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ARTICLE

Associations between Mental Health Outcomes and Adverse Childhood Experiences and Character Strengths among University Students in Southern China

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ABSTRACT

Adverse childhood experiences (ACEs) can negatively affect mental health, whereas character strengths seem to be positively correlated with mental health. Detailed information on the history of ACEs among university students in China and the extent which mental health is associated with ACEs and character strengths can contribute to the needed empirical evidence for relevant stakeholders. Objectives of this study are 1) to estimate the prevalence of ACEs among undergraduate students in Southern China; and 2) to assess the extent which mental health outcomes (positive growth, well-being, and depression) are associated with ACEs and character strengths among undergraduate students in Southern China. We conducted a self-administered survey among first and second-year students at a university in Southern China and analyzed data using descriptive statistics and linear regression analyses. Among the 779 students who completed the questionnaire, 283 were males, 439 were females, and 57 did not indicate their gender. The prevalence of ACEs among the participants was 32.1%. History of ACEs was associated with lower positive growth score *(Adjusted Beta = −0.20; 95% CI = −0.37, −0.02; p = 0.030)* and lower well-being score *(Adjusted Beta = −1.13; 95% CI = −2.04, −0.23; p = 0.014)*. Vitality domain of character strength was associated with all three mental health outcomes after adjusting for covariables *(all p-values < 0.001)*. Our study findings provide empirical evidence for stakeholders in university mental health. However, caveats regarding lack of temporality, selection bias, social desirability bias, and lack of generalizability should be considered in the interpretation of the study findings.

KEYWORDS

Adverse childhood experience; character strength; positive growth; well-being; depressive symptoms

Introduction

Adverse childhood experiences (ACEs) refer to negative events that an individual experiences in childhood that cause harm or threat to their mental and physical health [1,2]. There are three categories of ACEs: abuses (physical, emotional, sexual), neglects (physical, emotional), and household dysfunctions (family history of mental illness, incarceration, substance abuse, divorce, or domestic violence) [3,4]. Adults with a history of ACEs tend to have more short-term and long-term health problems and higher premature deaths than those without such a history [5]

through differences in physiological development and health-damaging behaviors [6]. History of ACEs is also associated with depression [7] among children [8], university students [9,10], as well as homosexual men [11].

However, individuals who experienced ACEs can also undergo positive changes [12]. These positive changes are referred to as positive growth [13,14]. Similarly, those who have experienced trauma can undergo Posttraumatic growth, and those who have faced adversity can undergo adversarial growth [15,16].

Positive growth is associated with environmental conditions (type and severity of adverse event, elapsed time since event, previous life stressors), social factors (social support, religious involvement), psychological processes (rumination, coping), and positive mental health resources (hope, optimism, and self-esteem) [17,18].

The OTHERS(S) model for personal development suggests that promoting 8 core resources (i.e., the namesake of the acronym) can help promote Posttraumatic growth: Optimism, True meaning, Humor, Emotional intelligence, Resilience, Spirituality, and Self-confidence [19]. Relatedly, character strengths refer to the positive, trait-like capacities for thinking, feeling, and behaving in ways that benefit oneself and others [20]. Nearly all of the 24 types of character strengths include core resources mentioned in the OTHERS(S) model, and thus can be used as the model's substitute measures. Previous studies have found positive associations between character strengths and Posttraumatic growth and valued outcomes (e.g., thriving, well-being, life satisfaction) [21]. Character strengths also helped to moderate the association between trauma and mental health issues such as depression [22–26].

University years (generally, when a person is 18 to 22 years of age) are a developmentally crucial period and a turbulent time whence the first onset of a broad range of mental disorders generally appears [27], especially among those with ACEs [28]. Approximately one-fourth of students in the People's Republic of China experience anxiety [29]. However, mental health care for Chinese university students is complicated by misconceptions, stigma, low mental health literacy, and difficulty in accessing care [30]. Although a previous study found that Chinese cultural values of collectivism, deference to authority, and familyism influenced character strengths among health facility patients [31], Chinese cultural values, particularly those centered on Confucianism (e.g., deference to authority, modesty, harmony, and collectivism) also limit the ability to generalize findings from studies conducted in Western countries [32]. For example, youths who experienced abuse may regard their experience not as a traumatic experience but as a regular part of their family's dynamics [33]. Growth from such experiences could be considered not as Posttraumatic or post-adversity growth but rather as part of a normal developmental process.

