

An Evolutionary Explanation for Depression in US Chinese International Students

Peishan Ouyang^{1*}, Yanzhi Wang², Jingzhi Qin³, Yuxuan Zhou⁴

¹*School of Environment and Sustainability, University of Michigan, Ann Arbor, USA,*

²*Eleanor Roosevelt College, San Diego, USA*

³*School of Arts and Sciences, University of Michigan, Ann Arbor, USA*

⁴*School of Physical Sciences and Engineering, Beijing Jiaotong University, Beijing, China*

**Corresponding Author. Email: oypeisha@umich.edu*

Abstract. In the current era of accelerating globalization, international educational exchanges are becoming increasingly frequent, and the scale of the international student body continues to expand. The mental health issues of international students have also drawn increasing attention. Take the United States as an example. In recent years, the mental health problems of teenagers have become increasingly serious. Mental health problems among Chinese international students (CIS) in the United States have gained increasing attention. Developing depression is often influenced by family financial support. This study hypothesizes that when support is perceived as a performance expectation, willingness to reciprocate (WTR) decreases, increasing depression risk; when perceived as a happiness expectation, WTR increases, reducing depression risk. Using the Patient Health Questionnaire-9 (PHQ-9) and a self-developed expectations scale, we found that CIS interpretations of familial support vary by relational model: communal sharing fosters security and lowers depression risk, while market pricing and authority ranking link support to performance, increasing pressure and depression. University services and culturally sensitive interventions can reframe support as unconditional care, reducing anxiety and strengthening WTR.

Keywords: Depression, Adaptation, WTR, Chinese international student, Chinese kinship

1. Introduction

In recent years, international students' mental health challenges have gained growing scholarly and policy attention [1]. The United States, the top host country, enrolled about 1,126,690 international students in 2023/2024, a 7% increase from the previous year [2]. Chinese students are the second-largest group with 277,398, following India's 331,602 [2].

Study abroad provides valuable opportunities but also creates emotionally and financially complex transnational relationships. Chinese international students (CIS) often rely heavily on family financial support, which can be either stabilizing or stress-inducing depending on perception. A survey of 256 CIS aged 16+ in Canada found that 15.3%, 20.4%, and 10.5% reported severe depression, anxiety, and stress, with education and financial status as significant predictors after

controlling for physical health [3]. Financial support affects mental health not only by providing resources but also through cultural expectations, family obligations, and perceived responsibilities, amplifying psychological strain. This study investigates how perceptions of financial support influence the relationship between family provision and depression risk among CIS in the United States.

Using an evolutionary psychology framework, synthesizing the Welfare Tradeoff Ratio (WTR) and the Bargaining Theory of Depression, to interpret depression among CIS as adaptive responses to perceived relational inequities within Chinese kinship. WTR is the cognitive process by which individuals prioritize others' over their own [4], shaped by social experiences and relationship contexts [5]. Unbalanced WTR can cause guilt, shame, and psychological distress [6], but it does not fully explain the financial support-depression link.

The Bargaining Theory sees depression as a costly signal evolved to renegotiate imbalanced or neglectful relationships when verbal negotiation fails [7]. Depression thus acts as a communicative adaptation prompting social attention. For CIS, depression thus acts as a communicative adaptation prompting social attention. For CIS, depression reflects both academic stress and implicit protest against perceived relational inequity, especially when family contributions exceed the student's capacity to reciprocate. Thus, how students interpret family financial support, as care, obligation, or pressure, is crucial

1.1. Financial support perceived as a performance expectation

Although financial support and WTR correlate positively, this relationship is moderated by perception. Chinese families typically provide extensive financial support, which, when seen as an investment demanding measurable returns, such as high academic achievement or prestigious careers, creates significant psychological pressure. Wang [8] suggests that over 85% of CIS come from households earning above ¥200,000 (~\$30,000 USD), with more than 75% of parents holding college degrees. This high socioeconomic status enables overseas education but raises the perceived cost of failure [9].

Financial support acts as a performance-linked stressor with implicit contractual expectations. When CIS feel they fail to deliver adequate returns, they experience WTR imbalance, leading to guilt and depressive symptoms [6], consistent with Delton & Robertson's [4] findings on WTR deficits provoking guilt.

