

Original Article

Association Between Perceived Stress and Self-Esteem Among Female University Students in Peshawar, Pakistan: A Cross-Sectional Study

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ABSTRACT

Background: University students are exposed to academic, social, financial, and personal stressors that may adversely affect psychological well-being and self-evaluation, with female students potentially experiencing additional contextual pressures. **Objective:** To determine the association between perceived stress and self-esteem among female university students in Peshawar, Pakistan. **Methods:** This analytical cross-sectional study included 400 female students recruited from selected public and private universities in Peshawar between January and March 2025. Perceived stress was assessed using the 10-item Perceived Stress Scale, and self-esteem using the 10-item Rosenberg Self-Esteem Scale. Descriptive statistics summarized score distributions, while Pearson's chi-square test examined the association between categorized perceived stress and self-esteem; Cramér's V quantified association magnitude. **Results:** The mean perceived-stress score was 17.05 ± 6.25 ; 59.0% of students had low, 28.0% moderate, and 13.0% high perceived stress. Mean self-esteem was 16.76 ± 6.36 ; 41.3% had low, 40.3% normal, and 18.5% high self-esteem. Low self-esteem occurred in 22.9% of students with low stress, 68.8% with moderate stress, and 65.4% with high stress. Perceived-stress category was significantly associated with self-esteem category, $\chi^2(4)=88.40$, $p<0.001$, with a moderate effect size (Cramér's $V=0.332$). **Conclusion:** Perceived stress and self-esteem were significantly associated among female university students. Students with moderate or high perceived stress showed a substantially greater prevalence of low self-esteem than those with low stress. These findings support university-based psychological support, stress-management, and student well-being initiatives and future preventive planning locally while longitudinal research is needed to clarify temporal relationships. **Keywords:** perceived stress, self-esteem, female students, university students, mental health, Peshawar, Pakistan.

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INTRODUCTION

University education represents an important developmental period characterized by increasing academic demands, greater personal autonomy, changing social relationships, financial responsibilities, and preparation for future employment. Although these experiences contribute to personal and professional development, they may also expose students to substantial psychological strain. Systematic evidence indicates that university students experience multiple interacting determinants of poor mental health, including academic pressures, social adjustment difficulties, financial concerns, pre-existing vulnerabilities, and inadequate support networks (1). Perceived stress is consequently common across university populations, with recent systematic reviews demonstrating a substantial burden across different

geographical and sociocultural settings (2). A 2026 systematic review and meta-analysis of post-COVID-19 university populations involving more than 255,000 students estimated an overall stress prevalence of approximately 45.6%, highlighting the persistence of psychological distress beyond the acute pandemic period (3). Pakistani university students have similarly demonstrated considerable levels of stress, anxiety, and depression, emphasizing the relevance of student mental health within the national context (4).

Stress among university students arises from several interconnected academic and non-academic sources. Academic workload, examinations, competition, time pressure, adaptation to university environments, financial difficulties, family circumstances, and social responsibilities may contribute to the way students perceive and respond to stressful situations (5,6). Higher academic stress has also been associated with poorer mental-health status and reduced psychological well-being among undergraduate students (7). Sex-related differences have been identified in some student populations, with female students frequently reporting greater stress or anxiety than their male counterparts, although the magnitude and consistency of these differences vary according to study population, measurement method, and context (5,8). These findings suggest that understanding stress among female university students requires consideration of both general university pressures and population-specific social and psychological circumstances.

Self-esteem is another important psychological construct during university life. It reflects an individual's overall evaluation of personal worth, competence, and self-acceptance and is closely related to psychological adjustment, interpersonal functioning, and emotional well-being. Lower self-esteem has been associated with greater academic stress and poorer psychological adjustment among university students (9). Contemporary psychometric and observational research further demonstrates that self-esteem is meaningfully related to perceived stress, anxiety, depressive symptoms, and life satisfaction in undergraduate populations (10). Evidence examining different dimensions of self-esteem also suggests that personal self-esteem is negatively associated with perceived chronic stress, supporting a close relationship between appraisal of the self and appraisal of stressful life circumstances (11).

