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Review article

Acceptance and Commitment Therapy (ACT) to reduce depression: A systematic review and meta-analysis

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ABSTRACT

Objectives: The aim of this study is to investigate the effectiveness of ACT on depression reduction and further examine the relationship between different follow-up periods, different degree of depression, and different age of patients through subgroup analysis.
Methods: Relevant electronic databases were searched from Jan 2010 to Aug 2018, including CNKI, WANFANG, PubMed, EMBASE, Cochrane Library, PsycINFO. Two reviewers independently screened for eligible studies, extracted data, and assessed risk of bias of the included studies. The Cochrane Collaboration's bias assessment tool was used to evaluate the risk of bias for included studies, and Review Manager 5.3 Software for the meta-analysis
Results: 18 studies with 1,088 participants were included in the review. Four studies were rated as high-quality studies, and the remaining 14 studies were rated as moderate quality studies. ACT significantly reduced depression as compared with the control group [SMD = 0.59, 95% CI (0.38, 0.81)]. The subgroup analysis found a significant difference between ACT and control group after post-intervention, three months follow up, mild depression group and adults group, [SMD= 0.62, 95% CI (0.35, 0.90), [SMD= 0.55, 95% CI (0.23, 0.87)], [SMD= 0.65, 95% CI (0.40, 0.91)], [SMD= 0.52, 95% CI (0.33, 0.71)] respectively.
Limitations: The heterogeneity between included studies results in heterogeneity of the results. Most of the specific methods for random sequence generation and allocation concealment were not clear. The search results had limitations since only the published studies in Chinese and English were searched and lacked a search for gray and paper documents.
Conclusions: The current study suggested that ACT was significantly for reducing depressive symptoms compared with the control group, especially at three months of follow-up, adult group and mild depression. More research is needed to investigate the difference effects for minor group, moderate and severe depression and long-term follow-up.

1. Introduction

At the global level, approximately 322 million people, which is 4.4% of the world's population, are suffering from depression (World Health Organization, 2017). Depression is a common mental disorder, characterized by persistent sadness and a loss of interest in activities that people normally enjoy, accompanied by an inability to carry out daily activities, for at least two weeks (Kim et al., al.,2015; World Health Organization, 2018). In addition, people with depression normally have several of the following symptoms: a loss of energy, anxiety, feelings of worthlessness, guilt or even having thoughts of self-harm or suicide (American Psychiatric Association, 2013). Fortunately, depression can be treated by taking antidepressant medication, going to therapies, or a combination of these treatments (World Health Organization, 2018). Antidepressants are used to treat clinical depression, and are usually taken in tablet form. There are several different types of antidepressants, and the most widely prescribed types are selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs). (The National Health Service, 2018). Antidepressants aim to correct chemical imbalances of neurotransmitters in the brain that are believed to be responsible for changes in mood and behavior (Medical News Today, 2018). If a patient feels little or no relief of the symptoms after taking antidepressants for several weeks, his or her psychiatrist can alter the dose of the medication, add another antidepressant, or replace it with a new antidepressant (American Psychiatric Association, 2018).

Antidepressants can be an effective form of intervention for depressive symptoms, but they may also cause side effects. Some studies suggest that psychotherapy such as cognitive behavior therapy (CBT) is safer than drugs and has equal efficiency (Dines et al., 2014; Felice

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et al., 2015; Lazar, 2014; Rodgers et al., 2012). Acceptance and Commitment Therapy (ACT), whose ultimate goal is to improve psychological flexibility, is a representative treatment in the third wave of CBT (Hayes et al., 1999). ACT is a psychological therapy that encourages participants to change their relationships with their thoughts and physical sensations through mechanisms of acceptance, mindfulness and value-based action (Hayes, 2004). ACT is a transdiagnostic psychotherapeutic intervention, based on the Relational Frame Theory (Barnes-Holmes and Roche, 2001). The overall goal of ACT is to increase psychological flexibility, which is the ability to be mindful of experiences in the present moment, in an accepting and nonjudgmental way, while behaving consistently with one's values, even when one's thoughts and feelings oppose taking valued action (Levin et al., 2014). To foster psychological flexibility, according to Grégoire et al. (2017), ACT relies on six interrelated and overlapping processes: acceptance (i.e., willingness to open fully to unwanted experiences such as difficult thoughts, memories, or emotions), contact with the present moment (i.e., being mindful and aware of one's experiences), self as context (i.e., maintaining perspective about oneself within one's experiences), cognitive defusion (i.e., being able to step back from unwanted experiences without getting stuck in them), committed action (i.e., engaging in actions that move toward important aspects of life), and values (i.e., staying connected to personal values or areas of life that are important).

