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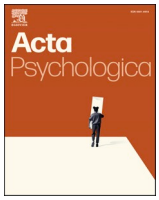

Effect of Confucian-based acceptance and commitment therapy(C-ACT) on mental health and psychological flexibility improvement of college students: A randomized controlled trial

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ABSTRACT

Chinese university students face multiple psychological pressures from social and economic aspects. Despite the availability of evidence-based psychological interventions, such as cognitive-behavioral therapy (CBT) and mindfulness-based stress reduction (MBSR), there is a widespread tendency among these students to forgo seeking help. Thus, there is an urgent need to design an efficient and concise psychological intervention method. Theoretical Model of Confucian Self-Development (TMCS), represented by Zeng Guofan's ethical practices and cultivation techniques of the Qing Dynasty in China, offers the possibility of cross-cultural adaptation of Confucian ethics and ACT through Psychological Flexibility, and from this, the development of the Confucian-based Acceptance and Commitment Therapy (C-ACT) intervention program. Through A Randomized Controlled Trial, 76 college student participants were randomly assigned to an intervention group (C-ACT, $n = 38$) versus a control group (Mindfulness-based Acceptance and Commitment Therapy, M-ACT). All participants received an 8-week intervention session with a social worker and counselor. The results of the study showed that the C-ACT group and the M-ACT group showed significant improvements in the levels of Psychological Flexibility and Psychological Distress at all stages, and in addition, the C-ACT group showed a more significant level of improvement in Harnessing than the M-ACT group. Therefore, C-ACT is a compelling psychological intervention for college students in mainland China and has significant potential for cross-cultural improvement and intervention organization based on the group's cultural background.

1. Introduction

As the employment situation in mainland China becomes increasingly challenging, the conflict between college students' employment aspirations and concrete social realities continues to grow, a gap that leaves college students in a state of psychological imbalance and psychological distress (Zhi, 2023). In addition, the range of interpersonal, economic, academic, and cultural challenges that college students may face may also add to the problems of stress, anxiety, and depression faced by college students (Dalky & Gharaibeh, 2019; Räsänen et al., 2016). In February 2023, the China National Mental Health Development Report (2021−2022) pointed out that the Chinese youth population, including the university student population, is a high-risk group for mental illness (Fu et al., 2023). Meanwhile, about 10–20 % of adolescents in western countries face the challenges of stress, anxiety, and depression (Polanczyk et al., 2015), and the problems of stress, anxiety, and depression are in fact the most common problems faced by college students (Regehr et al., 2013). It is concerning that higher levels of psychological distress often lead to adverse psychological and behavioral effects, such as the emergence of anxiety and depression, as well as social dysfunction or aggressive behaviors (Drapeau et al., 2012). Furthermore, these effects may escalate to severe consequences,

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including an increased risk of suicide (Takebayashi et al., 2018). However, college students can forgo seeking professional help when faced with mental health problems due to stigma, among other reasons (Kim, 2023; Zivin et al., 2009). Therefore, when developing mental health intervention programs and providing mental health services for college students, the above situations should be fully considered, and measures should be developed accordingly.

It has been shown that Acceptance and Commitment Therapy (ACT) is widely used in the treatment of various psychological disorders, including stress, anxiety and depression (Hayes et al., 2012; Lappalainen et al., 2014; A- tjak et al., 2015). In addition, more and more studies have applied ACT to the intervention and treatment of psychological problems in adolescents, especially college students (Hayes & Ciarrochi, 2015; Muto et al., 2011), and have developed various forms of ACT intervention programs or intervention models based on college students' age characteristics and attitudinal needs, such as the " Youth COMPASS" intervention program (Puolakanaho et al., 2019), ACT self-help programs (Klimczak et al., 2023), The student COMPASS ACT-based program (Räsänen et al., 2016), Web-based ACT program (Levin et al., 2014) or such, and achieved good psychological intervention results. However, although ACT has achieved good results in the process of psychological interventions for college students, Randomized Controlled Trial (RCT) studies based on ACT interventions and targeting college student populations are relatively limited in mainland China, primarily because of some limitations in the details of the intervention methods and cultural adaptability (Wang et al., 2017; Zhao et al., 2023). Existing research has indicated that online student Acceptance and Commitment Therapy (ACT) intervention programs based on mindfulness techniques and Buddhist ethics may have limitations in improving students' mental health and enhancing levels of psychological flexibility (Zhou et al., 2025). Furthermore, meta-analyses concerning culturally-adapted psychological interventions have demonstrated significant improvements associated with culturally adapted interventions compared to those that are not culturally adapted (Chen et al., 2024; Hall et al., 2016). Therefore, it is essential to develop and implement cross-cultural adaptations of ACT tailored for the college student population, while also evaluating the applicability and efficacy of this model within randomized controlled trials.

With this in mind, we developed an ACT-based psychological intervention program for university students aimed at improving their psychological flexibility (PF) and mental health. The design of this intervention program takes into account the basic features of the current third wave of cognitive therapies on the one hand and draws on the experiences of group ACT interventions for university students (Hennemann et al., 2022; Pan et al., 2023), Mindfulness-based Cognitive Behavioral Therapy (M-CBT), Mindfulness-based Cognitive Therapy (M-CBT) and Mindfulness-based Cognitive Therapy (M-CBT) for university students on the other.), Mindfulness-based Cognitive Therapy (M-BCT) (Querstret et al., 2020; Ritvo et al., 2021; Sheikhzadeh et al., 2021), and Mindfulness-based Stress Reduction (MBSR) (Hazlett-Stevens & Oren, 2017); on the other hand, considering the basic need for cross-cultural improvement of psychological intervention methods in different countries, reference was made to Taoist Cognitive Therapy (TCT), which incorporates Chinese Taoist ethics (Chang et al., 2016) and Tranquil Sitting Therapy (WEN et al., 2023), which combines Chinese Confucian ethics, as successful intervention cases. On the other hand, existing research indicates that mindfulness meditation impacts psychological functioning in a manner similar to the inhibitory or excitatory mechanisms of neurons, effectively blocking pathological thoughts or emotions in the unconscious from reaching the conscious level, thereby achieving significant psychological improvement (Ahmed, 2023). Additionally, considering the existing Taoist Cognitive Therapy (TCT) based on Taoist ethics (Chang et al., 2016) and the Tranquil Sitting Therapy based on Confucian ethics (WEN et al., 2023) in China, further exploration is needed regarding the relationship between their core meditation techniques and mindfulness meditation.

The purpose of this study was to evaluate the effectiveness of this intervention program, and more specifically, we wanted to investigate whether the coach-supported Confucian-based Acceptance and Commitment Therapy (C-ACT) intervention would improve college students' PF and psychological well-being and whether it demonstrated a higher level of PF and psychological well-being after cross-cultural modification than the Mindfulness-based Acceptance and Commitment Therapy (M-ACT) intervention. Overall, this RCT was designed to test the hypotheses that participation in the C-ACT versus M-ACT intervention program would (a) increase college students' levels of PF and psychological well-being, (b) reduce college students' levels of psychological distress in terms of STRESS, ANXIETY and DEPRESSION, and we also expected that (c) C-ACT group college students will exhibit better levels of PF and psychological well-being than college students in the M-ACT group. In summary, this study describes a group intervention program for college students that involves social workers and counselors working together after cross-cultural adaptation based on cultural context and evaluates the effectiveness and timeliness of this potential model.

