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ORIGINAL RESEARCH

Moderating Role of Peer Pressure and Positive Learning Environment Between Career Calling and Academic Procrastination in Chinese Medical Students During Controlled COVID-19 Pandemic: A Cross-Sectional Study

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Purpose: The COVID-19 pandemic sets specific circumstances that may accelerate academic procrastination behavior of medical students. Career calling is a protective factor that fights against academic procrastination and may further improve medical students' mental health and academic achievement. This study aims to determine the status of Chinese medical students' academic procrastination during controlled COVID-19 pandemic. Moreover, the study investigates the relationships and mechanisms among career calling, peer pressure, a positive learning environment, and academic procrastination.

Patients and Methods: Data were collected from several Chinese medical universities through an anonymous cross-sectional survey of 3614 respondents (effective response rate = 60.0%). Using online questionnaires to collect the data and IBM SPSS Statistics 22.0 for statistical analysis.

Results: The average score of academic procrastination of Chinese medical students was 2.62±0.86. This study proved the usage of peer pressure and positive learning environment as moderating roles of relationship between career calling and academic procrastination. Career calling was negatively correlated with academic procrastination ($r = -0.232$, $p < 0.01$), while it was positively correlated with peer pressure ($r = 0.390$, $p < 0.01$) and a positive learning environment ($r = 0.339$, $p < 0.01$). Moreover, academic procrastination was negatively correlated with peer pressure ($r = -0.279$, $p < 0.01$) and a positive learning environment ($r = -0.242$, $p < 0.01$). Peer pressure was positively correlated with a positive learning environment ($r = 0.637$, $p < 0.01$).

Conclusion: The findings emphasize the importance of constructive peer pressure and a positive learning environment that discourages academic procrastination. Educators should highlight medical career calling education by offering related courses to fight against academic procrastination.

Keywords: career calling, academic procrastination, peer pressure, positive learning environment, medical students, moderating effects

Introduction

Most people exhibit procrastinating behaviors at different stages of life. Academic procrastination is a type of procrastination in which students voluntarily delay their academic activities until the last minute.[1] Academic procrastination has been widely studied in recent years.[2–4] Academic procrastination behavior of medical students accelerated by the Corona Virus Disease 2019 (COVID-19) pandemic.[2–4] Frode Svartdal proposed that procrastination behaviors were not

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sensible or rational and believed that academic procrastination was illogical as it goes against sensible choices that could improve academic achievement and self-accomplishments.[5] Academic procrastination impacts students' academic performance, quality of learning, and the emotional pressure they face. Moreover, it can burden others when procrastinators do not complete the tasks needed for others to progress in their academic careers.[6] Specifically, academic procrastination not only affects students' academic achievement, also may influence their classmates' learning behaviors and pace, the instructors' teaching experience and work satisfaction, and the schools' education quality, reputation, and ratings.[7] Therefore, it influences factors other than academic performance. Procrastination causes pressure and negative emotions that affect students' mental health through guilt, inadequacy, depression, and self-doubt.[8] It often results in lower test scores and constant stress during deadline approaches.[9,10] Medical students suffer greater pressure and several studies have proved that medical students face academic procrastination.[11–13] One of the results revealed that Chinese medical students showed higher levels of academic procrastination than previous students, with a higher utilization of the Internet.[14] Another scholar said medical students experienced higher academic procrastination during the COVID-19 pandemic.[15] This is because medical students use procrastination to avoid dealing with anxious and uncomfortable feelings due to external tension and learning situations.[16] This coping mechanism is also used to alleviate negative emotions due to sudden long-term isolation, reduced social interaction, and changes in learning style brought about by the COVID-19 pandemic prevention measures.[15] In addition to online classroom functions, poorly managed research supervision mechanisms are emerging as a greater issue. For example, students could study lying on their beds and use cheating apps to search for answers during tests. This may worsen students' academic procrastination tendencies. Unfortunately, most medical students will continue to procrastinate, regardless of the adverse outcomes.[17] The outcomes of this can be severe, including the endangering of patients' lives during students' future careers. It should be noted that during the pandemic, medical workers have had to shoulder a greater burden than before and medical students have had to work harder to cope with the sudden increase in work difficulty. Thus, it is essential to research ways to minimize medical students' academic procrastination.

Career calling refers to a foundational passion or drive toward working in a particular field. It is also considered a type of personal resource.[18] Dik and Duffy clarified career calling into three-part: (1) a transcendent summons, (2) a meaningfulness or other method to approach a particular life and (3) primary sources of motivation which from other people's values and goals.[19] Ryan mentioned that a person engaged in a pro-socially oriented career would have a calling to assist others directly or indirectly or to strive toward change for the better.[20] The COVID-19 pandemic has significantly impacted the medical profession, and medical workers had to cope with increased pressure and workload.[21] Career calling has been identified as a resilient personal resource with the potential to help medical staff cope with the stress of the pandemic. In some surveys, medical workers indicated a career calling to fight the effects of the COVID-19 pandemic.[21,22] In other words, career calling is important for all medical practitioners in highly challenging situations.

From the medical education perspective, career calling is self-identification, a medically professional mindset, resiliency, and a rule set that is acquired during education that is characteristic of a trained medical professional.[23] This is important for medical practitioners in the medical profession.[24] Students who equate their profession to their calling display better career determination, comfort, and clarity of purpose.[25] Moreover, career calling can maintain motivation and passion for studying and drive medical students to become medical professionals.[26] Bonvin believed that career calling should be added to the medical education curriculum to improve the quality of education and stimulate students' active learning.[26] Career calling may serve as a protective factor against academic procrastination among medical students. However, there is a lack of evidence on the relationship between career calling and academic procrastination among Chinese medical students. We aimed to identify constructive factors to explain the connection between career calling and academic procrastination to lessen the latter's influence.