There have been a number of systematic reviews on ACT during the last decade focusing on a variety of diseases, including psychological and physiological illnesses (e.g., Swain et al., 2013; Hann and McCracken, 2014; Montgomery et al., 2011). Previous systematic reviews investigating populations with depression/anxiety have provided evidence for the effectiveness of ACT as a psychological intervention for depression (e.g., Jiménez et al., 2012; Powers et al., 2009), but only one of them looked at randomized control trials (RCTs; Hacker et al., 2016), and the authors found that ACT had at least moderate pre-post effects for symptom reduction for both anxiety and depression. However, Hacker et al. (2016) did not conduct subgroup analysis in terms of follow up and degree of depression.

During the last four years, there has been a strong increase in RCTs investigating the efficiency of ACT for depression: 181 participants were enrolled in three studies published in 2015 (Gao and He, 2015; Moghanloo et al., 2015; Losada et al., 2015), 334 participants in four studies in 2017 (Wang et al., 2017; Zhang et al., 2017; Grégoire et al., 2017; Davoudi et al., 2017), and 126 participants in two studies published in 2018 (A-Tjak et al., 2018; Gonzalez-Fernandez et al., 2018). This means that a large number of RCTs on ACT for depression has never been included in a systematic review. Therefore, it is necessary to conduct an updated systematic review and meta-analysis synthesizing evidence of the efficacy of ACT for depression in terms of follow-up time, degree of depression, and age of patients through subgroup.

2. Methods

2.1. Search strategy

The current review updated and added to Hacker et al. (2016). We searched studies published in the Chinese and English languages. The following electronic databases were searched for eligible studies published from Jan 1, 2010 to Jun 4, 2018: CNKI, WANFANG, PubMed, EMBASE, Cochrane Library, and PsycINFO. The search strategy was modified slightly for different databases. Search terms were as follows: Acceptance and Commitment Therapy/ACT, Depress*/Dysthymi*/Adjustment Disorder*/Mood Disorder*/Affective Disorder/Affective Symptoms, Clinical Trials as Topic/Clinical Trial/Random*. The searching strategy for PubMed can be found in Appendix 1.

2.2. Inclusion and exclusion criteria

Eligible studies were randomized controlled trials (RCTs) with the following inclusion criteria: (1) participants were diagnosed with depression using professional scales (e.g., Hamilton depression scale, Montgomery and Asberg Depression Rating Scale), regardless of the ethics, gender or age of participants; (2) intervention treatment consisted of ACT without other types of treatment, and the forms of ACT treatment were as follows: individual or group; face to face rather than Internet-based; (3) The comparison group included active interventions (e.g., CBT) and conventional control measures (e.g., a waiting list control); and (4) depression was the primary outcome, measured by depression rating scales. Duplicates and studies that use other interventions with ACT were excluded. In addition, studies were excluded if important and relevant data could not be obtained, even after the authors were contacted. Only studies using standardized measures of depression were included, and studies using diagnostic interviews conducted by professionals were excluded.

2.3. Screening and data extraction

Studies were selected following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009). Studies were screened independently by two reviewers, and any disagreement was resolved by discussion between the two reviewers. If consensus could not be reached, a third reviewer was consulted. The titles and abstracts identified by the search were reviewed independently by the two reviewers. Articles were screened and selected for full-text review if they met the selection criteria.

Data extraction followed the Cochrane's guidelines for systematic reviews (Higgins et al., 2011). Two reviewers extracted data separately, and any disagreement was resolved by discussion or consultation with a third reviewer. The following study information was recorded: year of publication, characteristics of participants, sample size, specific treatment for the intervention and control groups, rating scales, and follow-up. Authors were contacted to obtain missing or unclear data for further analyses.