The relationship between stress and self-esteem has been observed across different university populations. Among Pakistani female university students, Afridi and Maqsood reported significant relationships among perceived stress, self-esteem, and life satisfaction, demonstrating the relevance of these constructs specifically among women in higher education (12). An inverse relationship between academic stress and self-esteem has also been reported among nursing students, with greater academic stress occurring alongside poorer self-esteem (13). More recent Pakistani evidence among medical students similarly indicates that lower self-esteem is associated with greater stress and other forms of psychological distress (14). International studies using the Rosenberg Self-Esteem Scale and Perceived Stress Scale have further demonstrated significant relationships between lower self-esteem and higher stress categories among university and medical-student populations (15,16). Collectively, these studies indicate that perceived stress and self-esteem are related constructs, although their magnitude and distribution may vary by educational setting, population, culture, and measurement approach.

In Pakistan, recent research has increasingly documented the psychological burden experienced by university and medical students. Studies have identified academic, social, and personal stressors as important correlates of poorer mental health (17), while contemporary multicentre evidence continues to demonstrate substantial perceived stress among Pakistani undergraduate students (18). Broader synthesis of Pakistani university-student mental health research also shows considerable between-study heterogeneity according to geographical setting, student characteristics, sampling procedures, and assessment instruments, reinforcing the need for locally contextualized evidence (19). However, the association between perceived stress and self-esteem specifically among female university students in Peshawar remains insufficiently characterized. Examining this relationship may provide locally relevant evidence for understanding psychological well-being among women enrolled in higher education. Therefore, the present study aimed to determine the association between perceived stress and self-esteem among female university students in Peshawar, Pakistan.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted among female students enrolled in selected public and private universities in Peshawar, Pakistan. Data were collected from January through March 2025. Female university students constituted the target population, and participants were selected from several universities using the random sampling approach employed in the study. Students were eligible if they were female university students, were willing to participate, and provided written informed consent. Students with a diagnosed mental illness, those who declined participation, and questionnaires with incomplete responses were excluded.

The required sample size was determined using a prevalence-based sample-size approach with an assumed prevalence of 50%, a 95% confidence level, and a 5% margin of error. Using these parameters, the minimum calculated sample was approximately 384 participants; the target sample was increased to 400 students. The use of a 50% anticipated prevalence provides the maximum variance when a reliable population estimate is unavailable and is a conventional approach for prevalence-based sample-size determination (20). Data were collected using a structured questionnaire incorporating the Perceived Stress Scale and Rosenberg Self-Esteem Scale. Before participation, students were informed about the purpose of the study, and written informed consent was obtained.

Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS-10), derived from the Perceived Stress Scale originally developed by Cohen, Kamarck, and Mermelstein to assess the extent to which individuals perceive situations in their lives as stressful (21). The PSS-10 has been widely applied in university populations and has demonstrated acceptable psychometric performance for assessing perceived stress among students (22). Total scores range from 0 to 40. For categorical analysis, scores were grouped as low perceived stress (0–13), moderate perceived stress (14–26), and high perceived stress (27–40).

Global self-esteem was assessed using the 10-item Rosenberg Self-Esteem Scale (RSES), originally developed to measure overall self-worth and self-acceptance (23). The RSES remains one of the most extensively used self-report measures of global self-esteem, with contemporary psychometric studies supporting its application among university students (10). Total scores range from 0 to 30. For the present analysis, scores below 15 were categorized as low self-esteem, scores of 15–25 as normal self-esteem, and scores of 26–30 as high self-esteem.

Data were entered and analyzed using IBM SPSS Statistics version 20. Continuous variables were summarized using mean and standard deviation, while categorical variables were presented as frequencies and percentages. The association between categorized perceived stress and categorized self-esteem was evaluated using the Pearson chi-square test. The contingency-table counts were additionally used to calculate Cramér's V as a measure of the magnitude of association. Statistical significance was defined as $p < 0.05$.

Ethical approval for the study was obtained from the relevant institutional ethical review committee. Participation was voluntary, written informed consent was obtained before data collection, and participant information was maintained confidentially throughout the study.

RESULTS

A total of 400 female university students were included in the analysis. The mean perceived-stress score was 17.05 ± 6.25 . Based on the categorical distribution, 236 students (59.0%) had low perceived stress, 112 (28.0%) had moderate perceived stress, and 52 (13.0%) had high perceived stress. The mean self-esteem score was 16.76 ± 6.36 . Low self-esteem was observed in 165 students (41.3%), normal self-esteem in 161 (40.3%), and high self-esteem in 74 (18.5%) (Table 1).