Peer pressure is defined as instances where one person affects or is affected by another or multiple others of the same age or social group.[27] This emphasizes that peers intensely impact personal behaviors, especially among teenagers.[28] However, to our knowledge, few studies have explored the connection between peer pressure and academic procrastination among Chinese medical students. Nevertheless, there is some evidence for this connection. Previous studies have suggested that peer pressure critically impacts students' academic and educational outcomes.[29] In other words, peer

pressure may affect the behavior and performance of students' learning. Another survey showed that peers could influence students' clinical performance,[30] indicating a relationship between peer pressure and students' procrastination in other ways. Moreover, peer behaviors influenced student learning through peer assessment,[31] peer punishment,[32] online peer-to-peer support,[33] and students' study behaviors. A scoping review of procrastination during the COVID-19 pandemic concluded that pressure from peers and teachers could prolong students' academic procrastination.[34] Based on this evidence, we assumed that peer pressure could moderate the connection between career calling and academic procrastination in our survey.

Concerning a positive learning environment, various studies have reported that learning environment affects learners' motivation and academic achievements.[34,35] A harmonious learning environment could stimulate students' motivation, nurturing the skills and knowledge required to realize their purpose.[36] At the same time, students who studied with others had more accuracy and confidence in their studies. Chantal M.L.R. Brazeau explained the connection between procrastination and a positive learning environment.[37] Lases also argued that a positive learning environment was positively related to work engagement in educational domains.[38] Thus, both teaching styles and learning methods have changed, particularly during the COVID-19 pandemic prevention and control period.[15] Teaching and learning styles are responsible for creating a comfortable and appropriate learning environment to facilitate student learning.[36] We posit that a positive learning environment could moderate the relationship between career calling and academic procrastination.

The purpose of this study is to determine the relationships among peer pressure, positive learning environment, academic procrastination and career calling. Furthermore, to explore that whether peer pressure or positive learning environment could be used as moderating factors in the relationship between career calling and academic procrastination. To serve the above aims, this study puts forward the following hypothesis:

Hypothesis 1: Career calling is negatively associated with academic procrastination among Chinese medical students.

Hypothesis 2: Peer pressure moderates the relationship between career calling and academic procrastination among Chinese medical students.

Hypothesis 3: A positive learning environment moderates the relationship between career calling and academic procrastination among Chinese medical students.

Materials and Methods

Participants and Procedures

This cross-sectional study survey was conducted from July to August 2021 using anonymous online questionnaires. The study adhered to the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of the Institutional Review Board of Harbin Medical University (ECHMU). Written informed consent was voluntarily obtained from all participants. The questionnaires were kept confidential and anonymous throughout the study to protect privacy. Per the method and standard requirements from Zhou,[39] the sample size of the survey was calculated as 1824 participants. Based on previous experience investigating online questionnaires, the researcher estimated the possible lowest rate of valid responses at 40%. Therefore, a sample of 4560 would be required based on potential drop-off. However, to ensure statistical quality, we expanded the sample size to 6000. Further considerations included regional differences, medical school reputation, major, grade, and sex ratio of medical students in China, among other factors. Students were chosen using stratified convenience sampling from a pool of medical school students in Nanjing, Guangzhou, Harbin, Dalian, and Mudanjiang. The survey was conducted through the online platform "Questionnaire Star". There were two to three people in charge of delivering the questionnaires to the medical schools mentioned above. They also needed to inform the participants what items they had to complete in the questionnaires. One Internet protocol address had only one answer. To guarantee the quality of the data, 6020 surveys were retrieved with strict adherence to the exclusion criteria. Two investigators were in charge of quality control to filter out mistaken deletions, omissions, and hypersensitivity issues. Ultimately, we received 3614 valid questionnaires with an effective rate of 60.0%.[40] These excluded answering times shorter than 8 min, incomplete answers, and failed quality control questions.

Measurement of Academic Procrastination

We used a scale designed by the research team to measure academic procrastination. The scale includes five items, eg, "I usually delay assignments until the deadline" or "I know I should study, but I usually don't study on time". Each item is rated from 1 = completely disagree to 5 = completely agree, with higher values indicating higher levels of academic procrastination. Cronbach's alpha for this scale was 0.906 in this study.

Measurement of Career Calling

The measurement of Career Calling was done using the Calling and Vocation questionnaire (CVQ) by Dik.[19] This scale what has been adapted since bringing into China is rated on a five-point Likert scale consisting of four items, ranging from 1 = never to 5 = every day, where higher scores indicate higher calling and vocation. Furthermore, other scholars in China have verified the scale's cross-cultural adaptability.[41,42] To measure Chinese medical students' current career calling level, the current study selected "Search - Transcendent Summons" dimension, including

> (1) I'm searching for my calling in my career (2) I yearn for a sense of calling in my career (3) I am trying to figure out what my calling is in the context of my career (4) I'm trying to identify the area of work I was meant to pursue

in this study.[19] Cronbach's alpha for the scale used in this study was 0.843.

Measurement of Peer Pressure and a Positive Learning Environment

Peer pressure and positive learning environment were measured by adapting the peer pressure scale by Wang.[43] This covers two dimensions with seven items: peer pressure (four items) and positive learning environment (three items). Each item was scaled from 1 = completely inconsistent to 5 = very consistent, with higher values indicating higher measurement targets. In this study, Cronbach's alpha for peer pressure was 0.845; for a positive learning environment, it was 0.840.