2.4. Assessment of risk of bias

Based on Zeng et al. (2015), which systematically reviewed the methodological assessment tools for pre-clinical and clinical studies, in the current study, the Cochrane Collaboration's tool was used to assess risk of bias (Higgins et al., 2011). Two reviewers carried out the assessment independently according to six domains: random sequence generation, allocation concealment, adequacy of blinding, completeness of outcome data, selectively reporting, and other biases. Each item was labeled as having high, low, or unclear risk of bias. Disagreement was resolved through group discussion among the authors.

2.5. Data analysis

Data were analyzed using Review Manager (RevMan) version 5.3(Cochrane Collaboration,2014). Chi-square test was used to assess heterogeneity among the studies included, and meta-analysis was conducted using the random effects model due to differences between the individual RCTs, as well as the fact that all studies included were published papers and the conclusion of this study would be dissimilated to other fields (Borenstein et al., 2005). For continuous data, giving the heterogeneity of included studies in terms of outcome measurements, follow up of intervention, the SMD (standardized mean difference) was chosen for analyses. The funnel plot was analyzed to investigate the possibility of publication bias.

3. Results

3.1. Screening and selection of studies

The initial search yielded 702 records from the Chinese and English databases; additional 13 records were obtained through reference tracking. After removing 175 duplicates, we performed abstract screening based on the remaining 540 records and 40 studies were