2. Applying the acceptance and commitment therapy to college students

ACT is a novel behavioral psychotherapy based on positive thinking and acceptance, representing the third wave of behavioral therapy (Gaudiano, 2011; Hayes et al., 1999). As a transdiagnostic approach, ACT has been validated in >100 RCTs and has been shown to have significant effects on stress, anxiety and depression, among others (Hart et al., 2021; Wang & Fang, 2023), and it seeks to improve the quality of behavior by emphasizing experiential acceptance, contact with the present moment, defusion, self-as-context, values, and committed action six psychological skills to enhance PF (Graham et al., 2016; Hayes et al., 2012). Further, through PF, an internal integrative process, individual emotions, and cognitions are altered, which extends to motivation, positive behavioral regulation, and maintenance of behavioral change to promote openness, awareness, and positive behavior formation (McCracken & Vowles, 2014).

Currently, Chinese university students are facing more significant challenges than ever before, with uncertain pressures from various sources raising their mental health risks, such as academic stress, lifestyle changes, economic decline, and employment insecurity (Gao et al., 2020; Wu et al., 2020). In recent years, ACT has been widely used as an intervention for the treatment and improvement of college students' psychological problems, which meets a wide range of psychological needs of the college student population (Räsänen et al., 2016) and shows two research tendencies: on the one hand, internet-based ACT interventions for college students have achieved good long-term psychological problem improvement after obtaining coaching guidance (Levin et al., 2014; Zhao et al., 2023); on the other hand, self-help ACT interventions have been effective in addressing college students' STRESS, ANXIETY and DEPRESSION due to their convenience, ease of use, cost-effectiveness and flexibility (Klimczak et al., 2023; Puolakanaho et al., 2019; Räsänen et al., 2016).

However, although the above studies have achieved promising results in alleviating college students' psychological problems, they also have certain limitations, such as Internet-based online ACT psychological interventions may face the problem of high participant roll-out rates (Carlbring et al., 2018), and self-help ACT interventions face the problem of decreased psychological intervention effectiveness due to the lack of coaching guidance (Spijkerman et al., 2016). In addition, in previous ACT psychological intervention studies for college students in China, not only did they face the problems raised above, but they also exhibited problems such as a lack of clarity in the study design and intervention program or only included parts of the ACT therapy program (Wang et al., 2017; Zhao et al., 2023). Notably, a current integrated coach-led intervention model that mixes self-help intervention programs with group

intervention programs can effectively overcome the shortcomings of the aforementioned intervention programs or projects (McDermut et al., 2001; Räsänen et al., 2016). In view of this, the coach-led ACT self-help intervention program has great potential for application and development, and this study verified the effectiveness of applying ACT to university students through the coach-led C-ACT and M-ACT group interventions.

3. The psychological flexibility model and confucian values

PF is at the heart of ACT, which emphasizes that conscious individuals are entirely in touch with the present moment and change or persist in their behavior according to the situation in order to serve their chosen values and that PF is a protective factor against various psychological problems such as stress, anxiety, and depression (Hayes et al., 2006; Larsson et al., 2022).).PF is consistent with the multilevel and multidimensional theory of extended evolution, in which individuals systematically evolve consciously through healthy variation, beneficial selection, and beneficial attention to situational tolerance (Hayes et al., 2020). Therefore, as a scientific model, PF should integrate existing knowledge to organize research and development of therapeutic activities and innovate the paradigm of progress (McCracken & Morley, 2014). In ACT, for clinical application, PF is defined as a broad concept that can be further classified into six psychological skills (which can also be referred to as six sub-processes): experiential acceptance, contact with the present moment, defusion, self-as-context values, and committed action (Graham et al., 2016; Hayes et al., 2012). In summary, given the scientific, broad, and integrative nature of PF and its importance in the process of ACT and mental health improvement, it lays an essential foundation for cross-cultural improvement of ACT and meeting the mental health needs of Chinese college students.

In ancient China, the scholarly class used Confucian "inner saint" work to get rid of psychological problems and formed a unique set of moral practice model called Theoretical Model of Confucian Self-Development (TMCS) (Mou, 2005; Yongli & Yiping, 2021), which has been used to improve the mental health of Chinese university students across cultures. TMCS has some interoperability with the six psychological skills in PF (McCracken & Morley, 2014; Yongli & Yiping, 2021), and it can be argued that PF serves as a bridge to the use of TMCS as an ethical foundation for ACT interventions. Further, as a practical example of TMCS, Zeng Guofan's Self-Cultivation ethical foundation and practice is highly informative. Zeng Guofan (1811–1872) was a famous Confucian scholar and meritorious official of the Chinese Qing Dynasty (1636–1912), whose ethical practice of Confucian psychology partially corresponds to the six psychological skills in PF (see Fig. 1 for details), which provides inspiration and a pathway for cross-cultural adaptation modification in ACT (Zeng, 2011a: 326; Zeng, 2011b: 157; Zeng, 2011c: 356).

Specifically, Confucian ethics integrates with the six processes of ACT through the following five aspects. First, abiding in reverence fosters experiential acceptance by encouraging participants to embrace thoughts and feelings without undue attachment, aligning with the Confucian emphasis on reasoned reflection; Second, abiding in Stillness cultivates present moment awareness through practices such as tranquil sitting, promoting self-reflection and ethical conduct in daily life; Third, personal cultivation facilitates cognitive defusion and self-as-context, enabling participants to detach from negative thoughts and reduce their impact, echoing Confucian self-cultivation practices; Fourth, sincerity encourages exploration of personal values and life meaning, aligning with the Confucian pursuit of self-understanding and authentic living; Fifth, putting into practice promotes committed action aligned with values, emphasizing the Confucian principle of integrating knowledge and action (Zhou et al., 2025).

Specifically, firstly, from the perspective of experiential acceptance, Zeng Guofan emphasizes abiding (居敬)in reverence to achieve the goal of harboring in one's heart(心存), which is specifically to keep one's thoughts from deviating from rationality through the constraints of speech, behavior and conduct, to accept all kinds of feelings and opinions. Secondly, from the perspective of contact with the present moment, Zeng Guofan emphasized abiding in stillness (主静)in order to achieve the goal of feeling at ease(心定), specifically through tranquil sitting (静坐)to sharpen oneself in daily life and moral practice. Thirdly, from the perspective of both definition and self-as-context, Zeng emphasizes personal cultivation(慎独)to achieve the goal of being relieved (心安). On the one hand, through daily learning(日知所亡)and calligraphy(作字), making oneself unmovable(不迁于境) , i.e., separating events from thoughts (Zeng, 2011b, p. 157; Zeng, 2011c: 356). On the other hand, through early rising(早期), exercising(保身)and avoiding going out at night(夜不出门), the individual reduces the influence of desires and thoughts on the self, i.e., the self is independent of desires or thoughts or ideas generated by desires (Zeng, 2011b, p. 179; Zeng, 2011c: 356); and fourthly, the individual is unmovable, i.e., separate from events and thoughts (Zeng, 2011b, p. 157; Zeng, 2011c: 356). Fourthly, from the perspective of values, Zeng Guofan emphasized sincerity(思诚)in order to achieve the goal of engrossedness(心专), specifically through nature nourishing(养气)and monthly summary(月无所忘)to increase one's daily experience and reflect on it from time to time, in order to approach the meaning of life and the essence of personal values (Zeng, 2011b, p. 179; Zeng, 2011c: 356). Fifth, from the perspective of committed action, Zeng Guofan emphasizes putting into practice(践行)in order to achieve the goal of knowledge and action go hand in hand(知行合一)(Zeng, 2011c p. 356; Zeng, 2011d: 374). specifically through intensive reading(读书不二), history reading(读史)and careful speech(谨言)(Zeng, 2011a: 326; Zeng, 2011d: 326). Based on