Measurement of Demographic Characteristics

The survey collected six demographic characteristics from the self-designed questionnaire: sex, major, grade, parenting style, monthly living expenses, and health. Students' majors were divided into eight categories: basic medicine, clinical medicine (including clinical medicine, anesthesiology, medical imaging, pediatrics, etc.), stomatology, public health and preventive medicine (including preventive medicine, food hygiene, nutrition, etc.), pharmacology (including clinical pharmacy, pharmacy, drug analysis, etc.), medical technology (including medical laboratory technology, medical imaging technology, biomedical engineering, rehabilitation therapy, quarantine, etc.), nursing (including nursing and midwifery), and other (including law, management, marketing, biological information, etc.). Grades were separated into Freshman, Sophomore, Junior, Senior, and above. Parenting style was classified into four types: neglectful (less strict requirements and less companionship), tolerant (less rigid requirements and more companionship), authoritarian (stricter requirements and less companionship), and authoritative (stricter requirements and more companionship). Options for monthly living expenses were RMB "0~1000", "1000~1500", "1500~2000", and "2000 and above". Subjective health was assessed on a five-point scale, comprising very bad, bad, average, good, and excellent.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics 22.0, with a two-tailed probability value of < 0.05 considered statistically significant. The *t*-test was used to test the group differences in continuous variables. Excluding sex, continuous variable factors and one-way analysis of variance (ANOVA) were used to test surplus factors. Pearson's correlation analysis was used to detect correlations between the continuous variables. Hierarchical multiple regression was employed to examine the association between positive learning environment, peer pressure, career calling, and academic procrastination. Moreover, it explored the moderating effect of a positive learning environment and peer pressure on the relationship between career calling and academic procrastination. Variables related to academic procrastination in the univariate analysis were adjusted. Potential control variables were first added as M1. Career calling is entered next with affiliated peer pressure as M2. The product of peer pressure and career calling is defined as M3. M1 was adjusted for a positive learning environment and named M4. Finally, the product of the positive learning

environment and career calling in M4 formed M5. A simple slope analysis was applied to visualize the interaction terms if the interaction effects were statistically significant. To display line charts with three grades (lower, mean, higher), we chose the options "-1SD, Mean, +1SD". The variance inflation factor (VIF) was used to evaluate multicollinearity; VIF<10 indicated that the results were acceptable During this study, none of the VIF models were problematic.

Results

Demographic Characteristics of Participants

Participants' demographic characteristics are presented in Table 1. The proportion of females was 74.4%, and males were 25.6%. The composition of majors was as follows: 4.1% basic medicine, 34.3% clinical medicine, 6.3% stomatology, 4.7% public health and preventive medicine, 15.6% pharmacy, 11.7% medical technology, 14.8% nursing, and 8.5% other. Almost half of the participants were freshmen (57.7%). For parenting types, 61.2% were tolerant, 20.1% were

Table 1 Demographic Characteristics (N=3614) and Univariate Analysis for the Factors Related to the Level of Academic Procrastination

Variable	Number of Subjects n(%)	Academic Procrastination (Mean±SD)	*p*-value (by *t*-test)
Sex			0.009
Male	925(25.6)	2.56±0.90	
Female	2689(74.4)	2.65±0.84	
Major			< 0.001
Basic Medicine	148(4.1)	2.57±0.87	
Clinical Medicine	1238(34.3)	2.57±0.86	
Stomatology	229(6.3)	2.71±0.86	
Public Health and Preventive Medicine	171(4.7)	2.60±0.88	
Pharmacy	562(15.6)	2.55±0.90	
Medical Technology	424(11.7)	2.62±0.81	
Nursing	534(14.8)	2.74±0.81	
Other	308(8.5)	2.74±0.88	
Grade			< 0.001
Freshman	2085(57.7)	2.53±0.86	
Sophomore	660(18.3)	2.77±0.86	
Junior	608(16.8)	2.74±0.83	
Senior and above	261(7.2)	2.76±0.84	
Parenting style			< 0.001
Neglected type	312(8.6)	2.89±0.83	
Tolerant type	2213(61.2)	2.62±0.85	
Authoritarian style	362(10.0)	2.72±0.91	
Authority type	727(20.1)	2.48±0.85	
Monthly living expenses (RMB)			0.040
(0,1000)	302(8.4)	2.51±0.79	
(1000~1500)	1649(45.6)	2.65±0.86	
(1500~2000)	1149(31.8)	2.60±0.86	
(2000,∞)	514(14.2)	2.67±0.90	
Subjective Heath			< 0.001
Very bad	11(0.3)	3.09±0.99	
Bad	139(3.8)	2.89±0.86	
Average	1200(33.2)	2.77±0.83	
Good	1783(49.3)	2.58±0.83	
Excellent	481(13.3)	2.34±0.95	

authoritative, 10.0% were authoritarian, and the remainder were neglectful. In addition, 77.4% of the students had monthly living expenses between 1000~2000 RMB. Finally, the overwhelming majority of the participants self-described their health as average to excellent.

Correlations Among Continuous Variables

Table 2 displays Pearson's correlation coefficients for continuous variables. Each variable had a statistically significant correlation with other variables. Career calling was negatively correlated with academic procrastination ($r = -0.232$, $p < 0.01$); however, it was positively correlated with peer pressure ($r = 0.390$, $p < 0.01$) and a positive learning environment ($r = 0.339$, $p < 0.01$). Moreover, academic procrastination was negatively correlated with peer pressure ($r = -0.279$, $p < 0.01$) and a positive learning environment ($r = -0.242$, $p < 0.01$). Moreover, peer pressure was positively correlated with a positive learning environment ($r = 0.637$, $p < 0.01$).

Hierarchical Regression Analysis

Table 3 presents the results of the hierarchical regression analysis. Control variables, including sex, major, grade, parenting style, monthly living expenses, and subjective health, significantly explained academic procrastination (adjusted $R^2 = 0.051$, $\Delta R^2 = 0.052$, $p < 0.01$). In the second step, career calling was found to be significantly and negatively related to academic procrastination ($\beta = -0.124$, $p < 0.01$). Similarly, peer pressure was significantly and

Table 2 Correlations Among Continuous Variables

Variables	Mean±SD	1	2	3	4
(1) Career Calling	3.72±0.70	1			
(2) Academic Procrastination	2.62±0.86	−0.232**	1		
(3) Peer Pressure	3.93±0.68	0.390**	−0.279**	1	
(4) Positive Learning Environment	4.03±0.69	0.339**	−0.242**	0.637**	1

Note: **$p < 0.01$ (two-tailed).

