

# The relationship between procrastination, perceived stress, saliva alpha-amylase level and parenting styles in Chinese first year medical students

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**Background:** Procrastination is prevalent among students today, and this negatively impacts upon their academic achievement. The current study aimed to explore the relationship between procrastination, perceived stress, saliva alpha-amylase (sAA) levels, and the parenting styles of Chinese first year medical students (MBBS).

**Methods:** We recruited 140 MBBS students aged 18–22 years. Assessments included the Procrastination Assessment Scale-Students (PASS), the Chinese version of the Perceived Stress Scale (PSS), saliva alpha-amylase level (sAA), and the Chinese version of the Egna Minnen av Barndoms Uppfostran (EMBU) which assesses parenting style. PSS and sAA levels were assessed at week 1 (baseline), then again at week 2 and week 4.

**Results:** Male students reported higher levels of procrastination and perceived stress reactions than their female counterparts. Male students reported experiencing higher punishing/severe and rejecting (ie negative) parenting styles, while female students reported experiencing higher warm and affectionate (ie positive) parenting styles. Positive parenting styles were negatively associated with to procrastination and stress reactions, while negative parenting styles were positively associated with procrastination and delayed stress reactions among MBBS students.

**Conclusion:** Procrastination induced stress in MBBS students, providing further evidence that procrastination enhances stress in young adulthood. Negative parenting styles, such as being punishing and rejecting, had a positive correlation with procrastination.

**Keywords:** academic procrastination, stress, saliva alpha-amylase, parenting style, medical students

## Introduction

Procrastination refers to the act of putting off, prolonging, postponing, suspending or delaying the completion of a particular task. This is known to impair the academic development and success of students.<sup>1</sup> Academic procrastination is a major problem among students.<sup>2</sup> Research has shown that over 70% of university students experience procrastination in related to their academic tasks and approximately 58% of undergraduate students report procrastinating for three hours or more in a day. Higher frequencies of sadness (46.59%) and procrastination (47.12%) have been observed in medical students.<sup>3,4</sup> Higher levels of academic procrastination and related delaying-type behavior have a negative impact on the learning of students and may result in academic failure.<sup>5</sup>

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Indeed one of the main factors linked with academic failure is academic procrastination.<sup>6,7</sup> Procrastination may also be defined as a voluntary behavior in which the negative consequences are expected to outweigh the positive consequences of delays.<sup>6,8</sup> Students who frequently engage in procrastination have lower course work scores and lower results in final exams.<sup>6,9</sup> The wide range of negative effects and consequences of academic delay include personal, psychological and medical issues.<sup>10</sup> Popoola pointed out that students who procrastinate understand their tasks, and the importance of doing their tasks, but still fail to do them because of their tendency to delay and make excuses.<sup>11</sup> In this regard, procrastination can be categorized as an interactive dysfunction with the main behavioral symptom being avoidance. Thus, it is important to understand the mental processes involved.

It is essential to identify the factors that facilitate procrastination related to academic tasks in student. A previous study has shown that academic procrastination can be linked to family issues, environmental issues, and personal issues.<sup>1</sup> Among these factors, parenting style was considered a significant basic and key factor in facilitating academic procrastination.<sup>12,13</sup> Another previous study has shown that the development of procrastination in children is affected by their interactions with and exposure to parents who serve as instructors, and thus reinforce certain behaviors.<sup>14</sup> Procrastination may be a response to the expectations that parents will respond to their own self-characteristics in harsh and controlled way.<sup>15</sup>

A related body of research has shown that higher parental expectation and criticism has been associated with socially-prescribed perfectionism, which is directly and positively linked to procrastination.<sup>16</sup> Parenting behaviors can play a positive or negative role during the socializing process.<sup>17,18</sup> Positive parenting offers a safer and more stable atmosphere that ultimately develops the child's educational and socio-economic progress, whereas negative parenting behaviors weaken the child's personality, confidence, and character, thus leading to lower academic progress. Critical parents develop the tendency of avoiding tasks and are socially reserved in public.<sup>19</sup> Thus; procrastination in students may be linked to the parenting style of their parents. However, the relationship between procrastination and parenting styles specially in the Chinese culture has not been fully clarified.