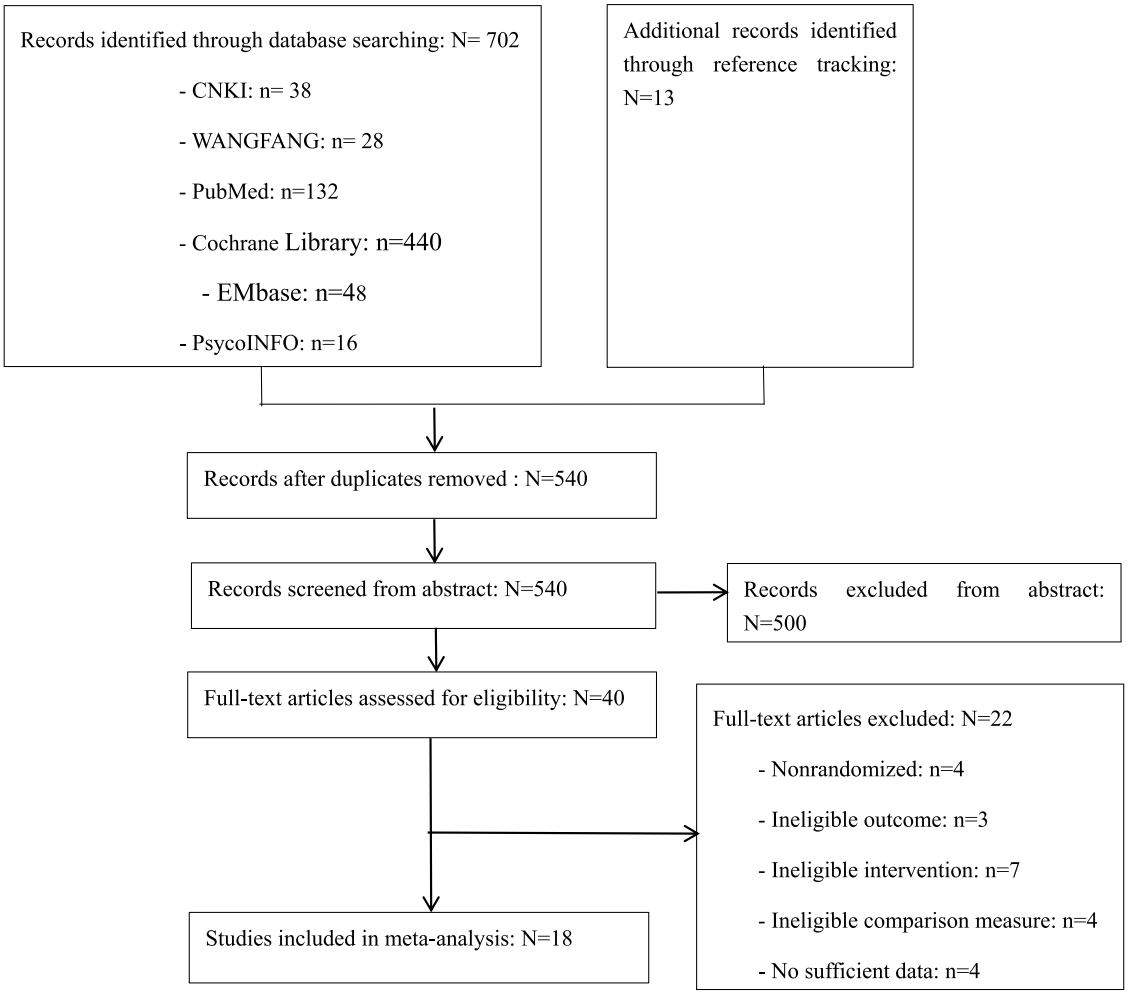

Fig. 1. PRISMA flow diagram of the study.

assessed for eligibility. After reading the full text, 22 papers were excluded:4 of them were dropped for non-randomization, 3 for not operationalizing depression as the main outcome, 7 for conducting ineligible intervention, 4 for conducting ineligible comparison measure, and 4 for lacking sufficient data for meta-analysis. Eighteen studies met inclusion criteria and were included in the final meta-analysis. The process of study selection following PRISMA guidelines was illustrated in Fig. 1. The kappa agreement was 0.81 between two reviewers in terms of data extraction and risk of bias assessment.

3.2. Characteristics of included studies

Table 1 contains the summary of the main characteristics of the eligible studies. The studies included were from China (Gao and He, 2015; Wang et al., 2017; Zhang et al., 2017), Canada (Grégoire et al., 2017), Netherlands (A-Tjak et al., 2018), Spain ((Losada et al., 2015; Gonzalez-Fernandez et al., 2018; Alonso-Fernández et al., 2013), Iran (Moghanloo et al., 2015; Davoudi et al., 2017; Mojtabaie and Asghari, 2014), Australia (Smout et al., 2010; Hayes et al., 2011; Livheim et al., 2014), Sweden (Folke et al., 2012), the UK (Mccracken et al., 2013; Clarke et al., 2014) and Finland (Kohtala et al., 2015), with a total of 1088 participants. These studies differed in the participants' basic condition, diagnosis, sample size, measurement tools, and follow-up. The largest sample consisted of 144 participants (Grégoire et al., al.,2017), and the smallest 16 (Alonso-Fernández et al., 2013). Fourteen studies reported the impact on participants of ACT intervention (Moghanloo et al., 2015; Losada et al., 2015; Grégoire et al., 2017; Davoudi et al., 2017; A-Tjak et al., 2018; Gonzalez-Fernandez et al., 2018; Alonso-Fernández et al., 2013; Mojtabaie and Asghari, 2014; Hayes et al., 2011; Livheim et al., 2014; Folke et al., 2012; Mccracken et al., 2013; Clarke et al., 2014; Kohtala et al., 2015). Four studies evaluated the impact of a three-month follow-up (Wang et al., 2017; Smout et al., 2010; Hayes et al., 2011; Mccracken et al., 2013). Five studies evaluated the impact of a six-month follow-up (Losada et al., 2015; Zhang et al., 2017;. A-Tjak et al., 2018; Smout et al., 2010; Clarke et al., 2014). The participants of seven studies were diagnosed with mild depression (Losada et al., 2015; Wang et al., 2017; Zhang et al.,2017; Davoudi et al., 2017; Gonzalez-Fernandez et al., 2018; Livheim et al., 2014; Folke et al., 2012). The participants of three studies were diagnosed with moderate and severe depression (Wang et al., 2017; A-Tjak et al., 2018; Hayes et al., 2011). Three studies looked at minor groups (i.e., professionals under the age of 18; Moghanloo et al., 2015; Livheim et al., 2014; Hayes et al., 2011), while the remaining 15 studies focused on adults (Gao and He, 2015; Wang et al., 2017; Zhang et al., 2017; Davoudi et al., 2017; A-Tjak et al., 2018; Grégoire et al., 2017; Gonzalez-Fernandez et al., 2018; Alonso-Fernández et al., 2013; Smout et al., 2010; Folke et al., 2012; Mccracken et al., 2013; Losada et al., 2015; Grégoire et al., 2017; Mojtabaie and Asghari, 2014; Clarke et al., 2014; Kohtala et al., 2015). The characteristics of participants, control groups and outcomes can be found in Table 1.