Table 3 Hierarchical Multiple Regression Results of Academic Procrastination

Variables	Academic Procrastination				
	$M_1(\beta)$	$M_2(\beta)$	$M_3(\beta)$	$M_4(\beta)$	$M_5(\beta)$
Control variables					
Sex	0.030	0.036*	0.032*	0.037*	0.035*
Major	0.053**	0.029	0.029	0.027	0.026
Grade	0.102**	0.066**	0.067**	0.068**	0.068**
Parenting style	−0.078**	−0.052**	−0.052**	−0.061**	−0.061**
Monthly living expenses	0.052**	0.049**	0.050**	0.051**	0.052**
Subjective heath	−0.162**	−0.102**	−0.102**	−0.108**	−0.109**
Independent variable					
Career Calling		−0.124**	0.196**	−0.144**	0.137
Moderator variables					
Peer Pressure		−0.193**	0.099		
Positive Learning Environment				−0.158**	0.088
Interactions					
Career Calling × Peer Pressure			−0.515**		
Career Calling × Positive Learning Environment					−0.435**
F	33.117**	59.626**	55.606**	54.453**	49.997**
Adjusted R^2	0.051**	0.115**	0.120**	0.106**	0.109**
ΔR^2	0.052**	0.065**	0.005**	0.056**	0.003**

Note: *$p < 0.05$, **$p < 0.01$ (two-tailed).

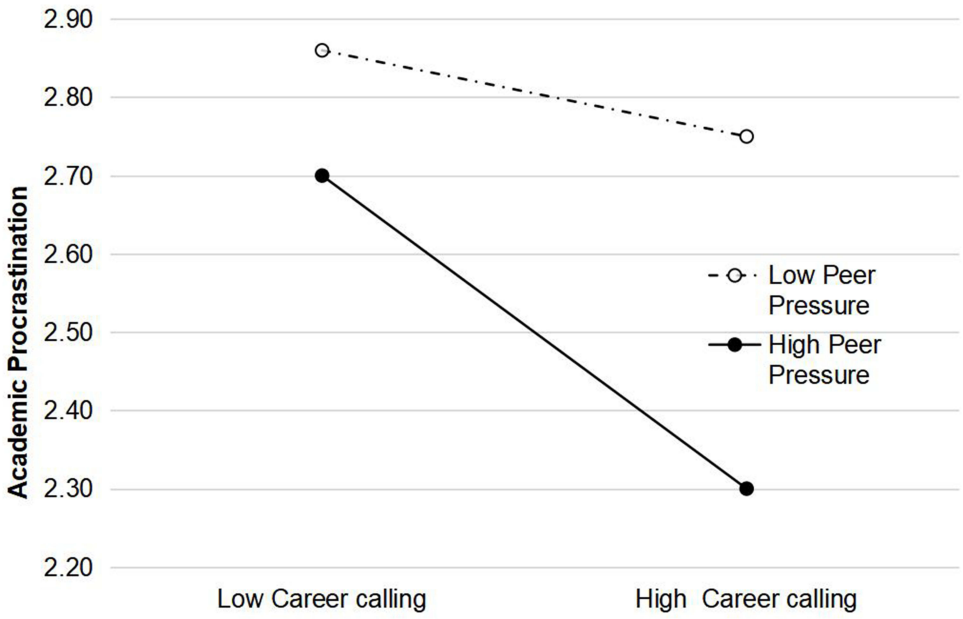

Figure 1 Simple slope diagram of the influence of the interaction between Career calling and Peer Pressure on Academic Procrastination.

negatively associated with academic procrastination ($\beta = -0.193$, $p < 0.01$). Career calling and peer pressure ameliorated the model fit for academic procrastination (adjusted R^2=0.115, $\Delta R^2 = 0.065$, $p < 0.01$). The career calling × peer pressure interaction term was significantly and negatively associated with academic procrastination ($\beta = -0.515$, $p < 0.01$). Simple slope analysis showed that if peer pressure was higher, the relationship between career calling and academic procrastination became stronger. In other words, the strength of the impact of career calling on academic procrastination differed between groups with positive (1 SD above the Mean, $p < 0.01$) and negative (1 SD below the Mean, $p < 0.01$) peer pressure. These interactions are shown in Figure 1. A positive learning environment and career calling improved the model fit of academic procrastination (adjusted R^2=0.106, $\Delta R^2 = 0.056$, $p < 0.01$). The career calling × positive learning environment interaction term was significantly and negatively associated with academic procrastination ($\beta = -0.435$, $p < 0.01$). Simple slope analysis revealed that the relationship between career calling and academic procrastination became stronger when the positive learning environment was higher. In other words, the strength of the impact of career calling on academic procrastination was different in groups with negative (1 SD below the Mean, $p < 0.01$) and positive (1 SD above the Mean, $p < 0.01$) learning environments. This interaction is shown in Figure 2.

Discussions

Current Status of Career Calling and Academic Procrastination Among Chinese Medical Students During Controlled COVID-19 Pandemic

The results of this survey identified the status of career calling and academic procrastination among Chinese medical students. The mean score of academic procrastination among the Chinese students surveyed was 2.62±0.86 (Mean ± SD), similar to other reports.[14,15] This suggests that Chinese medical students tend to exhibit academic procrastination. It is necessary to reduce this negative trait and focus on developing a quality medical education program to combat the problem. The demographic characteristics included sex, major, grade, parenting style, monthly living expenses, and subjective health; these reflect the current status of academic procrastination of Chinese medical students. Universally, female students procrastinated more than male students, a finding that differed from those in previous studies.[44,45] Blige Uzun Ozer explained that more female than male students reported procrastination due to fear of failure or laziness.[46] Students in majors following professions connected to patient mortality may have a greater sense of responsibility than other majors leading to different levels of academic procrastination.[47] Medical students with higher grades may have lower academic procrastination because they feel anxious about the limited study time before graduation and work