In addition to the potential role of parenting styles, the long duration of study and high tuition fees, associated with medical education mean that it is considered a period of

high stress with significant challenges for the well-being and happiness of students worldwide.<sup>20</sup> The existing literature suggests that there are positive links between academic procrastination and stress. Academic procrastination has an adverse impact on the academic progress of students and thus induces stress and anxiety,<sup>21</sup> and stress can have a negative effect on emotional well-being.<sup>22</sup> Procrastination and delay behaviors have an adverse impact on student academic progress and thus increase the stress.<sup>23</sup> One study has found that academic procrastination by doctoral students results anxiety, stress, and guilt.<sup>13</sup>

Furthermore, stress causes physiological changes such as sympathy-adrenal-medullar axis hypo-activity and results in higher levels of saliva alpha-amylase (sAA).<sup>24</sup> Several reports have suggested that psychosocial stress increases sAA release and marked increases in sAA have been detected following psychosocial stress, which is indicative of the stress-dependent activation of sAA.<sup>25</sup> To the best of our knowledge, no published studies to date have evaluated sAA levels under psychosocial stress or examined the changes in sAA activity that occurs in medical students.

The purpose of the present study was to explore the correlations between procrastination, stress reactions and the parenting styles experienced by Chinese medical students, and in particular, the kinds of parenting style that are likely to lead to academic procrastination. We hypothesized that (1) procrastination would induce higher levels of stress and sAA.<sup>26</sup> (2) Negative parenting styles would be correlated with higher procrastination while positive parenting styles would be correlated with low procrastination.

## Methods

### Participants and procedure

Participants were 140 medical (MBBS) students (62 males and 78 females, age range 18–22 years) from Shandong University who were in their first year at medical school. The medical school, established in 1864, is one of the top-ranking universities in China. After graduating from senior high school, undergraduate students must attend medical school for five years in order to receive their Bachelor degree in medicine, and this period is regarded as the most important stage in medical education.

All participants completed a questionnaire containing demographic questions, a parenting style questionnaire, a procrastination assessment questionnaire; a perceive stress questionnaire and saliva sampling at the beginning of the

semester. In order to examine the dynamic levels of stress reactions during procrastination, the perceived stress questionnaire and saliva sampling were followed up at week 2 and week 4 after the first test. All participants provided written informed consent. Approval for the study was obtained from the Institutional Ethics Committee of the Medical School of Shandong University.

## Measures

### Procrastination assessment scale-students (PASS)

PASS is used to measure academic procrastination in students.<sup>19</sup> It consists of two parts, and the first part presents six academic tasks. For the six tasks, the participants complete three rating scales indicating the frequency with which they procrastinate on that task (1= Never procrastinate, 5= Always procrastinate) whether their procrastination on that task is a problem (1= Not at all a problem, 5= Always a problem) and whether they wish to decrease their procrastination on that task (1= Do not want to decrease 5= Definitely want to decrease). The sum of the PASS items delivers an overall measure of academic procrastination with total scores ranging from 12–60. The second part of the PASS asks respondents to think about the last time they felt the need to procrastinate during writing a term paper and to identify the reason for that procrastination.

### Chinese version of the Eгна Minnen av Barndoms Uppfostran (EMBU)

The EMBU is an 81-item self-report inventory.<sup>27</sup> The Chinese version of the EMBU (EMBU-CV) was revised by Yue and consists of six kinds of fathering parenting style (warm & affectionate, punishing and severe, favoring, rejecting, overly-intervening and overly-protecting) and five kinds of mothering parenting style (warm and affectionate, punishing and severe, favoring, rejecting and overly-intervening and protecting).<sup>28</sup> The Cronbach's alphas of the EMBU-CV ranged from 0.46–0.85, and the test-retest reliability coefficients ranged from 0.58–0.82 in the current study. For fathers and mothers, the factors of warm and affectionate, and favoring, are both as defined as positive parenting styles while punishing and severe, rejecting, and overly-intervening and overly-protecting are defined as negative parenting styles.

### Chinese version of the perceived stress scale (PSS)

The PSS-10 is a measure of perceived stress and has shown good reliability and validity with a Cronbach  $\alpha$  of 0.86.<sup>29</sup> It comprise the 10 original PSS items, six of which

are negative (items 1, 2, 3, 6, 9, and 10), and four of which are positive (items 4, 5, 7, and 8). The participants were asked to answer each question using a 5-point Likert scale score ranging from 0 (never) to 4 (very often) and report the frequency of events associated with each PSS item in the last month. The total score ranges from 0–40 with higher scores reflecting higher levels of stress.