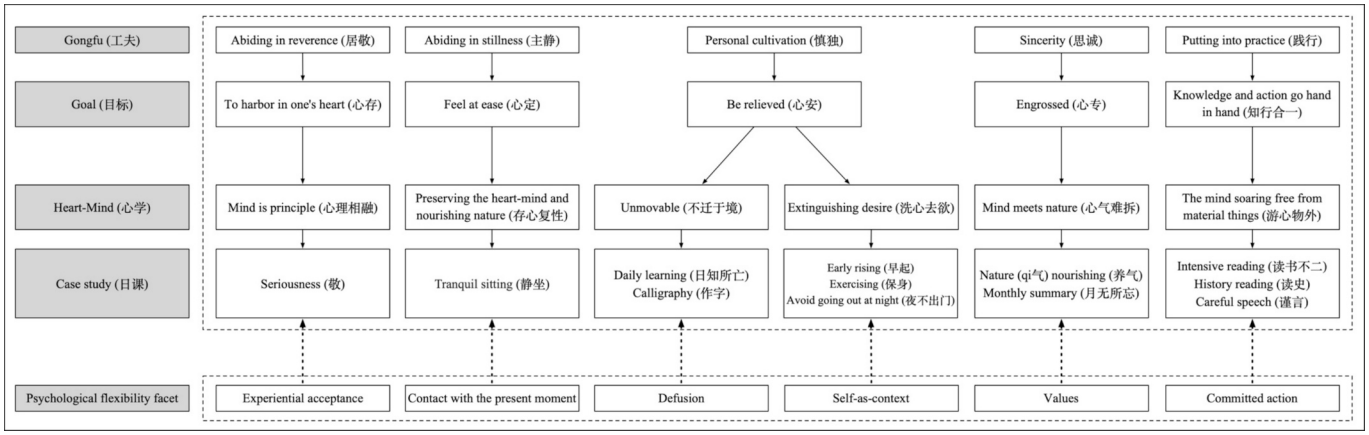

Fig. 1. Theoretical Model of Zeng's Self-Cultivation in Confucian Psychology.

this, this study designed an ACT intervention based on Confucian ethics for a group of Chinese university students.

4. Methods

4.1. Study design

This study was designed as a Randomized Controlled Trial (RCT), divided into two groups, and conducted between September 2023 and February 2024. Under the experimental conditions, both the intervention and control groups were provided free access to a face-to-face group ACT intervention designed to provide students with knowledge and counseling to enhance their PF and mental health, facilitating their learning and improving their social adjustment and identity transformation. In this study design, the intervention group received the culturally adapted ACT intervention program, i.e., the C-ACT intervention program, and the control group received the non-culturally adapted ACT intervention program, i.e., the popular M-ACT intervention program. The researchers measured both the intervention and control groups before the start of the intervention program (Baseline), after the end of the intervention program (Postintervention, 8 weeks later), and again 3 months after completion of the intervention program (3 months follow-up). The study aimed to determine and compare the effects of the intervention group (C-ACT) with the control group (M-ACT) during the duration of the intervention program (from baseline to 3-month follow-up).

4.2. Participant

Participants were recruited from a comprehensive university in Lanzhou City, Western China. Recruitment methods included distributing recruitment information through the university's WeChat and QQ groups and putting up posters in 12 fixed areas on the university campus, with advertisements including a brief description of the project and contact information of the project leader. To participate in the intervention program, interested individuals needed to meet the following criteria: (a) be a student (consistent with the target population of the underlying project of this study); (b) be at least 18 years old (in China, reaching the age of 18 signifies the attainment of full civil capacity); (c) have access to the Internet; (d) be willing to participate in a free intervention program; (e) not currently be receiving any other form of psychosocial interventions; (f) not have received Acceptance and Commitment Therapy (ACT) interventions in the past; and (g) have no religious beliefs (as individuals with certain religious beliefs may interpret or integrate Confucian principles differently). Therefore, 76 of the 81 participants contacted were included in the analysis, and participants who met the inclusion criteria were randomly allocated to the intervention group (C-ACT) versus the control group (M-ACT) by an independent researcher using a whole-cluster randomization methodology, with reasons for exclusion described in Fig. 2.

The mean age for the sample was 19.20(SD = 1.38), and 34 participants were female(44.7 %). No significant differences were observed between the groups(C-ACT, $n = 38$; M-ACT, n = 38) in the demographic data collected. Also, no significant differences in PPFI and DASS scores were found between the intervention and control groups at baseline assessment. More specific details of demographic and sample characteristics at baseline are provided in Table 1.

4.3. Procedures

In order to participate in this study, individuals were required to provide their signature on an informed consent form. Participants who were randomly assigned to the intervention and control groups were matched with an available coach in each group, who contacted the participant they were to coach via WeChat or QQ. Following the commencement of the intervention program, the coach was responsible for the participants' M-ACT or C-ACT tutoring for a period of 8 weeks and completed the post-intervention assessment. After 3 months, the participants were required to complete the follow-up assessment. The intervention program divided the participants into 8 groups, with 2 coaches assigned to each group; 4 groups were designated as the intervention group and 4 groups as the control group, with each group consisting of 8–10 participants. Each intervention and control group had a sub-coach who supervised the coaches and managed specific tasks