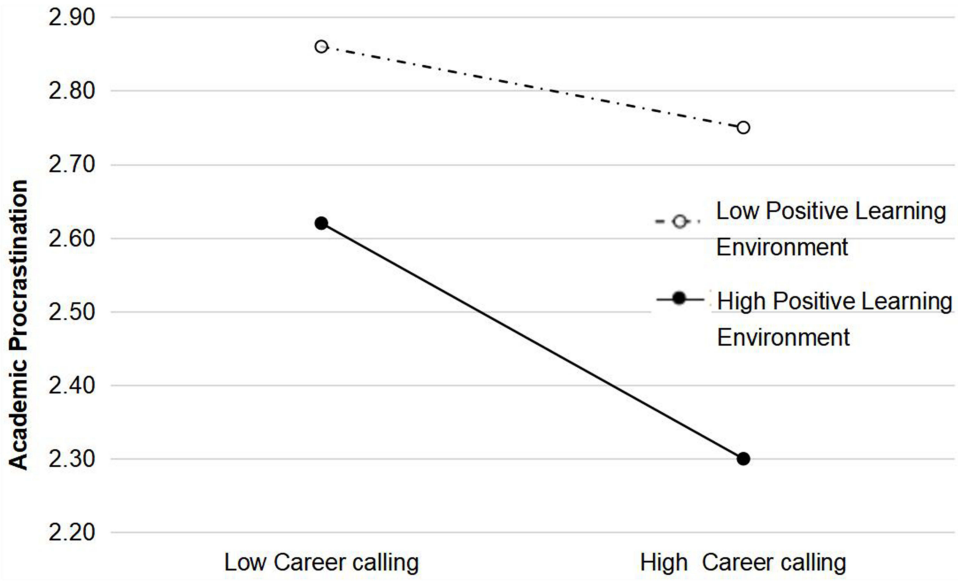

Figure 2 Simple slope diagram of the influence of the interaction between Career calling and Positive Learning Environment on Academic Procrastination.

placement.[43] In addition, students' growth environments can influence academic procrastination.[44] Several outcomes say that parenting styles influence students' learning. The more positive the parenting styles, the less stress and procrastination they feel.[44] In other words, positive parenting styles were associated with academic procrastination. To some extent, students' monthly living expenses reflect their family incomes. Scholars have found an association between family income and students' academic procrastination.[14] This survey found the same result that monthly living expenses affect academic procrastination. Jeffries found that students with poor mental health had higher academic procrastination levels than their mentally healthy peers.[48] Regarding physical health, Li stated that proper physical activity predicted a lower level of academic procrastination.[49] Understanding the demographic characteristics of academic procrastination can enable the construction of an appropriate model to reduce Chinese students' academic procrastination.

The Relationship Between Career Calling and Academic Procrastination

This study analyzed the frameworks underlying the relationship between career calling and academic procrastination by building a moderated model among Chinese medical students during China's COVID-19 pandemic lockdown period. The study found that peer pressure and a positive learning environment played separate moderating roles in the association between career calling and academic procrastination. Considering the positive effects of career calling and the negative effects of academic procrastination, more attention should be paid to the moderating factors to decrease medical students' academic procrastination and benefit their education.[50] This study found that a stronger career calling was related to lower academic procrastination among Chinese medical students. This is similar to the findings of Su Jin Chae who found that career calling was negatively correlated with academic procrastination.[51] Career calling has been proven useful in driving autonomic motivation and increasing an individual's job satisfaction.[52] Medical students could not avoid the influence of the Hippocratic Oath, which dictates the ethical standards of doctors. This oath is the physician's calling and shapes medical career paths.[53] Career calling may push medical students to progress by building a belief that becoming medical practitioners requires students to ameliorate their procrastination behaviors.

Peer Pressure Moderated the Relationship Between Career Calling and Academic Procrastination

This study investigated the moderating role of peer pressure on the relationship between career calling and academic procrastination. Simple slope analysis showed a more obvious effect of career calling on academic procrastination among Chinese medical students when there was more peer pressure. This means that medical undergraduates experienced less academic procrastination with higher peer pressure.[54]

Kaipeng Hu mentioned that peer pressure was unique to social networks and had a tremendous impact on individual behaviors; furthermore, it impacted the mental health of people with non-adherent behavior and created a rift among students.[54] Moreover, parents' forced social comparison—parents comparing their children's academic achievements with others —may encourage students to compare themselves passively.[55] This behavior is common among Chinese parents, requiring children to pay attention to how others perceive them.[56] In addition, medical students prefer to compare themselves with peers with similar experiences to assess their circumstances and identify disparities.[30]

Additionally, a competitive employment mechanism may boost benign peer pressure. This means that between two students with the same academic achievement and technical ability, the one with a higher career calling consciousness would have a greater probability of being employed. Medical professionalism is underpinned by the public's trust in doctors,[57] requiring a career calling. This meant that peer pressure might be present in academia and act on career calling. For these reasons, some Chinese medical students focus on their professional studies and take corresponding actions to address the gap with others. Hence, they diminish their academic procrastination.

Due to the strained medical environment in the context of the COVID-19 pandemic, medical students are under greater pressure from peers. They could be pushed to accelerate their academic progress. Additionally, their well-developed network makes students concerned with their contemporaries in reality and online, increasing pressure and broadening their horizons. However, not all peer pressure is beneficial. Alison F found that improper peer pressure could negatively influence teenagers' school performance.[28] When psychological security is attacked, students may withdraw from their studies,[58] increasing the burden of academic procrastination.

In summary, we should promote constructive peer pressure to decrease the academic procrastination of Chinese medical students. This could be achieved by artificially cultivating role models among students, channeling positive peer pressure online, and finding a way to convert anxiety into motivation. Using appropriate methods to impose proper peer pressure could relieve the adverse effects of academic procrastination.

Positive Learning Environment Moderated the Relationship Between Career Calling and Academic Procrastination

This survey corroborated findings that a positive learning environment can moderate the degree of impact between career calling and academic procrastination. Milou[59] mentioned that a harmonious learning environment contributes to high-quality medical education, a finding that was confirmed in this study.