However, despite the vast literature on ACEs in high-income countries [6,34], few such studies have been conducted in China. Moreover, existing research in China tends to explore ACEs from the perspective of trauma [28–30]. Thus, there exists a knowledge gap on the association between ACEs, character strengths, positive growth, well-being, and depressive symptoms among university students in China. Such findings can provide empirical evidence for stakeholders in undergraduate mental health.

The objectives of this study are 1) to estimate the prevalence of ACEs among undergraduate students in Southern China; and 2) to assess the extent which mental health outcomes (positive growth, well-being, and depression) are associated with ACEs and character strengths among undergraduate students in Southern China.

Materials and Methods

Study design and setting

We conducted a cross-sectional study using a self-administered survey at a university in Southern China. The university focused on health sciences and had approximately 20,000 students, mainly from the same region. The university also provided on-campus accommodation to students.

Study participants and sample size calculation

We included first and second-year undergraduate students over the age of 18 from all faculties. At the study university, undergraduates in the first and second years are generally between 18 to 20 years of age. We did not include upper-level students as their availability might vary according to the need to do an internship or practicum. We selected our study participants using systematic sampling with probability proportional to size.

We performed sample size calculation based on the first objective (to estimate the prevalence of ACEs among the students). We assumed that the population was infinite, and that 50% of the students had experienced one or more ACEs (p = 0.50) [35,36], with a margin of error of 5% (d = 0.05), at a 95% level of confidence ($Z_{1-\alpha/2}$ = 1.96). We used following formula for the calculation of sample size for proportion estimation:

$$n = \frac{z^2_{1-\frac{a}{2}}\, p(1-p)}{d^2}$$

We obtained a sample size of 384 students. However, we wished to obtain an adequate number of those who experienced four or more types of ACEs; thus, we decided to enlarge the sample size by an arbitrary 60% and obtained a sample size of 615 persons. We sent invitation to participate in our study to the students online. Thus, we assumed that an arbitrary 55% of those who received an electronic invitation would not respond to the invite and complete the survey, and further enlarged our sample size to 1400 students.

To assess the extent that ACEs and character strengths were associated with mental health outcomes (positive growth, well-being, and depressive symptoms), we calculated the sample size based on an assumption that 60% of the students with ACEs experienced a mental health problem (p1 = 0.60), whereas 40% of students without ACEs experienced a mental health problem (p2 = 0.40) [37]. We

used the following formula for sample size calculation to assess the association between two proportions:

$$n = \left[\frac{z_{1-\alpha/2}\sqrt{\bar{p}\bar{q}\left(1+\frac{1}{r}\right)} + z_{1-\beta}\sqrt{p_1 q_1 + \frac{p_2 q_2}{r}}}{\Delta} \right]^2$$

We obtained a sample size of 107 participants with ACEs and 107 participants without ACEs, or 214 participants in total. Assuming a non-response rate of 20%, we adjusted our sample size to 134 students in each group, or 268 students in total, for the mentioned assessment.

Study instruments

Our study instrument was a self-administered questionnaire that consisted of the following sections: 1) essential characteristics; 2) adverse childhood experiences (ACES); 3) character strengths; and 4) measurements of mental health outcomes, including positive growth, well-being, and depressive symptoms. Essential characteristics included gender, grade, family income per month, self-reported academic achievement, and whether the respondent had undergone psychological counseling.

Measurement of adverse childhood experiences (ACEs)

We used the Chinese version of the Adverse Childhood Experiences Questionnaire to measure the ACEs of our participants [1,38–40]. The questionnaire includes ten questions. The Chinese version of ACEs was developed using translation, back-translation, and cultural adaptation [39]. We assigned to each participant a score of 1 point for each reported adverse experience and 0 point for the otherwise. We used the Chinese version of the instrument [39] in the present study and added a follow-up question on each item concerning onset age for those who had the adverse experience. The reliability coefficient was 0.62 in the present study.