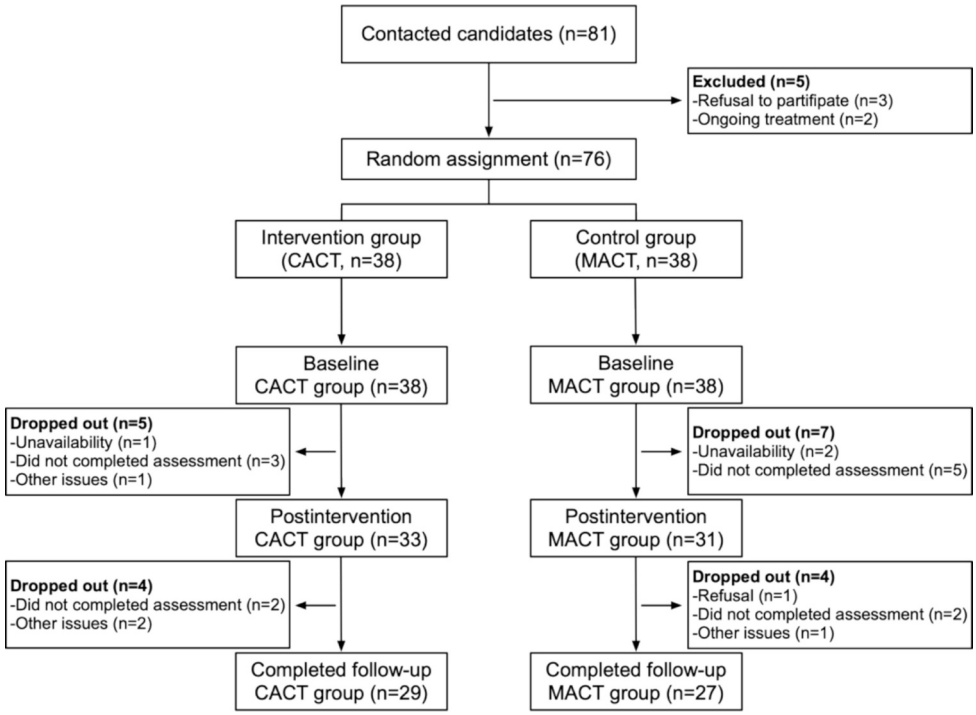

Fig. 2. Study CONSORT Diagram.

Table 1
Participants' Characteristics.

Characteristics	Total (*N* = 76)	CACT (n = 38)	MACT (n = 38)	Group comparison (t or χ^2)
Mean age in years (SD)	19.20 (1.38)	19.34 (1.53)	19.05 (1.21)	0.363
Gender (female)	34 (44.7 %)	18 (47.4 %)	16 (42.1 %)	0.645
Grade				0.355
Freshman	57 (75.0 %)	28 (73.7 %)	29 (76.3 %)	
Sophomore	5 (6.6 %)	1 (2.6 %)	4 (10.5 %)	
Junior	7 (9.2 %)	5 (13.2 %)	2 (5.3 %)	
Senior	7 (9.2 %)	4 (10.5 %)	3 (7.9 %)	
Specialty				0.559
Art and human sciences	47 (61.8 %)	23 (60.5 %)	24 (63.2 %)	
Sciences	28 (36.8 %)	15 (39.5 %)	13 (34.2 %)	
Study of medicine	1 (1.3 %)	0	1 (2.6 %)	
Place of birth				0.639
Large Cities	23 (30.3 %)	13 (34.2 %)	10 (26.3 %)	
Medium cities	16 (21.1 %)	9 (23.7 %)	7 (18.4 %)	
Towns	16 (21.1 %)	6 (15.8 %)	10 (26.3 %)	
Rural	21 (27.6 %)	10 (26.3 %)	11 (28.9 %)	
Achievement ranking				0.841
Top 10 %	24 (31.6 %)	11 (28.9 %)	13 (34.2 %)	
10–30 %	26 (34.2 %)	13 (34.2 %)	13 (34.2 %)	
30–50 %	20 (26.3 %)	10 (26.3 %)	10 (26.3 %)	
Bottom 50 %	6 (7.9 %)	4 (10.5 %)	2 (5.3 %)	
Mean (SD) of behavioral measures at baseline				
PPFI	65.04 (11.81)	63.71 (13.00)	66.37 (10.49)	0.330
Avoidance	24.03 (6.22)	24.21 (6.61)	23.84 (5.88)	
Acceptance	21.58 (7.18)	20.34 (7.93)	22.82 (6.21)	
Harnessing	19.43 (6.30)	19.16 (7.25)	19.71 (5.27)	
DASS	14.67 (9.90)	13.08 (9.44)	16.26 (10.22)	0.163
Stress	5.57 (3.69)	4.89 (3.49)	6.24 (3.82)	
Anxiety	4.76 (3.39)	4.21 (3.31)	5.32 (3.43)	
Depression	4.34 (3.51)	3.97 (3.21)	4.71 (3.79)	

Note: Continuous variables were compared using Independent-samples t-tests; categorical variables were compared using the χ^2 test. All differences were $p > 0.05$.

during the intervention process. The coaches were licensed social workers or counselors with training in M-ACT and C-ACT, while the sub-coaches were licensed senior counselors and senior social workers possessing extensive clinical experience.

4.4. Measurement

4.4.1. Personalized psychological flexibility (PPFI)

The Personalized Psychological Flexibility (PPFI) is a purpose-specific self-report measure of PF that asks participants to respond to items based on "an important goal that you are working on" (Kashdan et al., 2020). The PPFI consists of 15 items on a seven-point Likert scale (1 = strongly disagree to = strongly agree), with higher scores indicating higher PF. It consists of three subscales. Avoidance (e.g., I avoid the most different goal-related tasks), acceptance (e.g., I accept the setbacks when pursuing this goal), and Harnessing (e.g., I accept the obstacles related to this goal). When faced with obstacles related to this goal, my frustration energizes me). The scores of the above three subscales were summed to produce a total score, where the avoidance subscale reverse scored (i.e., higher scores indicate less avoidance). It is important to emphasize that, through factor analysis, the PPFI overcomes the shortcomings of existing PF measures, thereby distinguishing it from hostile affectivity measures (Tyndall et al., 2019; Wolgast, 2014). The adequacy and validity of the PPFI's psychometric measurements have been preliminarily demonstrated in a sample of Chinese university students (Fang et al., 2023). In this study, the PPFI had an internal reliability of Cronbach's $\alpha = 0.765$.

4.4.2. Depression anxiety stress scale (DASS-21)

The Depression Anxiety Stress Scale (DASS-21) is a self-report measure of general psychological distress that consists of three subscales of depression, anxiety and stress (Lovibond & Lovibond, 1995). The DASS-21 is a 21-item, 4-point Likert-type scale (3 = applied to me very much. or most of the time; 2 = applied to me to a considerable degree, or a good part of time; 1 = applied to me to some degree, or some of the time; 0 = did not apply to me at all) consisting of sentences describing negative emotional states experienced during the last week. Previous research has shown that the DASS-21 is sensitive to clinical psychological changes on the online ACT (Petersen et al., 2021). The DASS-21 has shown good internal consistency and convergent and discriminant validity in measures of Chinese university students (Wang et al., 2016). In this study, the DASS-21 had an internal reliability of Cronbach's $\alpha = 0.928$.

4.5. Statistical analysis

Participant data were analyzed using SPSS 26.0 software. All 76 participants who completed the baseline assessment were included in the analysis, and wholly conditional multiple interpolations handled missing data in the follow-up assessment with a total of 20 interpolations with 50 iterations (participant age, gender, grade, specialty place of birth, achievement ranking, PPFI and DASS scores at all three time-points were included in the model used to interpolate missing data). After data interpolation was completed, the data were further analyzed. First, paired *t*-tests were used to compare baseline, post-intervention and follow-up scores of PPFI and DASS to assess the effects of the two different intervention programs; Secondly, the effect sizes of the repeated measures between the different groups were calculated using pooled means and standardized deviations (values of Cohen's d between 0.2 and 0.5 indicates small effect size, values between 0.5 and 0.8 indicates medium effect size and > 0.8 indicates large effect size) (Cohen, 1988); we then assessed longitudinal intervention effects using a linear mixed model that included one categorical random effect (participant), one categorical fixed effect (group: C-ACT and M-ACT), one ordinal fixed effect (time: baseline, post-test, and follow-up), and group * time interaction through group * time. Time interaction to assess the difference in effect between the two interventions by group * time F test by the fixed effect; finally, we performed a baseline for the intervention group (C-ACT) and control group (M-ACT). Finally, we calculated the change in postintervention and follow-up scores for the intervention group (C-ACT) and control group (M-ACT) and assessed the magnitude of the different intervention programs of C-DPBGI and C-LOBGI using a one-sided, two-sample t-test.