3.3. Quality assessment of included studies

Eighteen studies included in the current review were evaluated for quality according to the Cochrane Handbook RCT methodological

Table 1
Characteristics of included studies.

Author, year	Country	Sample size	Participants	Intervention	Control	Rating scale	Length of follow up	Length of ACT sessions
Wang et al. (2017)	China	60	type of patients: female infertility, depression level: moderate or above age:16–55	ACT	TAU	HAMD MADRS	four weeks/eight weeks/three months/12 months	/
Zhang et al. (2017)	China	60	type of patients: type 2 diabetes depression level: mild or above age: 35–78	ACT	TAU	HAMD	six months	/
Gao and He (2015)	China	60	type of patients: Tinnitus lasted more than 6 months depression level: / age: over 18	ACT	CBT	HADS	ten weeks/six months/18 months	10 weeks, (once a week of 60 min)
A-Tjak et al. (2018)	Netherlands	82	type of patients: / Depression level: major depressive disorder age: 18–65	ACT	CBT	HDRS-17 QIDS	six months	First 8 weeks(once a week of 45–55 min);16–24 weeks(once every 2 weeks of 45–55 min)
Grégoire et al. (2017)	Canada	144	type of patients: university students depression level:/ age:a mean age of 31.72	ACT	WLC	PHQ-9	/	4 weeks (once a week of 150mins)
Gonzalez-Fernandez et al. (2018)	Spain	44	type of patients: cancer patients, depression level: mild depression, age:34–62	ACT	CG	HADS	/	12 weeks (once a week of 90 min)
Davoudi et al. (2017)	Iran	70	type of patients: male smokers, Depression level: mild depression, age:18–40	ACT	TAU	BDI	six weeks	8 weeks (once a week of 90-min)
Moghanloo et al. (2015)	Iran	34	type of patients: diabetes depression level:/ age:7–15	ACT	CG	RCDS	/	10 weeks (once a week of 90 min)
Losada et al., al.(2015)	Spain	87	type of patients: dementia family caregivers depression level: mild depression age:over 18	ACT	CG	CES–D	six months	8 weeks (once a week of 90 min)
Smout et al. (2010)	Australia	104	Type of patients: methamphetamine users depression level:/ age:16–65	ACT	CBT	BDI-II	three months/six months	12 weeks(once a week of 60-min)
Hayes et al. (2011)	Australia	38	type of patients:/ depression level: moderate to severe age:12–18	ACT	TAU	RADS-2	three months	/
Folke et al. (2012)	Sweden	35	type of patients: unemployed individuals on long–term sick leave due to depression depression level:/ age:18–65	ACT	CG	BDI	18 months	/
Alonso-Fernández et al. (2013)	Spain	16	type of patients: older people with chronic pain living in nursing homes depression level:/ age:71–91	ACT	CG	GDS-10	/	5 weeks (twice a week of 120 min each)
Mccracken et al. (2013)	UK	73	type of patients: persistent pain of longer than 3 months' duration depression level:/ age:23–86	ACT	TAU	PHQ-9	three months	2 weeks (three times a week of 60 min each first, then once a week)
Clarke et al. (2014)	UK	39	type of patients: personality disorder depression level:/ age: a mean age of 43.46	ACT	TAU	BDI-II	six months	16 weeks (once a week of 120 min)
Livheim et al. (2014)	Australia	55	type of patients: mild to moderate depression adolescent depression level: mild to moderate age:12–18	ACT	TAU	RADS-2	/	8 weeks

(*continued on next page*)

Table 1 (*continued*)

Author, year	Country	Sample size	Participants	Intervention	Control	Rating scale	Length of follow up	Length of ACT sessions
Mojtabaie and Asghari, 2014	Iran	30	type of patients: women with breast cancer depression level: mild depression age: over 18	ACT	CG	BDI-II	/	8 sessions of 45–60 min each
Kohtala et al. (2015)	Finland	57	type of patients: self-reported depressive symptoms depression level:/ age: a mean age of 46.2	ACT	WLC	BDI	/	4 sessions of 60 min each

Notes: ACT, acceptance and commitment therapy; CBT, cognitive behavior therapy; CG, Control Group; TAU, Treatment as usual; HAMD, Hamilton depression scale; MADRS, Montgomery and Asberg Depression Rating Scale; HADS, Hospital Anxiety and Depression Scale; HDRS-1, Hamilton depression rating scale; QIDS, Quick Inventory of Depressive Symptomatology; PHQ-9, Patient Health Questionnaire; BDI: Beck Depression Inventory; BDI-II, Beck Depression Inventory-II; RCDS, Reynolds' Child Depression Scale; CES-D, Center for Epidemiologic Studies-Depression; RADS-2, The Reynolds Adolescent Depression Scale-2; GDS-10, the Geriatric Depression Scale; /, Not mention.