Measurement of character strengths

We used the Values in Action Inventory of Strengths (VIA-IS) instrument [41] to assess the character strengths of our study participants. The VIA-IS included 24 character strengths and the mean reliability coefficient of 24 character strengths was 0.85 [41]. We used the 72-item Chinese version of the instrument in this study. The Chinese version was developed under the World Health Organization's basic guidelines for the translation and revision of measurement tools, balancing cultural commonality and cultural specificity [42]. We performed exploratory factor analysis on the responses to the VIA-IS questions and identified six factors/domains of character strengths. They were: Factor 1, humanity (six character strengths: appreciation of beauty and excellence, gratitude, kindness, spirituality, citizenship, love); Factor 2: wisdom (six character strengths: prudence, social intelligence, perspective, open-mindedness, self-regulation, leadership); Factor 3: temperance (three character strengths: fairness, forgiveness, humility/modesty); Factor 4: vitality (two character strengths: zest, hope); Factor 5: courage (six character strengths: bravery, creativity, love of learning, integrity, persistence, curiosity); and Factor 6: humor (one character strength: humor). We have included the specific results of factor analyses as supplementary materials for reference. The mean reliability coefficient of all 24 strengths was 0.77 with the range of 0.61 to 0.89 in the present study.

Measurement of positive growth

We used the Chinese version of the Posttraumatic Growth Inventory (PTGI) [16] to measure positive growth among the study participants. The Chinese version of PTGI was developed using translation, back-translation, cultural adaptation, semantic analysis, and then reliability and validity analyses [43]. The PTGI consisted of 21 questions and assessed positive growth in 5 domains: New Possibilities, Relating to Others, Personal Strength, Spiritual Change, and Appreciation of Life. For this study, we used the Chinese version of the PTGI with Cronbach's α coefficient being 0.83 and the re-test coefficient after two weeks was 0.71 [44]. The reliability coefficient was 0.95 in the present study.

Measurement of well-being

We used the Chinese version of the WHO-5 questionnaire issued in 2007 by the Psychiatric Research Unit, WHO Collaborating Center for Mental Health, Frederiksborg General Hospital [45] to measure the well-being of our study participants. The WHO-5 [46] consists of 5 self-reported questions regarding the subjective well-being of the respondents. The original instrument's sensitivity was 0.86, and the specificity was 0.81 [46]. Based on the responses, we summed the responses and calculated the raw well-being score, which ranged from 0 points (lowest level of well-being) to 25 points (highest level of well-being). The reliability coefficient was 0.91 in the present study.

Measurement of depressive symptoms

We measured depressive symptoms using the Centre for Epidemiologic Studies Depression Scale-Short Form (C-CES-D-SF). The instrument consisted of 9 self-reported depressive symptoms measurement questions with 4-point Likert scales [47]. We used a well-developed and widely used Chinese version of the CES-D-SF [48,49] with an internal consistency reliability of 0.86. All-item total correlations were higher than 0.5. The cut-off scores of the short version were 10 for depressive tendencies and 17 for high-risk depression. The reliability coefficient was 0.72 in the present study.

Data collection processes

Investigators obtained the list of all first and second-year undergraduate students from the university. The investigators then used systematic sampling to sample 1400 students from the list. Investigators then sent electronic invitations (e-invitations) through the university's e-learning system to the 1400 students and invited them to join the study. Students who responded were invited to the campus meeting hall. Research assistants then provided students

with more information about the study and invited them to join the survey and answer the questionnaire. Research assistants told the students they were free to refuse participation with no consequence. Students who decided to participate went to the classroom next to the meeting hall to fill out the study questionnaire.

Study participants were asked to sign an informed consent form before completing the survey questionnaires. Due to the sensitive nature of the study and the respect for anonymity, we considered surveys from participants who gave consent but decided not to sign their name or used a pseudonym to be valid and included these responses in the analyses. We asked the study participants to sit adequately apart (one participant in every three seats) to prevent each participant from overlooking others' responses. Participants who had finished filling their survey questionnaire were asked to place the questionnaire in an opaque box by themselves.