The distribution of self-esteem differed markedly across perceived-stress categories (Table 2). Among students with low perceived stress, 54 of 236 (22.9%) had low self-esteem, whereas low self-esteem was present in 77 of 112 students (68.8%) with moderate perceived stress and 34 of 52 students (65.4%) with

high perceived stress. Conversely, high self-esteem was observed in 67 of 236 students (28.4%) with low perceived stress compared with 3 of 112 (2.7%) in the moderate-stress group and 4 of 52 (7.7%) in the high-stress group.

Table 1. Distribution of Perceived Stress and Self-Esteem among Female University Students

Measure	Mean ± SD	Category	n (%)
Perceived stress	17.05 ± 6.25	Low (0–13)	236 (59.0)
		Moderate (14–26)	112 (28.0)
		High (27–40)	52 (13.0)
Self-esteem	16.76 ± 6.36	Low (<15)	165 (41.3)
		Normal (15–25)	161 (40.3)
		High (26–30)	74 (18.5)

SD, standard deviation.

Table 2. Association between Perceived Stress and Self-Esteem among Female University Students

Perceived stress	Low self-esteem, n (%)	Normal self-esteem, n (%)	High self-esteem, n (%)	Total, n
Low (0–13)	54 (22.9)	115 (48.7)	67 (28.4)	236
Moderate (14–26)	77 (68.8)	32 (28.6)	3 (2.7)	112
High (27–40)	34 (65.4)	14 (26.9)	4 (7.7)	52
Total	165	161	74	400

Percentages are calculated within perceived-stress categories. Pearson $\chi^2(4) = 88.40$; $p < 0.001$; Cramér's $V = 0.332$. The minimum expected cell frequency was 9.62; therefore, all expected cell frequencies exceeded 5.

Pearson chi-square analysis demonstrated a statistically significant association between perceived-stress category and self-esteem category, $\chi^2(4) = 88.40$, $p < 0.001$. The magnitude of association, quantified using Cramér's V , was 0.332. The findings demonstrate that the distribution of self-esteem varied substantially across perceived-stress categories, with low self-esteem occurring considerably more frequently among students in the moderate- and high-stress categories than among those in the low-stress category.

DISCUSSION

The present study demonstrated a clear association between perceived stress and self-esteem among female university students in Peshawar. Although 59.0% of participants were classified in the low perceived-stress category, the mean PSS score was 17.05 ± 6.25 , which fell within the moderate-score range used in the study. Low self-esteem was present in 41.3% of participants. More importantly, its distribution differed markedly across stress categories: low self-esteem occurred in 22.9% of students with low perceived stress compared with 68.8% of those with moderate stress and 65.4% of those with high stress. The association was statistically significant, $\chi^2(4) = 88.40$, $p < 0.001$, and Cramér's V of 0.332 indicated a moderate magnitude of association. Because the study was cross-sectional and the variables were analyzed categorically, these findings indicate an association rather than causation or a quantified continuous inverse correlation.

The observed relationship is consistent with previous work involving female and university-student populations. Afridi and Maqsood reported significant relationships among perceived stress, self-esteem, and life satisfaction among female university students, providing particularly relevant evidence from a Pakistani context (12). Pakistani medical-student research has likewise shown that lower self-esteem is associated with greater stress and other forms of psychological distress (14). Comparable relationships have been reported internationally among medical students, where lower levels of self-esteem were associated with higher stress categories or greater perceived stress (15,16). Earlier work among nursing students similarly demonstrated that academic stress and self-esteem were related, with greater academic stress accompanying lower self-esteem (13). The consistency of these findings across different educational settings supports the interpretation that self-esteem and perceived stress are meaningfully interconnected psychological characteristics during university education, while differences in instruments, curricula, sampling methods, and sociocultural contexts may influence the strength of the observed associations.

