been associated with higher levels of student–teacher trust, reduced behavioral problems, and enhanced emotional wellbeing [158]. This sustained relational continuity allows for deeper attunement between students and educators, fostering psychological safety over time. Similarly, Hong Kong’s “Whole School Approach to Guidance and Discipline” integrates relational support into the fabric of academic life by assigning long-term teacher mentors and creating consistent structures for social-emotional learning. This initiative has shown promise in reducing social-emotional difficulties and promoting inclusive school climates [159].

Beyond institutional practices, these findings call for a recalibration of developmental models to better account for how institutional ecologies and cultural norms shape relational risk trajectories. In Confucian-heritage societies, cultural scripts emphasizing deference, restraint, and emotional self-containment can inhibit help-seeking and exacerbate internalized distress [44]. Therefore, interventions must not only provide support but also challenge the normative constraints that silence students’ emotional needs. One promising example is the “mindfulness-based kindness curriculum” adapted for East Asian educational contexts [160]. Unlike traditional mindfulness programs focused solely on attention regulation, this curriculum incorporates compassion-oriented practices such as compassion journaling (writing letters of kindness to oneself or others), gratitude circles, and guided loving-kindness meditations, all of which are adapted to emphasize interdependence and relational harmony. Pilot studies in Singapore have shown that this program increases students’ willingness to seek emotional support, reduces shame-based self-concealment, and improves teacher–student rapport [161]. These culturally attuned interventions offer a scalable model for transforming school relational climates—from environments of emotional compliance to ecosystems of psychological openness and belonging.

In addition, the gender-specific patterns in relational sensitivities revealed in this study call for a fundamental reconceptualization of relational support in schools—not as a uniform, one-size-fits-all approach but as part of a differentiated ecology of care that responds to diverse relational interpretations and needs. While traditional social and emotional learning (SEL) programs emphasize universal skills such as empathy, communication, and conflict resolution, they often overlook how relational signals are encoded and decoded differently across gendered developmental trajectories and cultural contexts [162]. Embedding gender-sensitive frameworks—such as relational-cultural theory [163]—into teacher training and school policy can help educators become more attuned to these subtleties.

Importantly, moving beyond binary gender frameworks is essential. As gender identities become more fluid and publicly expressed among youth, future relational research and interventions must adopt intersectional and inclusive lenses to examine how relational norms, institutional expectations, and identity-based marginalization shape students’ access to emotional support and psychological resilience in schools [164].

6.3. Limitations and Directions for Future Research

Despite its methodological strengths—including its large sample size, the use of validated instruments, and robust statistical modeling—this study presents several methodological and conceptual limitations that merit careful consideration.

6.3.1. Methodological Limitations

First, the cross-sectional design limits causal inference. Although the study identified significant associations between relationship quality and psychological difficulties, the directionality of these relationships cannot be determined. It is possible that students experiencing greater psychological distress perceive their interpersonal relationships more negatively than vice versa [165]. Future research should adopt longitudinal or experience sampling designs to examine temporal and causal pathways [166].

Second, the exclusive reliance on student self-reports may introduce response biases, including social desirability and recall inaccuracies—particularly in reporting sensitive issues such as emotional alienation or mental health difficulties [167]. Incorporating multi-informant data would reduce mono-method bias and triangulate findings more robustly.

Third, although stratified sampling across grade levels was used, the sample was drawn from a single academically selective private boarding school in Yunnan Province. Regional disparities in educational quality, access to psychological support, and relational norms across China have been widely documented [92]. As such, the findings may not be generalizable to students from different regions, ethnic groups, or socioeconomic backgrounds. Replication across more diverse educational settings and regional contexts in China is therefore needed to enhance the external validity of the results and to inform policy development that is inclusive and contextually responsive [91].

6.3.2 Conceptual Limitations

Conceptually, this study focused on three core relational dimensions—trust, communication, and alienation—which capture essential aspects of interpersonal quality. However, other relationship characteristics, such as conflict, emotional support, teacher autonomy support, and school connectedness, were not examined [168], limiting the comprehensiveness of the relational model. Additionally, the study relied on students' perceived relationship quality rather than observed relational behaviors, which may be influenced by their current emotional or psychological states, introducing the risk of perceptual bias [167]. While the study explored moderation by gender and grade level, it did not investigate potential mediating mechanisms through which relational factors affect psychological difficulties. Constructs such as emotion regulation, self-esteem, or perceived belonging may play intermediary roles in these associations [169]. Future research should broaden the conceptual framework to incorporate these additional relational and psychological variables and adopt complementary methodologies—such as observational or ecological momentary assessments—to obtain more objective and context-sensitive insights into students' interpersonal experiences [170].

Finally, while this research was situated within a Confucian-heritage context, it did not explicitly examine how cultural values—such as filial piety, collectivism, and deference to authority—may shape students' relational perceptions and psychological well-being [171]. Future studies could explore how culturally embedded expectations influence student experiences and how these norms interact with educational environments to shape mental health.

7. Conclusion

This study investigated how the quality of students' relationships—with parents, peers, and teachers—shapes psychological difficulties within the distinctive sociocultural ecology of Chinese boarding schools. We further examined whether these associations vary by developmental stage (grades 4 to 10) and sex. Across all the relational domains,

emotional alienation—rather than the mere absence of trust or communication—emerged as the most consistent and robust predictor of psychological difficulties. This finding underscores the need to move beyond generic mental health strategies that emphasize trust-building or communication skills alone and toward more targeted efforts that identify and address emotionally aversive relational dynamics. Equally noteworthy is the developmental stability of these effects. This highlights the role of contextual factors—such as the institutional ecology of boarding schools and cultural expectations surrounding emotional expression—which may compress typical developmental trajectories and amplify vulnerability. Accordingly, interventions should adopt a developmentally continuous model of relational support, embedding emotional safety and connectedness throughout students' school careers rather than targeting narrow developmental windows. Finally, the study's findings on gender-specific relational sensitivities indicate that relational support is not experienced uniformly but is mediated by gendered socialization and culturally embedded scripts. These patterns underscore the importance of gender-responsive pedagogies that recognize diverse relational "currencies" and modes of emotional meaning-making.

At the theoretical level, this study challenges linear, stage-based models of development and introduces a relational-developmental framework that is dynamic, contextually embedded, and culturally contingent. It calls for a recalibration of existing paradigms in both developmental psychology and educational research to account for how institutional ecologies and normative scripts shape not only relational experiences but also the very pathways through which those experiences translate into mental health outcomes.

Finally, while the findings offer valuable insights, they also point toward fruitful directions for future inquiry. Longitudinal designs, multimodal assessments, and more culturally expansive frameworks are needed to unpack the causal mechanisms, behavioral correlates, and cultural variations of relational health. In particular, intersectional research that includes diverse gender identities and regional educational systems is essential for expanding the generalizability and equity of future relational interventions.

In conclusion, this study reaffirms that the emotional fabric of schooling—woven through trust, attunement, and belonging—is not peripheral to student development but central to it. In Chinese boarding schools and beyond, safeguarding this fabric must become a primary goal of educational practice and policy, lest relational disconnection silently erodes the very foundations of youth wellbeing.

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