Furthermore, CIS recognizes the resource asymmetry, as families sacrifice economic comfort to sponsor education abroad. Unidirectional support perceived as lacking equitable reciprocity violates traditional Chinese norms, intensifying emotional stress. In such cases, depression emerges as a bargaining signal to renegotiate expectations or seek emotional recognition from family [7,10].

1.2. Financial support perceived as a happiness expectation

Not all financial support is interpreted as a performance contract. When CIS perceive family financial support as emotional care aimed at their well-being and personal growth rather than academic outcomes, their WTR increases, fostering emotional motivation to give back in non-material ways.

Studies in East Asian populations show that perceived parental emotional support enhances intrinsic motivation and psychological resilience [11]. Research from South Korea confirms that support embedded in emotional expression, rather than performance demands, promotes relationship security and reduces stress [12]. CIS with such perceptions develop healthier coping strategies and

are less likely to internalize stress as failure. Friedlander et al. [13] found that international students reporting strong emotional and family support had significantly lower depression and anxiety.

Additionally, the Confucian concept of filial piety (孝, xiao), when reframed emotionally, allows flexible mutual benefit, economic, emotional, symbolic, or communicative [14,15]. In such climates, depression is less likely to signal failed reciprocity, as mutual understanding buffers emotional pressure.

Despite growing recognition of CIS mental health, especially depression. research rarely examines kinship and economic expectations in this context, focusing more on cultural adaptation and psychosocial models. This study integrates WTR and bargaining theory from evolutionary psychology to explain depression emergence when emotional needs are unmet or relational obligations feel asymmetric. It thus extends and enriches theoretical frameworks. The study aims to explore depressive symptom development among CIS in the U.S., emphasizing the emotional and financial roles of Chinese kinship on psychological well-being.

1.3. Hypothesis

Thus, this study proposes two hypotheses(Figure 1):

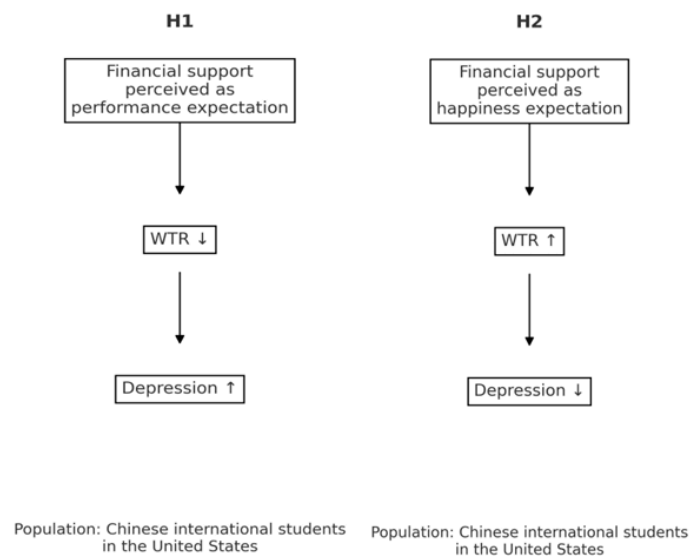


Figure 1. Model of performance expectation & happiness expectation

H1: When family financial support is perceived as a performance expectation, WTR will decrease, and then developing depression will increase among Chinese international students in the United States.

H2: When family financial support is perceived as a happiness expectation, WTR will increase, and then development depression will decrease among Chinese international students in the United States.

2. Method

2.1. Study design

We will use self-administered questionnaires and reaction time (RT) tasks to analyze whether different expectations of parental financial support (performance expectations vs. happiness expectations) are closely related to depressive symptoms (among Chinese international students studying in the United States).

2.2. Participants

This study aims to recruit approximately 300 Chinese international students aged 16 to 29 who are currently enrolled in high school or university in the United States. Specific criteria are as follows: (1) Primarily raised in a Chinese cultural environment (including mainland China, Hong Kong, and the Taiwan Region); (2) Currently financially supported by parents. Participants will be recruited through student organizations, school email lists, and Chinese social media platforms.