Self-esteem may be particularly relevant because it reflects individuals' evaluation of their own worth, competence, and ability to manage demands. Research among university students has linked self-esteem with broader psychological well-being and with symptoms of stress, anxiety, and depression (9,10). More recent psychophysiological evidence has also shown that personal self-esteem is negatively associated with perceived chronic stress, although subjective stress and physiological stress responses do not necessarily behave identically (11). These findings provide a plausible psychological context for the current results: students with more positive evaluations of themselves may appraise difficult circumstances differently or possess greater psychological resources for coping with them. Nevertheless, the present study did not measure coping processes, appraisal mechanisms, or temporal direction, and therefore cannot determine whether low self-esteem contributes to greater perceived stress, repeated stressful experiences contribute to poorer self-esteem, or both arise partly from shared contextual factors.

The distribution of perceived stress also warrants careful interpretation. Although the mean PSS score was within the moderate range, most students belonged to the lowest categorical group. A similar mean PSS-10 score of approximately 18 has been reported among university students in another higher-education setting (5), whereas systematic reviews demonstrate substantial variation in student stress across populations, regions, academic disciplines, and measurement approaches (2,3). Pakistani research has likewise identified considerable psychological distress among university students, although reported prevalence estimates vary according to the instrument and threshold used (4). More recent Pakistani evidence among undergraduate medical students has continued to identify substantial perceived stress and differences according to student characteristics and behavioral factors (18). Accordingly, the present mean score and categorical frequencies should be interpreted together rather than describing the entire sample simply as experiencing "moderate stress."

The self-esteem findings are also important. Approximately two in five participants had scores categorized as low self-esteem, while fewer than one in five were classified as having high self-esteem. Contemporary studies indicate that self-esteem profiles differ considerably between university populations. For example, Komariah et al. found moderate stress alongside generally favorable self-esteem and quality-of-life profiles among first-semester nursing students, illustrating that stress and self-esteem distributions can vary according to educational stage, institutional setting, and student characteristics (24). Psychometric research also indicates that self-esteem remains closely associated with broader dimensions of psychological adjustment and stress-related functioning among university students (10). The relatively high proportion of low self-esteem observed in the present study therefore deserves attention but should not be interpreted as evidence of a clinical disorder, because the RSES assesses global self-evaluation rather than providing a psychiatric diagnosis.

The relationship identified in this study may reflect several interacting psychological and contextual processes. Perceived stress is influenced not only by exposure to demanding circumstances but also by an individual's appraisal of whether available personal and social resources are sufficient to manage those demands. Academic pressure, family circumstances, financial pressures, and competing responsibilities have all been associated with perceived stress and mental well-being among university students (6). Personal self-esteem may operate as one of several psychological resources related to how stressful experiences are interpreted and managed (11). Recent evidence also indicates that coping strategies can partly modify relationships between perceived stress and broader well-being outcomes, with more adaptive coping associated with more favorable psychological functioning (25). These mechanisms were not directly assessed in the present study, but they provide a plausible framework for understanding why perceived stress and self-esteem may cluster together.

The findings have practical relevance for higher-education institutions. Universities represent an important setting for identifying students experiencing psychological difficulties and for providing accessible counseling, mental-health literacy, stress-management, peer-support, and referral services. Systematic reviews indicate that university mental health is influenced by multiple academic, social, behavioral, and contextual factors and therefore benefits from approaches that extend beyond management of a single symptom or stressor (1). Reviews of university mental-health programs similarly emphasize the

importance of structured institutional strategies that combine assessment, prevention, psychological support, and appropriate referral pathways rather than relying exclusively on students to seek help after substantial distress has developed (26). In the context of the present findings, initiatives designed to improve coping skills, help-seeking, social support, and positive psychological functioning may be particularly relevant for students experiencing elevated perceived stress or low self-esteem, although the effectiveness of any specific intervention cannot be inferred from this observational study. This study has several strengths. It addressed an understudied female university population in Peshawar and included 400 participants recruited across multiple universities. The use of established instruments allowed standardized assessment of perceived stress and global self-esteem, while presentation of both continuous scores and categorical distributions provided complementary descriptions of the study variables. In addition, the contingency-table analysis contained sufficient expected frequencies for Pearson's chi-square testing, and reporting Cramér's V provided an interpretable estimate of association magnitude rather than relying only on statistical significance.