### Salivary $\alpha$ -amylase measurement

Salivary samples were collected using a salivate dental swab at the same time of day (7 pm) for all participants to avoid confounding influence of circadian rhythms. Participants placed salivate dental swabs into their mouths and gently chewed for 1 min to collect saliva. The swab was returned to the researcher and stored in a  $-20$  °C refrigerator.<sup>26</sup> sAA was assayed using a commercially available  $\alpha$ -amylase assay kit (Nanjing Jiancheng Bioengineering Institute).

### Data analysis

The data were collected and then quantitatively analyzed using (SPSS) version 21. Repeated measures analysis of variance (ANOVA) was conducted to assess week 1 (baseline) to follow-up changes in PSS and sAA levels. One-way ANOVA with Bonferroni testing<sup>30</sup> was used to assess differences in parental styles, PSS, and sAA levels in students group as follows; high, medium or low procrastination. Independent *t*-tests were used to compare the differences among variables according to gender. Pearson's correlations were conducted to examine potential relationships among the variables. Differences were considered statistically significant if the *p*-value was less than 0.05.

## Results

### Differences in procrastination, perceived stress, saliva $\alpha$ -amylase levels and parenting style between male and female students

The male student had higher levels of procrastination, PSS scores at week 4, and sAA at week 1, and in terms of parenting styles, higher father ratings for the factors of punishing and severe, and rejecting, and higher mother ratings for the factors of rejecting, and punishing and severe, than female students. In contrast, female students had higher PSS at week 1 and higher father ratings for the parenting style factor of warm and affectionate than male students.

## Changes in perceived stress and saliva $\alpha$ -amylase levels at different time point - all participants

As shown in Table 1, mean perceived stress levels declined slightly from week 1 to week 2 and declined further at week 4. The overall mean change in perceived stress from week 1 to week 4 was (0.61) and the mean scores at the two time points differed significantly. Furthermore, sAA levels at week 1 declined at both week 2 and week 4 but there were no significant differences between week 1 and week 4. Thus, perceived stress levels decreased but sAA levels remained unchanged over time.

## Perceived stress, saliva $\alpha$ -amylase levels and father and mother parenting styles between high, medium and low procrastination groups

To explore the differences in perceived stress, sAA and parenting style, according to procrastination level, participants were divided into three groups on the basis of their PASS scores. Individuals scoring 30 or below were grouped into “low procrastination”, those 31 and 36 were grouped into “medium procrastination” and those with scores 37 or higher were grouped into “high procrastination”. As shown in Table 2 the high and medium procrastination groups scored higher on PSS at week 1, week 2, and week 4, than the low procrastination group. The higher procrastination group scored higher on the PSS at week 1, week 2, and week 4, than the medium procrastination group. The high procrastination group had significantly higher levels of sAA at week 1, 2 and 4 than the medium procrastination group. The medium procrastination group had significantly higher levels of sAA at week 1, 2 and 4 than the low procrastination group. These results indicate that the greater procrastination induced higher levels of stress.

The higher procrastination group scored lower for the father parenting style factor of warm and affectionate than the medium procrastination group. However, the high

procrastination group reported higher scores for the father parenting style factor of punishing and severe than the medium procrastination group. The father parenting style of overly-intervening and rejecting were also both higher in the high procrastination group than the low procrastination group. Meanwhile, the medium procrastination group reported lower scores for the father parenting style factor of favoring than the low procrastination group. The high procrastination group reported higher scores for the mother parenting style factors of rejecting and punishing and severe than the medium and low procrastination groups. However, the high procrastination group had lower scores for the mother parenting style factor of warm and affectionate and overly-intervening than the low procrastination group. Furthermore, the high procrastination group had higher scores for mother parenting style factor of favoring than the medium procrastination group. The results indicated that students with high procrastination had experienced more negative parenting styles while students with lower procrastination had experienced more positive parenting styles.

## Correlations between perceived stress, saliva $\alpha$ -amylase levels, and procrastination

As shown in Table 3, procrastination significantly and positively correlated with the PSS scores at week 1, 2, and 4. Procrastination also positively correlated with sAA at week 1, 2 and 4. Meanwhile, the scores for PSS at week 1, 2, and 4 all positively correlated with sAA levels at the same time point. Similarly, sAA levels at week 1 positively correlated with sAA at week 2.

## Correlations between procrastination, perceived stress, saliva $\alpha$ -amylase levels and father parenting styles

As shown in Table 4, the father parenting style of warm and affectionate significantly and negatively correlated with procrastination. The father parenting styles of Punishing and severe, overly-intervening and rejecting significantly and positively correlated with procrastination.