2.3. Procedure

The demographic questionnaire will be completed online during the recruitment period. Participants will provide basic information, including age, length of stay in the US, and frequency of communication with parents (e.g., video calls). Upon arrival at the laboratory and after signing the informed consent form, participants will complete the remainder of the experiment on a Mac desktop computer. The entire session is expected to take approximately 30 to 40 minutes. This entire section will be recorded using the RT Task method. It consists of 30 statements divided into two parts:

2.3.1. PHQ-9 (RT)

This section will assess depressive symptoms over the past two weeks, with questions covering sadness, fatigue, difficulty sleeping, and lack of energy (Patient Health Questionnaire-9).

2.3.2. Expectation framework and WTR scale (RT)

This section will investigate the extent to which children perceive their parents' expectations and family support. The first 20 statements in the Expectation Framework are designed to investigate why students believe their parents give them money. Example statements include: "My parents give me money because they want me to be successful" and "My parents give me money because they want me to be happy". We use these statements to determine whether participants perceive their parents' support as performance-based or happiness-based, and we will analyze participants based on these results. The other 10 statements measure the Welfare Trade-off Ratio (WTR), which assesses how much personal benefit parents are willing to sacrifice to help their children. Example statements include: "My parents would sacrifice their own needs to help me" and "My parents prioritize my well-being over their own." Higher agreement levels indicate greater perceived parental investment and a higher WTR.

For each statement in the two groups, we assume that participants will indicate whether their actual life circumstances align with each statement by pressing "Yes" or "No" on the keyboard. Additionally, we will record the reaction time in milliseconds from the moment participants click the

“Read the question” button after each statement until they click 'Yes' or “No.” Slower reaction times may indicate that participants require more time to make a decision, which may suggest subconscious hesitation or emotional conflict. For example, if a participant answers “My parents care about my feelings” but pauses before pressing “Yes,” this may indicate emotional uncertainty or tension, even if they consciously agree with the statement. Through this method, we can detect the true circumstances that participants cannot articulate through their reported answers.

2.4. Data analysis

We will then use statistical tools to test the relationship between financial support and perceived WTR and if this relationship is moderated by their perception of happiness expectation and performance expectation and then test the relationship between WTR and depression.

At the same time, we will also group participants by age (<18 years vs. >18 years) based on the information in the demographic questionnaire to test whether age affects the relationship between support interpretation, WTR, and depression (based on the evolutionary psychology hypothesis that younger individuals rely more on caregiver attachment).

3. Discussion

CIS's precipitation of familial financial support may potentially stem from their differences in their understanding of the family relationship model. According to the human relationship model proposed by Fiske [16], if the family relationship model conforms to communal sharing (CS) model, which emphasizes the emotional connection between family members based on a sense of belonging, then students from such background are more likely regard parental financial support as “an expression of happiness” which means unconditional emotional care rather than an exchange behavior with functional expectations. This perception may enhance CIS's subjective assessment of their parents' WTR, fostering a stronger sense of security. Consequently, even within an unfamiliar cultural environment, this stable emotional foundation can help alleviate depressive tendencies.

Conversely, the perception of CIS who understand financial support as an expectation of their personal performance may be influenced by the market pricing (MP) model in relationships, where interpersonal interactions adhere to principles of equivalent resource exchange [16]. When applied to family relationships, it will be manifested as an investment-return logic. Specifically, familial financial investments (e.g., paying high tuition) may imply high expectations, such as academic achievements. This support relationship links resource input with output, which puts students in the psychological position of “investees” and requires them to complete the “exchange” with performance. Therefore, these CIS may face heightened role pressure and are prone to regard support from families as conditional investment rather than a manifestation of emotional connection. This cognitive bias likely weakens their positive perception of WTR in kinship relationships, thereby increasing their risk of depression.