Fig. 2. Quality assessment of included studies.

quality evaluation criteria. Four studies (Losada et al., 2015; Davoudi et al., 2017; A-Tjak et al., 2018; Mccracken et al., 2013) were rated as of high quality and met the quality assessment criteria of three RCTs. The remaining 14 studies (Gao and He, 2015; Moghanloo et al., 2015; Wang et al., 2017; Zhang et al., 2017; Grégoire et al., 2017; Davoudi et al., 2017; Gonzalez-Fernandez et al., 2018; Alonso-Fernández et al., 2013; Mojtabaie and Asghari, 2014; Hayes et al., 2011; Livheim et al., 2014; Mccracken et al., 2013; Clarke et al., 2014; Kohtala et al., 2015) were rated as of moderate quality and only met the criteria for quality evaluation of two RCTs. The quality of the studies included was summarized in Fig. 2.

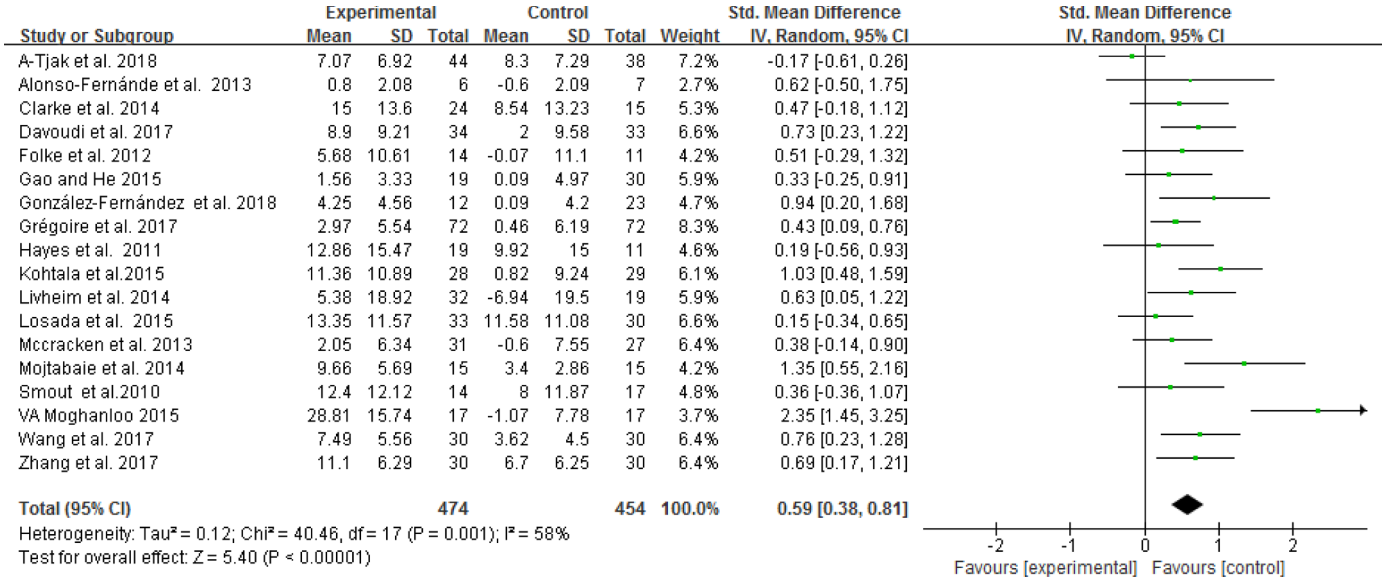

Fig. 3. Meta-analysis of ACT on depression reduction.