4.6. Power analysis

Given that we could not determine the number of participants a priori based on a power analysis, a priori sample size analysis was conducted using G*Power 3.1 (Faul et al., 2007; Faul et al., 2009). This analysis aimed to calculate the minimum sample size detectable with a 95 % probability and an alpha error probability of 0.05. We inputted 0.8 for the effect size d, 0.9 for the power. The sample size analysis indicated

that our study was adequately powered to detect big effect sizes (power = 0.905). Furthermore, a post-hoc power analysis was performed with G*Power 3.1, utilizing the final sample size of 76 participants ($n = 38$ for both the intervention and control groups). This power analysis revealed a power of 0.96 for the test.

4.7. Intervention

Confucian-based Acceptance and Commitment Therapy (C-ACT) Intervention.

The 8-week Confucian-based Acceptance and Commitment Therapy (C-ACT) Intervention program builds on existing ACT intervention programs that have been used to improve the mental health of university students and to reduce the potential for psychological distress, depression, anxiety, and stress (Räsänen et al., 2016). The C-ACT intervention program is based on an existing ACT intervention program (Räsänen et al., 2016) to improve students' mental health and reduce the potential for psychological distress, depression, anxiety, and stress, and has been adapted to meet the needs of students in cross-cultural contexts (WEN et al., 2023). The C-ACT intervention program is based on a face-to-face curriculum consisting of six modules to improve students' PF: (a) Introductory, (b) Experiential, (c) Interactive, (d) Intervention, (e) Intervention. (a) Introductory; (b) Experiential acceptance; (c) Contact with the present moment; (d) Defusion; (e) Self-as-context; (f) Values; (g) Committed action. The above six modules will be progressively developed each week. Through the explanation of relevant concepts and objectives by coaches and the guidance of relevant supporting techniques, participants will be required to complete a fixed number of Confucian ethical studies and practical daily exercises each week, such as tranquil-sitting, Calligraphy, Early rising, and History reading. The above exercises are designed to assist participants in experiencing the connection between Confucian ethics and daily practice. At the same time, given the abstract nature of Confucian ethics, educational videos were provided for participants to refer to and learn about Confucian ethics that are difficult to understand; in addition, participants were required to complete a C-ACR diary every day to summarize what they had learned each day and reflect on their shortcomings and progress. At the beginning of the intervention, the program leader also produced a C-ACT reading guide, which participants could use to provide feedback and guidance to the coaches. For a detailed description of the themes of the C-ACT core modules, the aim, and the daily exercises, please refer to Table 2.

Table 2
Structure and Content of the C-ACT Intervention: Modules, Themes, and Coach's Role.

Core modules	Theme and aim	Coach's role	Examples of daily exercises
1. Introductory	Baseline assessment. Semi-structured interview aiming at mapping the participant's current situation and needs.	Interview the participant. Record the basic information and situation of the participants.	Video on Confucian values. C-ACT diary. Tranquil sitting (静坐)
2.Experiential acceptance	Acceptance of ideas and feelings: ideas do not deviate from reason	Introducing the meaning of abiding in reverence, encouraging participants to make progress, and providing guidance for daily practice.	Calligraphy (作字) Early rising (早起) Exercising (保身) History reading (读史)
3.Contact with the present moment	Focus on the here and now: sharpening oneself in daily life and ethical practice	Introduction to the meaning of Abiding in stillness, focusing on the obstacles that may be encountered in daily life.	Taking action according to values. Review of thoughts and values.
4.Defusion	Separating events from ideas: ideas do not change with changing circumstances	Introducing the meaning of Personal cultivation, pointing out the importance of Tranquil sitting for reshaping ideas.	
5.Self-as-context	The observer's view of the problem: reducing the impact of ideas on oneself	Introducing the meaning of personal cultivation (prudence) and pointing out the role of mindset in guiding behavior.	
6.Values	The observer's view of the problem: reducing the impact of ideas on oneself	Introducing the meaning of Sincerity and providing guidance on embracing and reshaping values	
7.Committed action	Knowledge and action go hand in hand: Meaningful action consistent with Confucian values	Introduce the meaning of Putting into practice and encourage participants to act on the values.	
8.Concluding	Wrapping up the intervention. Relapse prevention. Post-intervention assessment.	Assess the client's situation and summarize the intervention. Provide further interventions if needed.	

4.8. Mindfulness-based acceptance and commitment therapy (M-ACT) intervention

The 8-week Mindfulness-based Acceptance and Commitment Therapy (M-ACT) Intervention program builds on an established MBSR program for college students (Hazlett-Stevens & Oren, 2017) to reduce the risk of M-BCT (Sheikhzadeh et al., 2021), which reduces individual depression, anxiety, stress, and fatigue, was modified and adapted to meet the needs of Chinese university students and the needs of the current study. The M-ACT intervention program is also based on a face-to-face curriculum and consists of six modules designed to enhance PF in university students, similar to the C-ACT intervention program. Unlike the C-ACT intervention program, the theme and aim of the M-ACT intervention program are based on Buddhist ethics, i.e., the four thematic factors that constitute mindfulness: (a) Karuna-compassion; (b) Upekkha-equanimity; (c) Mudita-empathetic joy; and (d) Mudita-empathy. (c) Mudita-equanimity; (d) empathetic joy; (e) Metta-loving kindness. The coaches will explain and guide the above concepts and techniques of mindfulness, and the participants will be required to engage in daily practices such as body scanning and mindfulness meditation every week to deepen their understanding of the mindfulness theme factors. Participants are required to engage in daily practices such as body scans and mindfulness meditation on a weekly basis to deepen their understanding of the thematic elements of mindfulness. At the same time, Buddhist mindfulness exercises and ethical videos were provided to participants to enhance their understanding of the mindfulness elements; in addition, participants were required to complete the M-ACT diary on a daily basis to reflect on and summarize their daily progress and shortcomings. Similar to the C-ACT intervention program, the program leader also produced an M-ACT reading guide. For a detailed description of the core module themes, aim, and daily exercises of M-ACT, please refer to Table 3.

4.9. Coaches

Based on previous research recommendations and intervention experiences (Puolakanaho et al., 2019; Räsänen et al., 2016), participants received counseling and support from 16 ACT-trained social work and psychology majors (8 social work majors and 8 psychology majors). Coaches were required to be in the second year of graduate school or

Table 3
Structure and Content of the M-ACT Intervention: Modules, Themes, and Coach's Role.