Within the Authority Ranking (AR) family, individuals may regard the familial financial support as a trust of their responsibilities rather than unconditional care, which emphasizes the hierarchical structure among family members, where elder family members control resources and children take on feedback and rewards [16]. This model aligns with the authoritarian filial piety in Chinese culture, emphasizing children's obedience based on parental age, financial resources, and authority to maintain their families' reputation [17]. Receiving familial financial support may be perceived as a reflection of their parents' high expectations regarding performance, leading to internalized pressure such as “I must succeed to fulfill my filial duty.” Such pressure may prompt students to

excessively pursue perfectionism, and when the actual performance does not meet their ideal expectations, they may feel out of control and frustrated [9]. This preoccupation with perfection may further aggravate the psychological burden faced by CIS, causing them mistakenly to believe that they have failed to return their family's investment equally when they cannot achieve the goal, and then perceive the imbalance of WTR in family relationships. This perceived imbalance may trigger intense feelings of guilt and shame, thereby further increasing their risk of depression.

3.1. Alternative explanations for non-significant findings

If financial perception fails to predict WTR and depression, this divergence may stem from two interconnected pathways that reflect unique cultural and relational pressures on CIS.

Students may fundamentally misinterpret familial financial support due to culturally embedded cognitive filters. Traditional Chinese narratives often frame educational funding as an investment requiring reciprocal academic returns [8], leading students—particularly those from families emphasizing Authority Ranking (AR) or Market Pricing (MP) relational models [16]—to perceive even well-intentioned support as transactional demands. This cognitive distortion manifests clinically as "debt anxiety," wherein students internalize parental contributions as unfulfillable obligations. Empirical evidence reveals that 17% of CIS originate from financially strained households [8], and these students frequently reinterpret "unconditional love" declarations as psychological burdens due to guilt-driven cognition. In our reaction time (RT) tasks, delayed responses to financial statements (e.g., "My parents provide sufficient tuition support") may indicate this latent conflict: surface agreement masking subconscious resistance. Critically, these findings underscore that financial support's psychological impact hinges not on monetary value, but on culturally mediated interpretation. Furthermore, the vast geographical distance separating students from their families inherently limits emotional connection and timely support during critical moments. This vacuum is often filled by accessible peer relationships, whose immediacy and closeness can effectively diminish the relative significance of financial support from home in influencing student well-being.

These alternative pathways do not invalidate our evolutionary framework but rather illuminate contextual boundaries of Bargaining Theory. The model's efficacy appears contingent on cultural filters that modulate signal interpretation: depression functions as an adaptive bargaining tool primarily when emotional WTR imbalances exist, whereas financial asymmetries may be neutralized by cognitive reappraisal or substituted support. Methodologically, the high-precision RT paradigm—though theoretically rigorous—faces ecological constraints. Millisecond-level measurement requires controlled laboratory settings that limit sample diversity (e.g., omitting CIS from rural backgrounds), while self-reported support categorization risks oversimplifying hybrid emotional-financial dynamics. Future studies should employ longitudinal designs to track how familial responses to depressive signals modulate WTR recalibration over time.

Building on these insights, we propose three actionable directions: First, develop interventions to reframe familial communication—training parents to replace performance-centric phrases like "This money ensures your success" with well-being-focused affirmations such as "We value your happiness." Second, design culturally calibrated implicit measures (e.g., narrative-based RT tasks) to capture debt anxiety outside laboratory constraints. Third, investigate how institutional policies—such as university subsidies for living expenses—might decouple financial support from performance guilt by reinforcing communal (vs. transactional) relational schemas. These steps

4. Conclusion

In an era of accelerated globalization, international educational exchanges have become increasingly frequent, and the scale of international students has continued to expand, making their mental health issues an urgent concern that cannot be ignored. The United States, as a major destination for international students, has witnessed a growing deterioration in teenagers' mental health in recent years, a trend that also casts a shadow over international students studying there. Neglecting their mental health not only risks academic underachievement and social isolation but may also lead to severe mental disorders, undermining the value of international education. Thus, educational institutions must enhance accessible mental health services and cross-cultural training for staff; governments and societies should jointly create an inclusive environment. Only by prioritizing their mental health can international students thrive academically and lead fulfilling lives in host countries, truly facilitating global educational and cultural exchanges.