**Table 1** Comparison in perceived stress and saliva  $\alpha$ -amylase levels at different time points ( $M \pm SD$ )

Variables	Week 1	Week 2	Week 4	Change	$\eta^2 p$	F	P
Perceived Stress	9.17 $\pm$ (1.35)	9.07 $\pm$ (1.09)	8.55 $\pm$ (1.42)	0.61	0.185	15.664	<0.001
Saliva $\alpha$ -Amylase (U/lmmol)	100.43 $\pm$ (63.41)	99.94 $\pm$ (60.98)	93.77 $\pm$ (57.70)	70.66	0.138	0.921	0.400

**Table 2** Comparisons of perceived stress, saliva  $\alpha$ -amylase levels and father and mother parenting styles by procrastination groups ( $M \pm SD$ )

Variables		High Procrastination (n=52)	Medium Procrastination (n=41)	Low Procrastination (n=47)	F	P
<b>Perceived Stress</b>	PSS (week 1)	9.577 $\pm$ 1.93 $\dagger\dagger$	9.537 $\pm$ 0.51**	8.40 $\pm$ 0.54	13.328	<0.001
	PSS (week 2)	9.731 $\pm$ 1.19 $\dagger\dagger$ **	9.293 $\pm$ 0.46**	8.17 $\pm$ 0.73	40.817	<0.001
	PSS (week 4)	9.173 $\pm$ 1.57 $\dagger\dagger$ **	8.659 $\pm$ 0.48	7.79 $\pm$ 1.46	14.142	<0.001
<b>Saliva <math>\alpha</math>-Amylase</b>	Saliva (week 1)	155.754 $\pm$ 42.60 $\dagger\dagger$ **	72.628 $\pm$ 15.61**	64.52 $\pm$ 68.25	54.407	<0.001
	Saliva (week 2)	152.732 $\pm$ 65.883 $\dagger\dagger$ **	92.247 $\pm$ 16.02**	47.85 $\pm$ 14.87	77.860	<0.001
	Saliva (week 4)	127.986 $\pm$ 76.50 $\dagger\dagger$ **	98.131 $\pm$ 17.10**	52.054 $\pm$ 12.19	30.942	<0.001
<b>Parenting style father</b>	Warm and affectionate	49.000 $\pm$ 5.77 $\dagger$	60.000 $\pm$ 2.64	62.89 $\pm$ 8.91	64.840	<0.001
	Punishing and severe	17.462 $\pm$ 3.29 $\dagger\dagger$	13.366 $\pm$ 0.49	14.15 $\pm$ 6.26	13.195	<0.001
	Overly-Intervening	22.865 $\pm$ 2.63 $\dagger\dagger$ **	18.976 $\pm$ 0.69**	17.32 $\pm$ 4.24	45.991	<0.001
	Favoring	10.538 $\pm$ 4.51	9.000 $\pm$ 3.29**	11.21 $\pm$ 3.82	3.564	0.031
	Rejecting	9.788 $\pm$ 2.44 $\dagger\dagger$ **	7.268 $\pm$ 0.45	6.70 $\pm$ 1.82	39.603	<0.001
Overly-protecting	10.538 $\pm$ 2.90	10.171 $\pm$ 2.21	10.23 $\pm$ 3.31	0.226	0.798	
<b>Parenting style mother</b>	Warm and affectionate	55.692 $\pm$ 7.91 $\dagger\dagger$ **	62.610 $\pm$ 2.32**	70.17 $\pm$ 2.92	93.391	<0.001
	Overly-intervening	30.192 $\pm$ 6.75 $\dagger\dagger$ **	34.049 $\pm$ 1.34**	38.77 $\pm$ 2.61	45.929	<0.001
	Rejecting	13.596 $\pm$ 3.16 $\dagger\dagger$ **	10.122 $\pm$ 0.90**	8.17 $\pm$ 0.38	93.510	<0.001
	Punishing and severe	12.000 $\pm$ 1.87 $\dagger\dagger$	9.561 $\pm$ 0.50	10.43 $\pm$ 4.69	8.232	<0.001
	Favoring	10.885 $\pm$ 4.59	9.220 $\pm$ 3.42**	11.17 $\pm$ 3.86	2.954	0.055

Notes:  $\dagger p < 0.05$ ,  $\dagger\dagger p < 0.01$  compared with the medium group.  $** p < 0.01$  compared with the low group.

Abbreviation: PSS, Perceived Stress Scale.