Several limitations should also be considered. The cross-sectional design prevents determination of temporal sequence and therefore does not establish whether perceived stress precedes low self-esteem or vice versa. Both PSS and RSES were self-reported, creating the possibility of reporting and common-method bias. Categorization of continuous scores may reduce information and obscure differences within categories, and the categorical analysis cannot substitute for analysis of the original continuous scores. The study was limited to female university students in Peshawar, which restricts generalizability to male students, students in other geographical regions, and populations with different academic or socioeconomic characteristics. Excluding students with diagnosed mental illness may also have reduced representation of individuals with the greatest psychological burden. In addition, potentially important factors such as age, academic year, type of institution, socioeconomic circumstances, social support, living arrangements, and other psychological characteristics were not incorporated into the reported association analysis, so residual confounding cannot be excluded.

Future studies should therefore examine perceived stress and self-esteem using longitudinal designs capable of establishing temporal relationships and should retain continuous scale scores for correlation and multivariable analysis where appropriate. Inclusion of demographic, academic, socioeconomic, behavioral, coping, and social-support variables would permit assessment of potential confounders and effect modifiers. Multicentre studies involving both female and male students across different Pakistani regions would also help determine whether the association observed in Peshawar is consistent across educational and sociocultural settings. Such work could provide a stronger evidence base for designing and evaluating targeted student mental-health and psychological-support interventions.

CONCLUSION

Perceived stress was significantly associated with self-esteem among female university students in Peshawar, with students in the moderate- and high-stress categories showing a substantially greater prevalence of low self-esteem than those with low perceived stress. The moderate magnitude of association indicates that the two constructs are meaningfully related but should not be interpreted as establishing causality. The findings highlight the importance of recognizing perceived stress and low self-esteem as interconnected dimensions of student psychological well-being and support the development of accessible university-based mental-health, counseling, and stress-management services while further longitudinal and multivariable research clarifies the direction and determinants of this relationship.

REFERENCES

1. Campbell F, Blank L, Cantrell A, Baxter S, Blackmore C, Dixon J, et al. Factors that influence mental health of university and college students in the UK: a systematic review. *BMC Public Health*. 2022. doi:10.1186/s12889-022-13943-x.
2. Fentahun S, Rtbe G, Nakie G, Andualem F, Tinsae T, Kibralew G, et al. Burden of perceived stress among university students in Africa: a systematic review and meta-analysis. *BMC Public Health*. 2025. doi:10.1186/s12889-025-23533-2.