3.4. The results of meta-analysis

3.4.1. Meta-analysis of ACT on depression reduction

Eighteen RCTs assessed the effects of ACT on depression. The meta-analysis took the first measurement after treatment and included 928 participants. Meta-analysis of the random effects model showed that ACT reduced depression compared with the control group, and the difference was statistically significant, SMD = 0.59, 95% CI = 0.38, 0.81, $p < .00001$, $I^2 = 58\%$. Detailed information can be found in Fig. 3.

3.4.2. Meta-analysis of depression reduction at different follow-up

Seventeen RCTs (1137 participants) measured the effects of ACT on depression in three different follow-up dimensions, including post-test, three months, and six months. Follow-up subgroup analysis indicated that follow-up was not the source of heterogeneity (test for subgroup difference $I^2 = 18.4\%$). After the intervention, the difference was statistically significant (SMD = 0.62, 95% CI = 0.35, 0.90, $p < .00001$, $I^2 = 66\%$]; at three months, the difference was statistically significant (SMD = 0.55, 95% CI = 0.23, 0.87, $p = 0.0008$, $I^2 = 0$); at six months, the difference was not statistically significant. Depressive symptoms reduced significantly after intervention and at three months of follow-up, but the effect decreased over time and no reduction was observed at six months of follow-up. Detailed information can be found in Fig. 4.

3.4.3. Meta-analysis of depression reduction in patients with different degrees of depression

Ten RCTs ($N = 503$) were used to calculate the effects of ACT on depression in patients with different degrees of depression. Degrees of depression subgroup analysis indicated that the degree of depression was not the source of heterogeneity (test for subgroup difference $I^2 = 31.9\%$). For mild depression, the difference was statistically significant (SMD = 0.65, 95% CI = 0.40, 0.91, $p < .00001$, $I^2 = 21\%$]. For moderate and severe depression, the difference was not statistically significant. ACT was effective on patients with mild instead of moderate or severe depression, as shown in Fig. 5.

3.4.4. Meta-analysis of depression reduction in patients of different ages

Eighteen RCTs ($N = 928$) measured the effects of ACT on reducing depression in patients with different ages. Ages subgroup analysis indicated that degrees of depression was not the source of heterogeneity (test for subgroup difference $I^2 = 0\%$). For adult group with depression, differences were statistically significant (SMD = 0.52, 95% CI = 0.33, 0.71, $p < 0.00001$, $I^2 = 40\%$); for minor group with depression, the difference was not statistically significant (SMD = 1.02, 95% CI = −0.11, 2.15, $p = 0.08$, $I^2 = 86\%$). Therefore, ACT was effective for adult depression while ineffective for minor group with depression, as shown in Fig. 6.

3.5. Publication bias

A funnel plot was drawn to investigate the possibility of publication bias. The funnel plot for publication bias showed no obvious asymmetry, indicating that the pooled results were not influenced by the publication bias (see Fig. 7).

4. Discussion

4.1. Summary of findings

The current systematic review included 18 RCTs with a total of 1088 participants. Four (Losada et al., 2015; Davoudi et al., 2017; A-Tjak et al., 2018; Mccracken et al., 2013) of the 18 studies were evaluated as high quality studies, and the remaining 14 studies (Gao and He, 2015; Moghanloo et al., 2015; Wang et al., 2017; Zhang et al., 2017; Grégoire et al., 2017; Davoudi et al., 2017; Gonzalez-Fernandez et al., 2018; Alonso-Fernández et al., 2013; Mojtabaie and Asghari, 2014; Hayes et al., 2011; Livheim et al., 2014; Mccracken et al., 2013; Clarke et al., 2014; Kohtala et al., 2015) were evaluated as moderate quality studies. The results of the meta-analysis showed that ACT was effective in relieving depression compared with the control group. Depressive symptoms relieved significantly after intervention and at three months of follow-up, but the effects decreased after that, with no difference found between two groups at six months of follow-up. ACT was effective for patients with mild depression, while ineffective for those with moderate or severe depression. ACT was an effective intervention for adults with depression, but not for minors. This meta-analysis offered a comprehensive understanding of the current state of evidence for ACT in relieving depressive symptoms and provided insights into future services and researches.