Core modules	Theme and aim	Coach's role	Examples of daily exercises
1. Introductory	Baseline assessment. Semi-structured interview aiming at mapping the participant's current situation and needs.	Interview the participant. Record the basic information and situation of the participants.	Video on Mindfulness values. M-ACT diary. Body scan Upekkha-equanimity meditation Metta-loving kindness meditation Karuna-compassion meditation Mudita-empathetic joy meditation Taking action according to values. Review of thoughts and values.
2. Experiential acceptance	Acceptance of thoughts and feelings: realizing the impact of thoughts and events on one's emotions and body	Introducing the principle of meditation, encouraging participants to make progress, and providing guidance for daily practice.	
3. Contact with the present moment	Focus on the here and now:being present	Introducing the meaning of being present and advocating for individuals to pay attention to their body and mind in the present moment.	
4. Defusion	Separating events from thoughts: identifying the selfmaladaptive thoughts and unpleasant emotions	Introducing the meaning of karuna-compassion, pointing out the importance of meditation for reshaping ideas	
5. Self-as-context	The observer's view of the problem: reducing the impact of ideas on oneself	Introducing the meaning of upekkha-equanimity, pointing out that the way of thinking guides behavior	
6. Values	The Value of Self: Reflections on the Nature of Life and the Meaning of Life	Introducing the meaning of mudita-empathetic joy and providing guidance on accepting and reshaping values	
7. Committed action	Knowledge and action go hand in hand: Meaningful action consistent with positive values	Introduce the meaning of metta-loving kindness and encourage participants to act on the values Assess the client's situation and summarize the intervention. Provide further interventions if needed.	
8. Concluding	Wrapping up the intervention. Relapse prevention. Post-intervention assessment.	Introduce the meaning of metta-loving kindness and encourage participants to act on the values Assess the client's situation and summarize the intervention. Provide further interventions if needed.	

above, all must have relevant group or psychological intervention experience, and all should provide a certificate of professional level of social workers and a certificate of mental health guidance issued by China's Ministry of Human Resources and Social Security. They received a total of 20 h of training in the ACT methodology and 20 h of training in Confucianism or Buddhist thought. In addition, they can receive group supervision (4 weeks * 2 h, 8 h in total) from a psychologist with in-depth knowledge of ACT methodology and experience in intervention on intervention methodology and participant issues during the intervention. At the same time, the coaches had extensive exchanges and continuous cooperation with two scholars who are experts in Confucianism and Buddhist studies on the ethics of intervention.

5. Results

The analyses revealed significant increases in PPFI scores and decreases in DASS scores for both the C-ACT and M-ACT groups from post-intervention to follow-up assessment (see Table 4). The C-ACT group demonstrated superior outcomes, as indicated by a significant group*-time interaction for the PPFI-Harnessing measure ($F = 5.00$, $p < 0.01$). In the post-intervention assessment, moderate within-group effect sizes were observed for PPFI-Total (M-ACT group) and PPFI-Avoidance (C-ACT group) ($0.52 < d < 0.57$), while all other measurement indicators showed small within-group effect sizes ($0.15 < d < 0.48$). In the follow-up assessment, small to medium within-group effect sizes were observed for PPFI-Acceptance and Harnessing scores in both the C-ACT and M-ACT groups ($0.22 < d < 0.47$), while other measurement indicators exhibited medium to large within-group effect sizes ($0.51 < d < 0.97$). The distribution and variation of the data can be seen in Fig. 3.

Table 5 reports the effect sizes of the score changes between the C-ACT group and the M-ACT group during the post-intervention assessment and the follow-up assessment. In the post-intervention assessment, the score change in PPFI-Total for the M-ACT group was significantly better than that of the C-ACT group, with small effect sizes observed ($d = 0.45$). However, during the period from the post-intervention assessment to the follow-up assessment, the score change in PPFI-Harnessing for the C-ACT group was greater than that of the M-ACT group, with medium effect sizes observed ($d = 0.57$).

6. Discussion

This study used a randomized control trial (RCT) to compare the effectiveness of C-ACT and M-ACT psychological interventions for university students. C-ACT is a cross-cultural ACT intervention based on the Confucian theoretical model of self-development and the paradigm of ethical practice, which aims to improve the psychological well-being and psychological flexibility of university students. In contrast, M-ACT is one of the current international one of the mainstream approaches used in ACT (Sheikhzadeh et al., 2021). The results of the study showed that participants in both the C-ACT and M-ACT groups reported improvements in psychological distress, as well as reductions in levels of stress, anxiety, and depression. In addition, as measured by the PPFI, participants in the C-ACT and M-ACT groups showed significant improvements in psychological flexibility and significant reductions in levels of avoidance and harnessing after the intervention.

In contrast, participants in the M-ACT group showed significant increases in acceptance levels, which remained unchanged after 3 months. During the 8-week intervention, both C-ACT and M-ACT had significant impacts on the psychological flexibility and psychological well-being levels of Chinese university students, demonstrating the effectiveness of C-ACT after culturally adapted modifications (WEN et al., 2023) and the applicability of M-ACT in the Chinese university student population (Räsänen et al., 2016). Overall, the above results are consistent with the results of recent interventions targeting psychological distress and PF in college students (Gunawan & Oriza, 2022; Jeffords et al., 2020) and are similar to the results of other existing ACT intervention programs or intervention projects targeting college student populations in terms of mental health improvement (Klimczak et al., 2023; Puolakanaho et al., 2019). Therefore, it can be said that the C-ACT intervention program designed in this study provides a potential and promising option for current group psychological interventions for college students in

Table 4
Means, SEs, and Effect Sizes for the Intervention Group (CACT) and Control Group (MACT) Analysis.

	PPFI								DASS							
	Total		Avoidance		Acceptance		Harnessing		Total		Stress		Anxiety		Depression	
	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT
Baseline (T1)	63.71	66.37	24.21	23.84	20.34	22.82	19.16	19.71	13.08	16.26	4.89	6.24	4.21	5.32	3.97	4.71
mean (SE)	2.11	1.70	1.07	0.96	1.29	1.01	1.18	0.86	1.53	1.66	0.57	0.62	0.54	0.56	0.52	0.62
Post (T2)	65.68	70.89	25.96	24.59	21.13	24.57	18.35	22.25	10.38	13.04	3.96	5.08	3.32	4.31	2.95	3.95
mean (SE)	1.60	1.50	0.74	0.92	1.04	0.80	0.84	0.80	1.04	1.31	0.42	0.50	0.36	0.47	0.34	0.51
Follow (T3)	70.85	74.91	27.92	26.61	22.58	25.30	20.49	23.02	7.71	10.27	2.81	3.70	2.74	3.17	1.76	3.08
mean (SE)	1.33	1.39	0.60	0.81	0.97	0.79	0.74	0.66	0.58	1.00	0.32	0.43	0.25	0.39	0.19	0.39
T1-T2 T score	−1.35	−3.50	−3.19	−1.43	−0.95	−2.17	1.00	−2.94	3.36	1.65	3.16	0.43	2.77	0.42	3.09	0.06
T1-T2 ES (d)	0.22	0.57***	0.52**	0.23	0.15	0.35*	0.16	0.48**	0.34**	0.35***	0.30**	0.33**	0.32**	0.32**	0.38**	0.22
T1-T3 T score	−4.34	−5.96	−5.56	−4.82	−2.60	−2.86	−1.36	−3.89	4.35	3.61	5.08	1.77	3.03	1.34	4.55	0.70
T1-T3 ES (d)	**0.70*****	**0.97*****	**0.90*****	**0.78*****	**0.42*****	**0.47****	**0.22**	**0.63*****	**0.75****	**0.71*****	**0.74*****	**0.78*****	**0.57****	**0.73*****	**0.91*****	**0.51****
T2-T3 T score	−6.80	−6.19	−4.78	−7.01	−3.43	−2.08	−5.40	−2.00	3.85	1.26	4.38	0.92	1.83	0.51	3.96	0.23
T2-T3 ES (d)	1.10***	1.00***	0.78***	1.14***	0.56**	0.34*	0.88***	0.32	0.52***	0.39**	0.50***	0.48***	0.31	0.43**	0.69***	0.31**
Group (F)	3.74		0.79		5.04*		4.90*		3.29		3.13		4.06*		2.65	
Time (F)	39.10***		40.17***		10.69***		9.74***		41.88***		49.54***		23.62***		26.19***	
Gr. * Time (F)	1.03		1.19		0.48		5.00**		0.91		0.47		0.08		0.21	

Note:The Gr. * Time interactions were estimated as a fixed effect in the linear mixed model. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

mainland China.