**Table 3** Correlations between procrastination, perceived stress and saliva  $\alpha$ -amylase levels

Variables	1	2	3	4	5	6	7
<b>Procrastination</b>	1						
<b>PSS week 1</b>	0.459**	1					
<b>PSS week 2</b>	0.521**	0.116	1				
<b>PSS week 4</b>	0.190*	-0.046	0.644**	1			
<b>Saliva week 1</b>	0.535**	0.264**	0.045	0.163	1		
<b>Saliva week 2</b>	0.739**	0.239**	0.373**	0.131	0.480**	1	
<b>Saliva week 4</b>	0.355**	-0.111	0.628**	0.366**	0.093	0.597**	1

Note: \*\* $p < 0.01$ , \* $p < 0.05$ .

Abbreviation: PSS, Perceived Stress Scale.

The father parenting style of warm and affectionate negatively and significantly correlated with procrastination, PSS at week 1 and 4 and sAA at week 1, and 2. Father parenting style of punishing and severe significantly and negatively correlated with PSS at week 2 but it significantly and positively correlated with procrastination, PSS at week 1, and week 4, and sAA at week 1, and week 2. The father parenting style overly-intervening positively and significantly correlated with procrastination, PSS at week 1 and 4, sAA at week 1, and 2. The father parenting style of rejecting had a significant and positive correlation with procrastination, PSS at week 1, and sAA at week 1, and 2.

### Correlations between procrastination, perceived stress, saliva $\alpha$ -amylase levels and mother parenting styles

As shown in Table 5, the mother parenting styles of warm and affectionate and overly-intervening both negatively and significantly correlated with procrastination but rejecting was positively and significantly correlated with procrastination. The mother parenting styles of warm and affectionate, and overly-intervening both negatively and significantly correlated with PSS at week 1, 2, and 4, and sAA at week 1, 2, and 4. The mother parenting styles of rejecting positively and significantly correlated with PSS at week 2 and 4 and with sAA at week 1, 2, and 4. The mother parenting style of punishing negatively and significantly was correlated with PSS at week 2 but positively and significantly with PSS at week 4 and sAA at week 1, and 2.

## Discussion

In the present study, we found that male students reported significantly higher levels of procrastination and saliva  $\alpha$ -amylase levels at week 1 then higher perceived stress

at week 4 than female students. Male students also reported higher levels of both mother and father parenting styles that were punishing and severe, and that were rejecting, than the female students. In contrast, female students had significantly higher levels of perceived stress at week 1, and the father parenting style of warmth and affection than male students. This observation of gender differences in procrastination and parenting styles can be explained through cultural differences. A previous study has shown that Asian parents, including Chinese parents, express their affection through punishment and over-protectiveness. Specifically, in China, fathers are more overly-protective and warm towards their daughters than their sons. Therefore, for Chinese medical students, parental control may be considered an expression of attention or concern, and thus accepted by Asian children.<sup>31</sup> Male students often report feeling rejected by their parents, who may relate to their high levels of procrastination and stress responsiveness.

The present study compared perceived stress, sAA levels, and parenting styles among the high, medium, and low procrastination students. Consistent with previous studies, the results showed that students with higher levels of procrastination had higher levels of subjective and objective stress, indicating that delaying tasks can create a significant amount of stress.<sup>32-35</sup> Meanwhile, our study also demonstrated that the perceived stress of MBBS students differed significantly from week 1 to week 4 while sAA levels, did not differ over this period. Thus results indicated that the MBBS students reported subjective stress at the beginning of the semester and this decreased over time, but the objective measure of stress, sAA did not decrease. Furthermore, we found that students with different levels of procrastination were associated with different types of parenting style. Individuals with lower procrastination had experienced a higher level of warm and

**Table 4** Correlations between procrastination, perceived stress, saliva  $\alpha$ -amylase levels and parenting styles of father

Father parenting style	Procrastination	PSS Week 1	PSS Week 2	PSS Week 4	Saliva Week 1	Saliva Week 2	Saliva Week 4
Warm and affectionate	-0.600**	-0.318**	-0.138	-0.232**	-0.950**	-0.523**	-0.118
Punishing and severe	0.263**	0.182*	-0.201*	0.227**	0.699**	0.250**	-0.126
Overly-intervening	0.584**	0.324**	0.137	0.263**	0.679**	0.499**	0.105
Favoring	-0.050	-0.019	-0.136	-0.046	0.036	-0.093	-0.153
Rejecting	0.606**	0.402**	-0.012	0.165	0.787**	0.555**	0.008
Overly-protecting	0.010	0.030	0.022	0.141	0.087	0.026	0.006

Notes: \*\* $p < 0.01$ , \* $p < 0.05$ .  
Abbreviation: PSS, Perceived Stress Scale.