Statistical Analysis

After receiving the questionnaires, the research assistant examined their completion and validity. Investigators considered questionnaires with less than two-thirds of the questions answered to be incomplete. Investigators excluded 5 participants (0.6%) who did not finish the ACE questionnaire and 28 participants (3.6%) who did not meet the other sections. The research assistant entered data from the remaining questionnaires into an electronic dataset.

We used descriptive statistics to describe the prevalence of ACEs and their co-occurrence among the study participants. We used the chi-square test of independence to compare the socio-demographic characteristics between participants with ACE(s) and those with no ACE. To assess the extent which ACEs and character strengths were associated with positive growth, well-being, and depressive symptoms, we used univariate (presence or absence of history of ACEs was the independent variable; positive growth, well-being, depressive symptoms were the dependent variables) and multivariate linear regressions (six domains of character strengths were the independent variables; positive growth, well-being, and depressive symptoms were the dependent variables). We identified confounders for multivariate linear regression based on factors associated with adverse childhood experiences as identified using the chi-square test of independence, as mentioned previously.

Results

We sent invitations to 1400 students, with 588 (42%) males and 812 (58%) females. Then, 1103 students answered the invitation, 784 agreed to fill out the questionnaire, and 779 students finished the questionnaires. Among the 779 students who completed the questionnaire, 283 (36.3%) were males, 439 (56.4%) were females, and 57 (7.3%) did not indicate their gender. Participants who reported ACEs

TABLE 1

Socio-demographic characteristics of study participants without adverse childhood experiences (ACEs) and participants with one or more ACE (n = 779 participants)

Variables	No-ACE n (%) (n = 529)	ACEs n (%) (n = 250)	Chi-square	df	*p*-values
Gender					
Female	280 (56.1)	159 (71.3)			<0.001
Male	219 (43.9)	64 (28.7)	14.29	1	
Grades					
1st year	293 (57.6)	149 (62.6)	1.50	1	0.220
2nd year	216 (42.4)	89 (37.4)			
Family income (CNY/month)					
<3000	29 (5.5)	23 (9.3)	17.81	4	0.0013
3000–5000	122 (23.2)	76 (30.6)			
5001–10000	197 (37.5)	68 (27.4)			
10001–20000	113 (21.5)	61 (24.6)			
>20000	60 (11.4)	19 (7.7)			
Academic achievement					
Excellent	15 (2.9)	6 (2.5)	1.55	3	0.671
Good	269 (51.6)	117 (49.4)			
Pass	228 (43.8)	108 (45.6)			
On probation	9 (1.7)	6 (2.5)			
Previously having received counseling					<0.001
No	461 (90.2)	182 (77.1)	22.03	1	
Yes	50 (9.8)	54 (22.9)			

Note: Those who refused to answer were excluded from the analyses.

TABLE 2

Prevalence of self-reported adverse childhood experiences among the study participants (n = 250 participants)

Variables	Frequency (%)
Overall prevalence (multiple answers allowed)	
Emotional abuse	119 (47.6)
Physical abuse	37 (14.8)
Sexual abuse	24 (9.6)
Emotional neglect	78 (31.2)
Physical neglect	7 (2.8)
Parental divorce	50 (20.0)
Domestic violence	8 (3.2)
Had a family member with substance abuse problem	12 (4.8)
Had a family member with mental illness	38 (15.2)
Had a family member who was incarcerated	26 (10.4)
Age when first ACE was experienced	
0–6 years	41 (18.8)
7–12 years	122 (56.0)
13 years or older	55 (25.2)
Number of ACE items experienced	
1 ACE	156 (64.2)
2 ACEs	63 (25.2)
3 ACEs	18 (7.2)
4 ACEs	8 (3.2)
5 ACEs	5 (2.0)

Note: Not including those who refused to answer the questions.

were more likely than participants who did not report ACEs to be female, to come from families with income of less than $700 per month, and to document a history of having received counseling (Table 1).

Of the 779 students who finished the questionnaire on ACEs, 250 students (32.1%) reported having experienced one or more ACEs, and approximately 13% of the participants said having experienced two or more ACEs. Among participants who reported ACEs, the most popular ACE was emotional abuse, followed by emotional neglect and parental divorce. The most common co-occurring ACE was also emotional abuse (Table 2). The number of experienced ACEs ranged from 1 to 5, and the most common age range when ACE was first experienced was 7 to 12 years old.