Meanwhile, during the follow-up assessment, it was found that participants in the C-ACT group and participants in the M-ACT group had moderate or higher effect sizes for psychological distress and stress, anxiety and depression improvement, and PPFI and avoidance, acceptance, and harnessing also exhibited moderate or higher effect sizes. PPFI and avoidance, acceptance, and harnessing also showed the same results, and the above findings reaffirm the great potential of C-ACT and M-ACT in China. Specifically, in terms of PF enhancement among college students, it can be found that the within-group effect sizes (d) of participants in the C-ACT group from the baseline assessment to the postintervention assessment stage were smaller than those of participants in the follow-up assessment stage from the postintervention assessment to the assessment stage. In the assessment stage, participants in the M-ACT group showed the opposite result, possibly predicting a better persistence of the C-ACT intervention program compared to M-ACT in terms of PF improvement in college students (Räsänen et al., 2016); furthermore, in terms of improvement of psychological distress in college students, it can be found that the within-group effect values (d) for participants in both the C-ACT and M-ACT groups from the baseline assessment to the postintervention assessment stage were smaller than those from the postintervention assessment to the follow-up assessment stage, suggesting that the C-ACT and M-ACT groups were more effective in improving PF among college students (Räsänen et al., 2016). The within-group effects of the C-ACT and M-ACT intervention programs on college students' psychological distress were smaller than the within-group effects from the postintervention assessment to the follow-up assessment stage, suggesting that the C-ACT and M-ACT intervention programs have good continuity in improving college students' psychological distress, which again demonstrates the potential of applying ACT to college student group interventions (Levin et al., 2014; Pan et al., 2023; Ritvo et al., 2021).

In addition, between-group effects analyses indicated that significant between-group differences in PF enhancement from the baseline assessment to postintervention assessment stage arose between participants in the C-ACT group and participants in the M-ACT group, and notably, enhancement of participants in the M-ACT group in this stage significantly interfered with C-ACT participants. ACT group participants, a result contrary to the underlying Hypothesis, which may be related to the abstract nature of the Confucian model of ethical practice and the theoretical model of self-development (WEN et al., 2023; Yongli & Yiping, 2021), as well as the incipient creation of the C-ACT intervention approach (Sheikhzadeh et al., 2021); on the other hand On the other hand, the results of the between-groups effect analysis also indicated that participants in the C-ACT group showed significantly higher improvement in the use of goal-related negative emotions for motivation than those in the M-ACT group in the postintervention assessment to follow-up assessment phase, a finding that suggests that Confucian values are effective in the improvement of acculturation for ACT of ACT, especially in the aspect of HARNESSING, which fully demonstrates the excellent effect of Confucian ethics as the basis of psychological intervention in dissipating adverse life events and stimulating individual motivation (Mou, 2005; Yongli & Yiping, 2021), and verifies the feasibility and validity of cross-cultural adaptive improvement of exotic intervention methods (Chang et al., 2016).

The present study is significant regarding the ACT intervention method of cross-cultural adaptation and group intervention for college students. On the one hand, the ACT intervention method based on the Confucian self-development theory and ethical practice model designed in this study incorporates Zeng Guofan's practices and techniques of cultivating the body in China's Qing Dynasty into the intervention plan scheme. It emphasizes daily practice, which has achieved good intervention results. This practice not only complements the limitations of the current ACT intervention practice and cultural adaptation in the Chinese college student population (Wang et al., 2017; Zhao et al., 2023) but also becomes another example of psychological intervention