**Table 5** Correlations between procrastination, perceived stress, and saliva  $\alpha$ -amylase levels and parenting styles of mother

Mother parenting style	Procrastination	PSS Week 1	PSS Week 2	PSS Week 4	Saliva Week 1	Saliva Week 2	Saliva Week 4
Warm and affectionate	-0.700**	-0.213*	-0.666**	-0.427**	-0.355**	-0.408**	-0.484**
Overly-intervening	-0.583**	-0.128	-0.606**	-0.340**	-0.207*	-0.335**	-0.463**
Rejecting	0.681**	0.147	0.570**	0.417**	0.500**	0.513**	0.424**
Punishing and severe	0.148	0.102	-0.236**	0.223**	0.621**	0.198*	-0.105
Favoring	-0.029	-0.058	-0.129	-0.028	0.066	-0.045	-0.073

Note: \*\* $p < 0.01$ , \* $p < 0.05$ .  
Abbreviation: PSS, Perceived Stress Scale.

affectionate parenting from their fathers and mothers, and less punishing and rejecting parenting styles. This indicates that parenting behaviors have differential impacts on children, which is consistent with previous studies.<sup>1,18,36</sup> Last, the data suggest that students who experienced positive parenting styles had lower levels of procrastination and lower stress responses. Interestingly, we found that the mother parenting style of overly-intervening negatively correlated with procrastination, but positively correlated with stress reaction, consistent with the previous research.<sup>37</sup>

Students with higher procrastination had higher levels of perceived stress and sAA levels, and had experienced higher levels of specific parenting styles in comparison with students with low and medium procrastination. Procrastination was positively correlated with both subjectively perceived stress and objective stress reactions. Furthermore, positive parenting styles were negatively correlated with procrastination and stress reactions, while negative parenting styles had a positive relationship with procrastination and delayed stress reaction among MBBS students. Our findings in a Chinese sample resemble those found in previous studies in showing that boys report a higher level of father and mother parenting styles of punishing and severe, and rejecting than girls.<sup>26,38,39</sup> This supports conclusions that there are major differences between boys and girls in procrastination at school, with higher levels of procrastination for boys compared to girls.<sup>1,40</sup>

Our data indicate that procrastination is influenced by parenting styles. Parenting styles that are rejecting, punishing, and severe as well as the expression of high expectations from parents induce socially-prescribed perfectionism, which is related to procrastination. Procrastination is often associated with self-worth. When a parent exercises authoritarianism on their children, they are likely to experience stress and struggle with their self-worth. Punishing and severe, rejecting and over-intervening are all characteristics of authoritative parenting. Warm and affectionate parenting styles instill in children a sense of security. In other words, procrastination is associated with parenting styles due to the psychological effects that parenting has on children. We found that male students have the highest levels of procrastination, mainly due to the dominant culture in China. Parents are more protective, warm, and affectionate to their daughters and are harder on their sons. In short, male students are punished and rejected more by their parents, which explains they procrastinate more than their female counterparts.

## Conclusion

We considered the relationships between procrastination, stress, saliva  $\alpha$ -amylase levels, and parenting styles in Chinese MBBS students during their first four weeks of study. Our results suggest that procrastination induced both perceived stress reaction and higher levels of sAA influenced by the time course of study along with the time moving and academic task increasing. The results build upon findings that procrastination increases stress in young adults by demonstrating that negative parenting styles such as punishment and rejection have a positive correlation with procrastination, inducing stress experienced by MBBS students. Given that negative parenting styles may play an important role in procrastination, self-concept and stress responsiveness, our findings suggest that improving mother and father parenting styles during childhood might be a potential prevention strategy to help overcome procrastination of medical students in Chinese student samples and further afield.

## Limitations

The study has some limitations that should be noted. First, the sample included only Chinese MBBS students and the sample size was relatively small. Although we sought to explore the correlations among procrastination, PSS, and sAA in students, our small sample may not accurately represent the whole student population. Second, we were unable to determine the intercorrelations within the repeated measures (ie the PSS and sAA); and so the reliability of the sAA measurement should be further examined in a larger sample size. Further studies are needed to confirm the results of the current study, and explore the outcomes in other cultures, thus requiring a large sample size. Such research may lead to an enhanced understanding of the role of parenting in preparing children for positive learning behaviors and the achievements of academic goals.

## Disclosure

The authors report no conflicts of interest in this work.

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