Compared to participants with no history of ACE, participants with a history of ACEs had significantly lower positive growth scores *(Adjusted regression coefficient Beta = −0.20; 95% CI = −0.37, −0.02; p = 0.03*)*, significantly lower well-being scores *(Adjusted Beta = −1.13; 95% CI = −2.04, −0.23; p = 0.014*)*, and marginal significantly higher depressive symptoms scores *(Adjusted Beta = 0.48; 95% CI = −0.05, 1.02; p = 0.072)* after adjusting for confounders (history of receiving counseling, gender, family income, and level of academic achievement) (Table 3).

Associations between domains of character strength and mental health outcomes were heterogeneous (Table 4). Positive growth was significantly associated with humanity, wisdom, vitality, and courage. Well-being was significantly associated with humanity, temperance, and vitality. Depressive symptoms were associated with vitality and courage. Vitality was the only domain that was significantly associated with all three outcomes.

Discussion

In this cross-sectional study, we described the prevalence and patterns of ACEs among university students in Southern China. We also found that positive growth, well-being, and depressive symptoms were associated with ACEs and various domains of character strengths. The findings of this study provide potentially helpful basic information for stakeholders in student mental health and also have implications for future intervention development.

The prevalence of ACEs among our study participants was lower than that among college students in the United States [50,51], Zambia [52], and Eritrea [53]. However, domestic violence and family dysfunctions are not commonly reported or discussed in public in China due to the perception of being a “private matter” and the fear of “losing face”. If the influence of such social desirability was present in our study, then the prevalence of ACEs could have been underestimated.

The proportion of students with more than 4 ACEs in our study was lower than in other studies. Students with multiple ACEs might have a lower chance of attending university, as ACEs are associated with health problems [5],

TABLE 3

Comparison of positive growth, well-being, and depressive symptom scores (Mean ± SD) between participants who reported no ACE and participants who reported one or more ACEs (n = 751 participants)

Outcomes	No ACE (n = 513)	ACEs (n = 238)	Unadjusted b (95% CI)	*p*	Adjusted b (95% CI)*	*p*
Positive growth	60.25 ± 22.03	55.34 ± 23.22	−0.23 (−0.40, −0.07)	0.005	−0.20 (−0.37, −0.02)	0.03
Well-being	14.75 ± 5.70	12.97 ± 5.44	−1.72 (−2.57, −0.87)	<0.001	−1.13 (−2.04, −0.23)	0.014
Depressive symptom	12.79 ± 3.28	13.47 ± 3.24	0.68 (0.18, 1.19)	0.008	0.48 (−0.05, 1.02)	0.072

Note: Those who refused to answer were excluded from the analyses; *Adjusted for gender, grade, academic achievement, family income, and history of counseling.

TABLE 4

Association between domains of character strengths and positive growth, well-being, and depressive symptom (adjusted regression coefficient (b) with 95% CI) (n = 751 participants)

Outcomes	Domains of character strength					
	Humanity	Wisdom	Temperance	Vitality	Courage	Humor
Positive growth	−0.31	0.19	0.01	0.36	−0.17	0.09
95% CI	(−0.50, −0.11)	(0.00, 0.38)	(−0.09, 0.11)	(0.22, 0.50)	(−0.31, −0.02)	(−0.10, 0.28)
p-value	0.01	0.045	0.99	<0.001	0.016	0.31
Well-being	−2.69	0.56	0.78	3.52	0.16	−0.83
95% CI	(−3.60, −1.77)	(−0.33, 1.45)	(0.32, 1.25)	(2.87, 4.17)	(−0.51, 0.83)	(−1.73, 0.07)
p-value	<0.001	0.23	0.002	<0.001	0.62	0.07
Depressive symptom	−0.08	0.31	0.07	−1.13	−0.46	−0.16
95% CI	(−0.64, 0.48)	(−0.24, 0.85)	(−0.21, 0.36)	(−1.53, −0.73)	(−0.87, −0.05)	(−0.71, 0.38)
p-value	0.86	0.32	0.6	<0.001	0.03	0.64

Note: Analyses only included students who completed the questionnaires, adjusted for all other domains of character strength, number of adverse childhood experiences (i.e., ACE score), history of receiving counseling, gender, family income, and level of academic achievement.

reduced intelligence [54], and cognitive deficits [55] during childhood and adolescence. Thus, our findings are generalizable only to university students in similar settings.