3. Antón-Ruiz JA, Bernabé M, Heredia-Oliva E. Prevalence of depression, anxiety, and stress among university students in the post-COVID-19 period: a systematic review and meta-analysis. *BMC Psychol.* 2026. doi:10.1186/s40359-026-05066-4.
4. Asif S, Mudassar A, Shahzad TZ, Raouf M, Pervaiz T. Frequency of depression, anxiety and stress among university students. *Pak J Med Sci.* 2020;36(5):971–976. doi:10.12669/pjms.36.5.1873.
5. Shaw MP, Peart DJ, Fairhead OJW. Perceived stress in university students studying in a further education college. *Res Post Compuls Educ.* 2017;22:442–452. doi:10.1080/13596748.2017.1362534.
6. Slimmen S, Timmermans O, Mikołajczak-Degrauwe K, Oenema A. How stress-related factors affect mental wellbeing of university students: a cross-sectional study to explore the associations between stressors, perceived stress, and mental wellbeing. *PLoS One.* 2022;17. doi:10.1371/journal.pone.0275925.
7. Córdova Olivera P, Gasser Gordillo P, Naranjo Mejía H, La Fuente Taborga I, Grajeda Chacón A, Sanjinés Unzueta A. Academic stress as a predictor of mental health in university students. *Cogent Educ.* 2023;10:2232686. doi:10.1080/2331186X.2023.2232686.
8. Limone P, Toto G, Messina G. Impact of the COVID-19 pandemic and the Russia-Ukraine war on stress and anxiety in students: a systematic review. *Front Psychiatry.* 2022;13:1081013. doi:10.3389/fpsy.2022.1081013.
9. Fernández González L, González Hernández A, Trianes Torres MV. Relationships between academic stress, social support, optimism-pessimism and self-esteem in college students. *Electron J Res Educ Psychol.* 2015;13(1):111–130.
10. Peng W, Zhou Y, Chu J, Liu Z, Zheng K, Yao S, et al. Factorial and criterion validities of the Chinese version of the Rosenberg Self-Esteem Scale among undergraduate students. *Psychol Res Behav Manag.* 2024;17. doi:10.2147/PRBM.S494452.
11. Tang X, Hu W, Zhao X, Liu Y, Ren Y, Tang Z, et al. The role of personal, relational, and collective self-esteem in predicting acute salivary cortisol response and perceived stress. *Appl Psychol Health Well Being.* 2024. doi:10.1111/aphw.12534.
12. Afridi S, Maqsood S. Perceived stress, life satisfaction and self-esteem in female university students. *Clin Couns Psychol Rev.* 2019;1(2):69–88. doi:10.32350/CCPR.12.05.
13. Pandey RA, Chalise HN. Self-esteem and academic stress among nursing students. *Kathmandu Univ Med J.* 2015;13(4):298–302. doi:10.3126/KUMJ.V13I4.16827.
14. Rizwan HC, Rahman S, Habib O, Khan MAW, Malik S, Minhas I. Relationship of self-esteem with depression, anxiety and stress among Pakistani medical students. *Pak J Med Health Sci.* 2022. doi:10.53350/pjmhs22162176.
15. Putra RC, Irawaty E. Hubungan self-esteem dengan tingkatan stres pada mahasiswa kedokteran Universitas Tarumanagara angkatan 2020–2022. *Tarumanagara Med J.* 2024;6(1). doi:10.24912/tmj.v6i1.31072.
16. Felita F, Adiwijaya JN, Hadiati T, Fitrikasari A, Savitri S. Does self-esteem affect stress levels in final year medical students? A study in final year medical students, Faculty of Medicine, Diponegoro University. *Diponegoro Int Med J.* 2024;5(1). doi:10.14710/dimj.v5i1.22494.
17. Mansoor I, Khan MA, Kubra K. Predictive relationship of perceived stressors and mental health of medical students. *Life Sci.* 2022;3(3):127–133. doi:10.37185/LnS.1.1.218.
18. Ahmed N, Tariq M, Siddique TSB, Maryam R, Fatima S, Saeed S, et al. Assessing the impacts of physical activity on mental health and perceived stress among undergraduate medical students in Pakistan: a cross-sectional study. *Ann Med Surg.* 2025. doi:10.1097/MS9.0000000000003245.
19. Niazi Y, Moazzam M, Asif M, Farooq SMY. Prevalence and epidemiology of depression symptoms among Pakistani students: a systematic review and meta-analysis (2000–2025). *Glob Ment Health.* 2025. doi:10.1017/gmh.2025.10125.
20. Naing L, Nordin R, Rahman HA, Naing YT. Sample size calculation for prevalence studies using Scalex and ScalaR calculators. *BMC Med Res Methodol.* 2022. doi:10.1186/s12874-022-01694-7.
21. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav.* 1983;24(4):385–396.

22. Anwer S, Manzar MD, Alghadir AH, Salahuddin M, Hameed UA. Psychometric analysis of the Perceived Stress Scale among healthy university students. *Neuropsychiatr Dis Treat.* 2020;16. doi:10.2147/NDT.S268582.
23. Rosenberg M. *Society and the Adolescent Self-Image.* Princeton, NJ: Princeton University Press; 1965.
24. Komariah M, Eriyani T, Rahayuwati L, Agustina HR, Nurhakim F, Somantri I, et al. Quality of life, self-esteem, and stress among first-semester student nurses in Indonesia: a cross-sectional study. *SAGE Open Nurs.* 2025;11:23779608251317805. doi:10.1177/23779608251317805.
25. Elsayed HAE. Perceived stress and life satisfaction among university students: the mediating and moderating roles of coping strategies and personality traits. *Front Psychol.* 2025;16:1593555. doi:10.3389/fpsyg.2025.1593555.
26. Suvo-Vega JA, Meneses-La-Riva ME, Fernández-Bedoya VH, Polonia ADC, Miotto AI, Alvarado-Suyo SA, et al. Mental health projects for university students: a systematic review of the scientific literature available in Portuguese, English, and Spanish. *Front Sociol.* 2022;7:922017. doi:10.3389/fsoc.2022.922017.