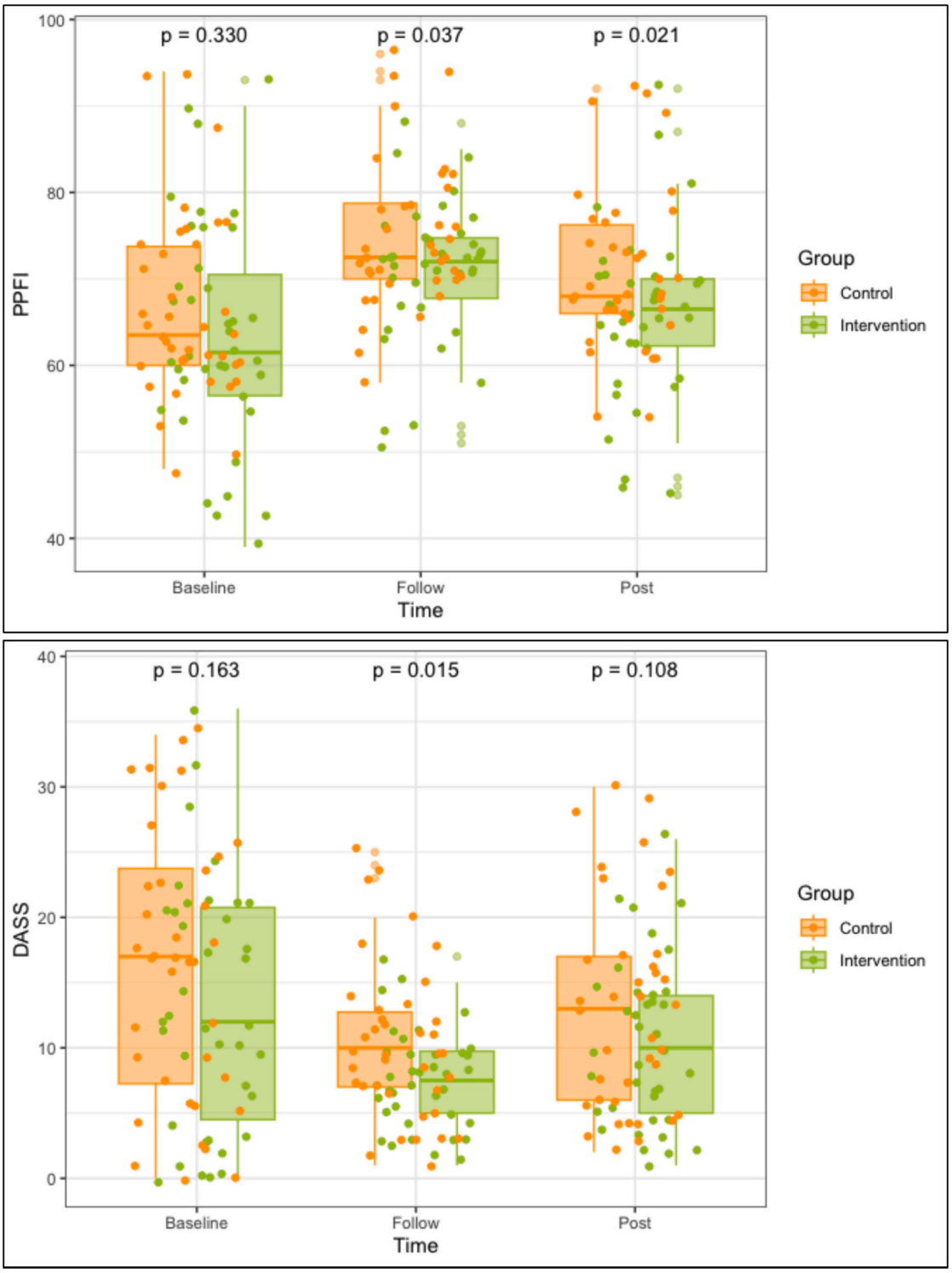

Fig. 3. Scatter Box Plot of the PPFI and DASS Scores.

practice of indigenous Chinese ethics after both the TCT methodology (Chang et al., 2016); on the other hand, this study has, this study created a new group intervention model in which social workers and counselors cooperated with students as coaches, with licensed social workers giving full play to their organizational and coordination skills and counselors giving full play to their psychological expertise, which significantly saves time and costs during face-to-face interventions, and promotes positive outcomes (Klimczak et al., 2023; Räsänen et al., 2016). At the same time, considering that Pharmacogenomic to Tailor Antidepressant Therapy hold significant potential for optimizing treatment, improving patient care, and reducing healthcare costs through preventive measures and personalized interventions (Huang & Pan, 2023), this study proposes solutions within the social sciences domain focusing on cultural adaptation and organizational system development, which may offer valuable insights.

This study has several limitations that suggest important directions for future research. First, the sample selection was demographically homogeneous, consisting solely of enrolled university students. Future

Table 5
Change Scores for Each Group and Comparisons of the Differences in Effect Size.

	PPFI								DASS							
	Total		Avoidance		Acceptance		Harnessing		Total		Stress		Anxiety		Depression	
	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT	CACT	MACT
T1–T2 score	4.12	5.96	1.49	2.17	1.34	2.33	1.06	1.98	2.70	3.22	0.93	1.15	0.89	1.01	1.03	0.76
mean (SE)	(0.58)	(0.74)	(0.33)	(0.55)	(0.38)	(0.52)	(0.31)	(0.44)	(0.80)	(0.77)	(0.30)	(0.36)	(0.32)	(0.29)	(0.33)	(0.35)
Effect Size (d)	0.45*		0.24		0.35		0.39		0.11		0.11		0.06		0.13	
T1–T3 score	9.29	9.98	3.45	4.19	2.79	3.06	3.20	2.76	5.37	5.99	2.54	1.15	1.47	2.15	2.22	1.63
mean (SE)	(1.00)	(1.01)	(0.57)	(0.59)	(0.55)	(0.68)	(0.55)	(0.47)	(1.23)	(1.18)	(0.38)	(0.26)	(0.49)	(0.40)	(0.49)	(0.46)
Effect Size (d)	0.11		0.13		0.07		0.14		0.08		0.19		0.25		0.20	
T2–T3 score	5.17	4.02	1.96	2.03	1.45	0.73	2.14	0.77	2.67	2.77	1.15	1.38	0.58	1.14	1.19	0.87
mean (SE)	(0.76)	(0.65)	(0.41)	(0.29)	(0.42)	(0.35)	(0.40)	(0.39)	(0.69)	(0.75)	(0.26)	(0.23)	(0.32)	(0.31)	(0.30)	(0.32)
Effect Size (d)	0.26		0.03		0.30		0.57*		0.02		0.15		0.29		0.17	

Note:Cohen's d (Effect size) was obtained by dividing the difference in change by the pooled baseline standard deviation. *p*-values are for one-sided tests of the intervention effect, i.e., Hypothesis: change in CACT > change in MACT. *p < 0.05, **p < 0.01, ***p < 0.001.

research should broaden the scope of intervention participants to include other youth populations, to assess the generalizability of C-ACT; Second, at baseline, this study did not take into account the varying levels of familiarity among participants with ACT or mindfulness practices during the recruitment of researchers. Future, when designing the intervention, it is crucial to consider the differences in participants' familiarity with ACT or mindfulness practices. Additionally, utilizing scales to measure this familiarity during the grouping process would help mitigate potential influences on the intervention outcomes; Third, while this study employed innovative intervention methods and organizational structures, it also exhibited a high dropout rate. This may be related to the complexity of the ethical and methodological aspects of C-ACT and M-ACT, as well as the academic pressures faced by university students (Räsänen et al., 2016; Wen et al., 2023). Future studies should focus on establishing participant management systems and optimizing intervention programs to improve participant retention. This could involve offering more flexible intervention schedules, providing additional incentives for participation, and enhancing communication with participants; Fourth, the intervention process may have been affected by potential inter-group contamination, as participants in the C-ACT and M-ACT groups may have exchanged information after the intervention sessions. Future research should employ more objective assessment methods to mitigate this potential bias. Examples of such methods include physiological measures (e.g., cortisol levels, heart rate variability), behavioral observations, and neuroimaging techniques; Finally, this study only investigated the impact of C-ACT and M-ACT on psychological flexibility and psychological distress. Future research is needed to explore the effects of these interventions on other domains of mental health, such as sleep quality, self-esteem, coping styles, and interpersonal relationships. It would also be valuable to further investigate the specific relationship between psychological flexibility and these other mental health outcomes. In particular, future studies should examine the mediating role of psychological flexibility in the relationship between C-ACT and improvements in various aspects of mental health.

7. Conclusion

The results of this study support the use of C-ACT as a feasible psychological intervention to improve PF and psychological distress among Chinese university students. The ACT intervention based on Confucian self-development theory and ethical practice model extends the theoretical and applicability of existing third-wave cognitive therapies, and in mainland China in particular, the ACT approach has demonstrated significant strengths in coping with adverse life events and transforming them into developmental motivation. Meanwhile, the support of applied psychology and social work students for the intervention program and the group psychosocial intervention is a promising intervention that is both cost-effective and efficient and can be integrated into the daily intervention procedures of university counseling centers. Future research should explore the feasible ways the ACT approach can be applied to other groups in mainland China and continue to deepen the exploratory research on the mechanisms and pathways that generate the effects of psychological interventions.

CRediT authorship contribution statement

Yaping Zhou: Writing – review & editing, Writing – original draft, Funding acquisition, Data curation, Conceptualization. **Xiaochen Wen:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis. **Siyi Han:** Resources. **Yinan Li:** Software. **Yue Lv:** Supervision. **Qiushan Li:** Visualization, Validation, Project administration.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Lanzhou University No.1 Hospital (Approval No.: LDYYLL-2023-535).

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Declaration of competing interest

The authors report no conflicts of interest in this work.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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