The bandwagon effect can be used to explain how a positive learning environment influences the relationship between calling and academic procrastination among Chinese medical students. This theory states that people affected by the environment may engage in behaviors they would not otherwise participate in.[59] It could be interpreted that students' decisions are influenced by the groups' typical responses.[60] According to this theory, students would spend more time studying than usual when the learning environment encourages such behavior.

Chinese Harmonious and Syncretic Culture is rooted in the Chinese mindset and could foster responsibility among students in reaction to peer achievements. This could promote cooperative learning among Chinese students to construct an active learning environment. Simply put, if one student in the study group is eager to learn, others may become more enthusiastic about studying. As a result, Chinese students who place themselves in a positive learning environment feel a sense of nervousness and obligation and follow their peers' learning behaviors. This may be one of the driving factors behind effective learning and help reduce academic procrastination.

Lastly, campaigns about the dedication of Chinese front-line medical workers and career calling were more intensive during the controlled COVID-19 pandemic in China. Such campaigns may also foster a desire to learn among Chinese medical students.

Therefore, this study suggests that Chinese medical students in a positive learning environment have greater academic urgency. This urgency could bolster their desire to improve their academic achievement. To enhance this effect, educators should remain vigilant of the controlled COVID-19 pandemic in China and its effects on student procrastination. Extending this environment online, we should create a novel positive learning space using Internet-based tools. These

may include strengthening efforts to publicize the anti-pandemic sentiment that endorses medical workers, building an online competition cooperation platform, and providing rewards or certificates for excellence in their field.

Limitations

Although we have found the moderating role of peer pressure and positive learning environment between career calling and academic procrastination in Chinese medical students, we have to admit the limitations in this study. First, the data was collected from online-questionnaires, it was prone to response bias because social desirability. Second, considering the expense, resource and real situation, we did not inquiry each regions' representative medical schools of China. Although we tired our best to control the quality of sampling process, but still could make the samples lose comprehensive. Third, the cross-sectional design could not decide the causal relationship among the studied variables. Hence, the future study should obtain huger samples size and rigorous technique. Fourth, because the COVID-19 pandemic has being normalized prevention and control, the study results may be interfered to generate bias.

Conclusions

This study reminds that medical educators should pay more attention on medical students' academic procrastination, especially during public health emergencies or scenic conversions. Strengthening career calling is a valid path to attenuate academic procrastination, which means medical educators should focus on cultivating the sense of career calling of medical students. Integrating career calling into the college curriculum might be a feasible way to decrease academic procrastination.[61] Hence, medical educators should highlight medical career calling education by offering related courses. Moreover, medical teachers could emphasize the sanctity of medicine to make students deeply aware of the importance of learning and the downsides of academic procrastination. Considering peer-related factors, medical educators should encourage constructive peer pressure and positive learning environment to enhance the quality of study and reduce the academic procrastination of Chinese medical students. To active the motivation of peer pressure, medical educators could establish award-and-penalty standards based on timely evaluation and feedback system, parents also may exert a properly peer-compared stress on their children who have academic procrastination. In order to establish positive learning environment, medical educators could set up dedicated places like learning corners, study-only coffee shops and multi-purpose study rooms to reduce the academic procrastination of Chinese medical students.

Data Sharing Statement

The datasets used and/or analyzed during this study are available from the corresponding author on reasonable request caodp211@126.com.

Consent for Publication

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Harbin Medical University.

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Disclosure

The authors declare no conflict of interest.