References

- [1] Shek, C.H.M., Chan, S.W.C., Stubbs, M.A., & Lee, R.L.T. (2024). Promoting International Students' Mental Health Unmet Needs: An Integrative Review. *International Journal of Mental Health Promotion*, 26(11), 905-924.
- [2] Statistics & Data. 2025. International Students in US by Country of Origin 1949/2024. <https://statisticsanddata.org/data/international-students-in-us-by-country-of-origin-1949-2024/>
- [3] Yu, L., Gao, Y., Wang, Y., Liu, T., MacDonald, A., Bian, F., Li, X., Wang, X., Zhang, Z., Wang, P.P., & Yang, L. (2023). Mental health conditions of Chinese international students and associated predictors amidst the pandemic. *Journal of Migration and Health*, 1-7.
- [4] Delton, A.W., & Robertson, T.E. 2016. How the mind makes welfare tradeoffs: evolution, computation, and emotion. *Current Opinion in Psychology*. 7, 12–16.
- [5] Eisenbruch, A. B., & Krasnow, M. M. 2022. Why warmth matters more than competence: A new evolutionary approach. *Perspectives on Psychological Science*, 17(6), 1604-1623.
- [6] Qi, W., Vul, E., & Powell, L.J. 2025. An accurate and efficient measure of welfare tradeoff ratios An accurate and efficient measure of welfare tradeoff ratios. *PloS One*, 20(5).
- [7] Hagen, E. H. 2003. The bargaining model of depression. In P. Hammerstein (Ed.), *Genetic and cultural evolution of cooperation* (pp. 95–123). Boston Review.
- [8] Wang, X. (2024). Socioeconomic status, cosmopolitanism, and educational aspirations: A study of China's middle-class students pursuing higher education in the U.S. amidst geopolitical tensions. *International Journal of Chinese Education*, 1-19.
- [9] Wei, M., Heppner, P. P., Mallen, M.J., Ku, T., Liao, K.Y., & Wu, T. (2007). Acculturative Stress, Perfectionism, Years in the United States, and Depression Among Chinese International Students. *Journal of Counseling Psychology*, 54(4), pp.385-394.
- [10] Ma, S., Zhu, Y., & Bresnahan, M. 2022. Chinese International Students' Face Concerns, Self-Stigma, Linguistic Factors, and Help-Seeking Intentions for Mental Health. *Health Communication*, 37(13), 1631–1639. <https://doi.org/10.1080/10410236.2021.1910167>
- [11] Chao, R.K. (2001). Extending research on the consequences of parenting style for Chinese Americans and European Americans. *Child Development*, 72(6), 1832–1843.
- [12] Kim, E., & Park, Y. S. (2006). Parent-child communication, academic performance, and psychological adjustment in Korean American adolescents. *Journal of Child and Family Studies*, 15(3), 325–337.
- [13] Friedlander, L.J., Reid, G.J., Shupak, N., & Cribbie, R. 2007. Social Support, Self-Esteem, and Stress as Predictors of Adjustment to University Among First-Year Undergraduates. *Journal of College Student Development*. 48(3), 259–274.
- [14] Liu, J., Wu, B., & Dong, X. (2018). Filial piety and psychological well-being of Chinese American adult-child caregivers. *Innovation in Aging*. 2(suppl_1), 658–658.
- [15] Yeh, C. J., & Inose, M. (2003). International students' reported English fluency, social support satisfaction, and social connectedness as predictors of acculturative stress. "Counselling Psychology Quarterly, 16(1), 15-28.
- [16] Fiske A. P. (1992). The four elementary forms of sociality: framework for a unified theory of social relations. *Psychological review*, 99(4), 689–723. <https://doi.org/10.1037/0033-295x.99.4.689>

- [17] Cao, H., Zhou, N., Wang, Y., & Liu, Y. (2025). Parental Social Comparison Shaming Hinders Chinese Adolescents' Presence of Life Meaning Through Thwarting Satisfaction of Need for Competence, Especially for Those Endorsing Reciprocal Filial Piety. *Child Development*, cdev.70000. <https://doi.org/10.1111/cdev.70000>