History of ACEs was negatively associated with positive growth and well-being. These findings were similar to those of previous major studies that ACEs were associated with poorer mental health [6–9,56]. However, the outcomes of our study were measured using a self-reported questionnaire with no probing. Such under-reporting could have introduced information bias to the study findings.

Domains of character strengths were associated with positive growth, well-being, and depressive symptom scores, with vitality being significantly associated with all three outcomes. The findings of our study were consistent with those of a survey among earthquake survivors in Sichuan, China [57], which found an association between character strengths and Posttraumatic growth. Vitality explained 32% of the variance in post-traumatic or positive growth among those with indirect trauma. According to our exploratory factor analysis, vitality included hope and zest. Peterson and colleagues also found that hope and zest are strongly associated with posttraumatic growth among those who have experienced at least one traumatic event [21]. It is possible that positive growth and well-being can be promoted among university students and depressive symptoms can be relieved through interventions involving hope and zest. Character strengths-based intervention (CSI) is an intervention in positive psychology that aims to identify, use, and develop character strengths [22,23]. Future studies should consider incorporating hope and zest into CSI as a way to promote growth and mental health among university students with ACEs.

Positive growth was significantly associated with humanity, wisdom, vitality, and courage. These associations indicated that identifying, using, and developing the following strengths might promote positive growth among university students with ACEs: appreciation of beauty and excellence, gratitude, kindness, spirituality, citizenship, love, prudence, social intelligence, perspective, open-mindedness, self-regulation, leadership, zest, hope, brave, creativity, love of learning, integrity, persistence, and curiosity. Well-being was significantly associated with humanity, temperance, and vitality. Thus, identifying, using and developing the following strengths might increase well-being among university students with ACEs: appreciation of beauty and excellence, gratitude, kindness, spirituality, citizenship, love, fairness, forgiveness, humility/modesty, zest, and hope. Depressive symptom was associated with vitality and courage, which suggested that identifying, using, and developing the following strengths might decrease depressive symptoms among university students with ACEs: zest, hope, bravery, creativity, love of learning, integrity, persistence, and curiosity.

All factors but humor had a significant association with one of the outcomes among positive growth, well-being, and depressive symptoms. Therefore, a long-term intervention to identify, use, and develop all 24 character strengths as a course might be a possible way to support university students with ACEs.

A number of limitations existed in our study. Firstly, the study's cross-sectional design did not allow for causal inference. Secondly, participants might not have been able to recall adverse childhood experiences, potentially introducing information bias into the study findings. Thirdly, our survey was conducted in a classroom on campus with the instructor located at the back of the classroom, which could have invoked reactivity and social desirability bias, potentially contributing to the under-reporting of ACEs. Lastly, our participants were students at one university in Southern China. The findings of the study might have limited generalizability to other populations. These caveats should be considered in the interpretation of the study findings.

Conclusion

The prevalence of ACEs among university students in Southern China was relatively high. ACEs were negatively

associated with positive growth, and well-being and marginally positively related to depressive symptoms. In contrast, the vitality domain of character strength was the opposite, and positively related to positive growth and well-being and negatively associated with depressive symptoms. The findings of this study contributed empirical evidence for stakeholders in university mental health and can potentially inform the development of future interventions. However, caveats regarding lack of temporality, selection bias, social desirability bias, and lack of generalizability should be considered in the interpretation of the study findings.

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Availability of Data and Materials: The data that support the findings of this study are available from now on in the following link: https://figshare.com/s/434411b28621e4da3ebb.

Ethics Approval: We received ethical approval for the study from the Human Research Ethics Committee, Faculty of Medicine, Prince of Songkla University, Hat Yai, Thailand (Approval Number: REC.63-382-18-1) and the Medical Ethics Committee of the Affiliated Hospital of Guangdong Medical University (Approval Number: PJ2020-097).

Conflicts of Interest: The authors declare they have no conflicts of interest to report regarding the present study.

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