References

1. Vilca LW. The moderating role of sex in the relationship between executive functions and academic procrastination in undergraduate students. *Front Psychol*. 2022;13. doi:10.3389/fpsyg.2022.928425
2. Yip MC, Chung OL. Psychometric properties of the Chinese version of procrastination assessment scale for students. *Front Psychol*. 2022;13. doi:10.3389/fpsyg.2022.1016116
3. Turhan D, Schnettler T, Scheunemann A, et al. University students' profiles of burnout symptoms amid the COVID-19 pandemic in Germany and their relation to concurrent study behavior and experiences. *Int j Educ Res*. 2022;116:102081. doi:10.1016/j.ijer.2022.102081
4. Patra V, Evangelia K, Georgios N. The Relationship B et al ween Defenses and Learning: the Mediating Role of Procrastination and Well-Being Among Undergraduate Students. *J Nerv Ment Dis*. 2022;10:1097. doi:10.1097/NMD.0000000000001570
5. Svartdal F, Dahl TI, Gamst-Klaussen T, Koppenborg M, Klingsieck KB. How study environments foster academic procrastination: overview and recommendations. *Front Psychol*. 2020;3005. doi:10.3389/fpsyg.2020.540910
6. Steel P, Ferrari J. Sex, education and procrastination: an epidemiological study of procrastinators' characteristics from a global sample. *Eur j Personality*. 2013;27(1):51–58. doi:10.1002/per.1851
7. Patrzek J, Sattler S, van Veen F, Grunschel C, Fries S. Investigating the effect of academic procrastination on the frequency and variety of academic misconduct: a panel study. *Stud High Educ*. 2015;40(6):1014–1029. doi:10.1080/03075079.2013.854765
8. Zacks S, Hen M. Academic interventions for academic procrastination: a review of the literature. *J Prev Interv Community*. 2018;46(2):117–130. doi:10.1080/10852352.2016.1198154
9. Kármen D, Kinga S, Edit M, Susana F, Kinga KJ, Réka J. Associations between academic performance, academic attitudes, and procrastination in a sample of undergraduate students attending different educational forms. *Procedia Soc Behav Sci*. 2015;187:45–49. doi:10.1016/j.sbspro.2015.03.009
10. Tice DM, Baumeister RF. Longitudinal study of procrastination, performance, stress, and health: the costs and benefits of dawdling. *Psychol Sci*. 1997;8(6):454–458.
11. Safari Y, Yousefpoor N. The Role of Metacognitive Beliefs in Predicting Academic Procrastination Among Students in Iran: cross-sectional Study. *JMIR Med Educ*. 2022;8(3):e32185. doi:10.2196/32185
12. Cho M, Lee Y-S. The effects of medical students' self-oriented perfectionism on academic procrastination: the mediating effect of fear of failure. *Korean J Med Educ*. 2022;34(2):121–129. doi:10.3946/kjme.2022.224
13. Ghaffari F, Mohammadi S, Arazi T, Arzani A, Rahimaghaee F. Shedding light on the causes of academic procrastination among nursing students: a qualitative descriptive study. *J Educ Health Promot*. 2021;10(1). doi:10.4103/jehp.jehp_1103_20
14. Tian J, Zhao J-Y, Xu J-M, et al. Mobile Phone Addiction and Academic Procrastination Negatively Impact Academic Achievement Among Chinese Medical Students. *Front Psychol*. 2021;12. doi:10.3389/fpsyg.2021.758303
15. Jia J, Wang -L-L, Xu J-B, Lin X-H, Zhang B, Jiang Q. Self-Handicapping in Chinese Medical Students During the COVID-19 Pandemic: the Role of Academic Anxiety, Procrastination and Hardiness. *Front Psychol*. 2021;12. doi:10.3389/fpsyg.2021.741821
16. Lee SA. Replication analysis of the coronavirus anxiety scale. *Dusunen Adam*. 2020;33(3):203–205. doi:10.14744/DAJPNS.2020.00079
17. Liu G, Cheng G, Hu J, Pan Y, Zhao S. Academic self-efficacy and postgraduate procrastination: a moderated mediation model. *Front Psychol*. 2020;11:1752. doi:10.3389/fpsyg.2020.01752
18. Dobrow SR, Tosti-Kharas J. Calling: the development of a scale measure. *Pers psychol*. 2011;64(4):1001–1049. doi:10.1111/j.1744-6570.2011.01234.x
19. Dik BJ, Eldridge BM, Steger MF, Duffy RD. Development and validation of the calling and vocation questionnaire (CVQ) and brief calling scale (BCS). *J Career Assessment*. 2012;20(3):242–263. doi:10.1177/1069072711434410
20. Duffy RD, Dik BJ. Research on calling: what have we learned and where are we going? *J vocat behav*. 2013;83(3):428–436. doi:10.1016/j.jvb.2013.06.006
21. Sun T, Zhang S-E, Yin H-Y, et al. Can resilience promote calling among Chinese nurses in intensive care units during the COVID-19 pandemic? The mediating role of thriving at work and moderating role of ethical leadership. *Front Psychol*. 2022;13. doi:10.3389/fpsyg.2022.847536
22. Zhou Y, Asante EA, Zhuang Y, Wang J, Zhu Y, Shen L. Surviving an infectious disease outbreak: how does nurse calling influence performance during the COVID-19 fight? *J Nurs Manage*. 2021;29(3):421–431. doi:10.1111/jonm.13181
23. Kao AC, Jager AJ. Medical students' views of medicine as a calling and selection of a primary care-related residency. *Ann Fam Med*. 2018;16(1):59–61. doi:10.1370/afm.2149
24. Zhang S, Wang J, Xie F, et al. A cross-sectional study of job burnout, psychological attachment, and the career calling of Chinese doctors. *BMC Health Serv Res*. 2020;20(1):1–11. doi:10.1186/s12913-020-4996-y
25. Dik BJ, Duffy RD, Eldridge BM. Calling and vocation in career counseling: recommendations for promoting meaningful work. *Prof psychol-res pr*. 2009;40(6):625. doi:10.1037/a0015547
26. Bonvin S, Stiefel F, Gholam M, Bourquin C. Calling situated: a survey among medical students supplemented by a qualitative study and a comparison with a surveyed sample of physicians. *Bmc med educ*. 2022;22(1):1–14. doi:10.1186/s12909-022-03642-x
27. Laursen B, Veenstra R. Toward understanding the functions of peer influence: a summary and synthesis of recent empirical research. *J res adolescence*. 2021;31(4):889–907. doi:10.1111/jora.12606
28. Pittman AF. Implications of peer pressure for adolescent nursing research: a concept analysis approach. *Compr child adoles n*. 2019;42(1):54–70. doi:10.1080/24694193.2017.1387829
29. Andrew M, Flashman J. School transitions, peer influence, and educational expectation formation: girls and boys. *Soc Sci Res*. 2017;61:218–233. doi:10.1016/j.ssresearch.2016.06.016
30. Raat A, Kuks JB, van Hell EA, Cohen-Schotanus J. Peer influence on students' estimates of performance: social comparison in clinical rotations. *Med educ*. 2013;47(2):190–197. doi:10.1111/medu.12066
31. Yin S, Chen F, Chang H. Assessment as Learning: how Does Peer Assessment Function in Students' Learning? *Front Psychol*. 2022;13. doi:10.3389/fpsyg.2022.912568
32. Yang H-X, Wu Z-X, Rong Z, Lai Y-C. Peer pressure: enhancement of cooperation through mutual punishment. *Phys Rev e*. 2015;91(2):022121. doi:10.1103/PhysRevE.91.022121
33. Naslund JA, Aschbrenner KA, Marsch LA, Bartels SJ. The future of mental health care: peer-to-peer support and social media. *Epidemiol Psych Sci*. 2016;25(2):113–122. doi:10.1017/S2045796015001067

34. Unda-López A, Osejo-Taco G, Vinueza-Cabezas A, Paz C, Hidalgo-Andrade P. Procrastination during the COVID-19 Pandemic: a Scoping Review. *Behav Sci-Basel*. 2022;12(2):38. doi:10.3390/bs12020038
35. Bojuwoye O, Moletsane M, Stofile S, Moolla N, Sylvester F. Learners' experiences of learning support in selected Western Cape schools. *S Afr j Educ*. 2014;34(1):1–15. doi:10.4102/curationis.v38i2.1502
36. Mashau TS. *Relevant Support Services in the Education System of the Northern Province*. Potchefstroom University for Christian Higher Education; 2000.
37. Brazeau CM, Schroeder R, Rovi S, Boyd L. Relationships between medical student burnout, empathy, and professionalism climate. *Acad med*. 2010;85(10):S33–S36. doi:10.1097/ACM.0b013e3181ed4c47
38. Lases LS, Arah OA, Busch OR, Heineman MJ, Lombarts KM. Learning climate positively influences residents' work-related well-being. *Adv Health Sci Educ*. 2019;24(2):317–330. doi:10.1007/s10459-018-9868-4
39. Zhou X, Liao X, Spiegelman D. "Cross-sectional" stepped wedge designs always reduce the required sample size when there is no time effect. *J clin epidemiol*. 2017;83:108–109. doi:10.1016/j.jclinepi.2016.12.011
40. Ebert JF, Huibers L, Christensen B, Christensen MB. Paper- or Web-Based Questionnaire Invitations as a Method for Data Collection: cross-Sectional Comparative Study of Differences in Response Rate, Completeness of Data, and Financial Cost. *J Med Internet Res*. 2018;20 (1):e8353. doi:10.2196/jmir.8353
41. Duan W, Tang X, Li Y, Cheng X, Zhang H. Perceived organizational support and employee creativity: the mediation role of calling. *Creativity Res j*. 2020;32(4):403–411. doi:10.1080/10400419.2020.1821563
42. Zhang Z, Zhang Y, Jia M. Does a sense of calling facilitate sustainability? Research on the influence of calling on employee green behavior. *Bus Strateg Environ*. 2021;30(7):3145–3159. doi:10.1002/bse.2795
43. Ying Y, Lv W. A study on higher vocational college students' academic procrastination behavior and related factors. *Int J Educ Manage Eng*. 2012;2(7):29–35.
44. Khalid A, Zhang Q, Wang W, Ghaffari AS, Pan F. The relationship between procrastination, perceived stress, saliva alpha-amylase level and parenting styles in Chinese first year medical students. *Psychol Res Behav Ma*. 2019;12:489. doi:10.2147/PRBM.S207430
45. Albursan IS, Al Qudah MF, Al-Barashdi HS, et al. Smartphone Addiction among University Students in Light of the COVID-19 Pandemic: prevalence, Relationship to Academic Procrastination, Quality of Life, Gender and Educational Stage. *Int j Env Res Pub Health*. 2022;19 (16):10439. doi:10.3390/ijerph191610439
46. Özer BU, Demir A, Ferrari JR. Exploring academic procrastination among Turkish students: possible gender differences in prevalence and reasons. *J Soc Psychol*. 2009;149(2):241–257. doi:10.3200/SOCP.149.2.241-257
47. Borges NJ, Manuel RS, Duffy RD. Speciality interests and career calling to medicine among first-year medical students. *Perspect Med Educ*. 2013;2(1):14–17. doi:10.1007/s40037-012-0037-9
48. Jeffries V, Salzer MS. Mental health symptoms and academic achievement factors. *J Am Coll Health*. 2020;1–4. doi:10.1080/07448481.2020.1865377
49. Li C, Hu Y, Ren K. Physical activity and academic procrastination among Chinese university students: a parallel mediation model of self-control and self-efficacy. *Int J Env Res Pub He*. 2022;19(10):6017. doi:10.3390/ijerph19106017
50. De la Fuente J, Sander P, Garzón-Umerenkova A, Vera-Martínez MM, Fadda S, Gaetha ML. Self-regulation and regulatory teaching as determinants of academic behavioral confidence and procrastination in undergraduate students. *Front Psychol*. 2021;12:602904. doi:10.3389/fpsyg.2021.602904
51. Chae SJ, Jeong SM, Chung Y-S. The mediating effect of calling on the relationship between medical school students' academic burnout and empathy. *Korean J Med Educ*. 2017;29(3):165. doi:10.3946/kjme.2017.62
52. Shi J, Zhao S, Wu Y. Spiritual leadership and career calling: a research based on self-determination theory. *Business Manage J*. 2018;40(12):138–152.
53. Wonner E, Tschernig T, Pabst R. The Hippocratic Oath and the physician's pledge and their potential role early in medical education. *Ann Anat*. 2021;238:151780. doi:10.1016/j.aanat.2021.151780
54. Chen -B-B, Shi Z, Wang Y. Do peers matter? Resistance to peer influence as a mediator between self-esteem and procrastination among undergraduates. *Front Psychol*. 2016;7:1529. doi:10.3389/fpsyg.2016.01529
55. Lee Y, Ha JH, Jue J. Structural equation modeling and the effect of perceived academic inferiority, socially prescribed perfectionism, and parents' forced social comparison on adolescents' depression and aggression. *Child Youth Serv Rev*. 2020;108:104649. doi:10.1016/j.childyouth.2019.104649
56. Xinyu C. *"Other People's Kids" Got Me Down: The Effect of Parental Social Comparison on Adolescent Depression*. Xinyang Normal University; 2022.
57. Doctors in society. Medical professionalism in a changing world. *Clin Med*. 2005;5(6 Suppl 1):S5–S40.
58. Tatiana B, Kobicheva A, Tokareva E, Mokhorov D. The relationship between students' psychological security level, academic engagement and performance variables in the digital educational environment. *Educ Inf Technol*. 2022;1–15. doi:10.1007/s10639-022-11024-5
59. Silkens ME, Lombarts KM, Scherpbier AJ, Heineman MJ, Arah OA. Towards healthy learning climates in postgraduate medical education: exploring the role of hospital-wide education committees. *Bmc Med Educ*. 2017;17(1):1–7. doi:10.1186/s12909-017-1075-0
60. Tullis JG, Goldstone RL. Why does peer instruction benefit student learning? *Cogn Res*. 2020;5(1):1–12. doi:10.1186/s41235-020-00218-5
61. Hunter I, Dik BJ, Banning JH. College students' perceptions of calling in work and life: a qualitative analysis. *J Vocat Behav*. 2010;76(2):178–186.