4.2. Strengths and limitations

The present study is a systematic review further investigating the efficacy of ACT for different degrees depression, different ages of patients, and follow-up through subgroup analysis. So far there has been only one systematic review and meta-analysis of RCTs on the effects of

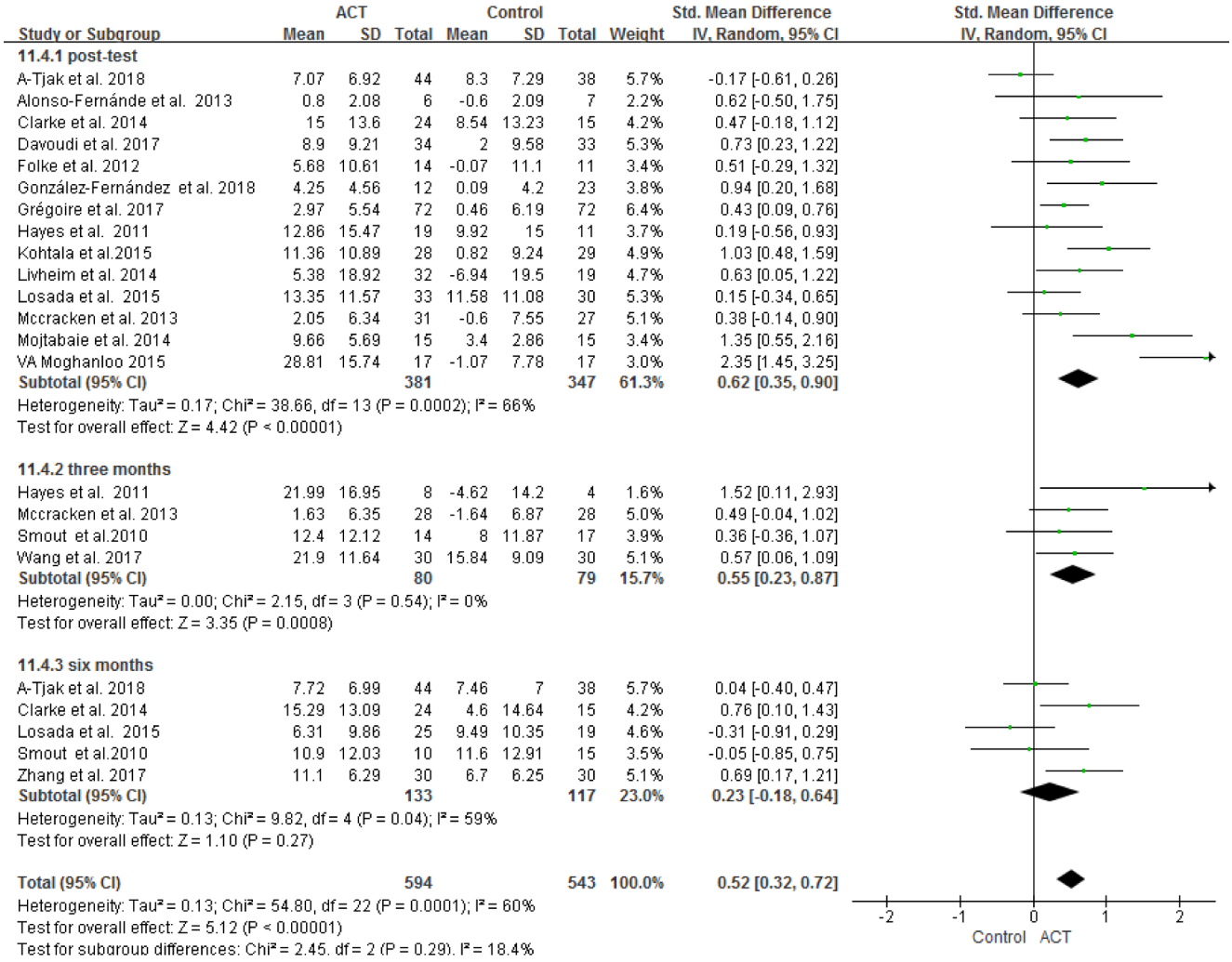

Fig. 4. Meta-analysis of depression reduction at different follow-up.

ACT on depression, which concluded that ACT can effectively treat depression and anxiety (Hacker et al., 2016).

The current review is an updated systematic review investigating the efficacy of ACT for different degree depression. While there are a number of trials conducting ACT on patients with depression at different ages with follow-up, no systematic review so far looked at how

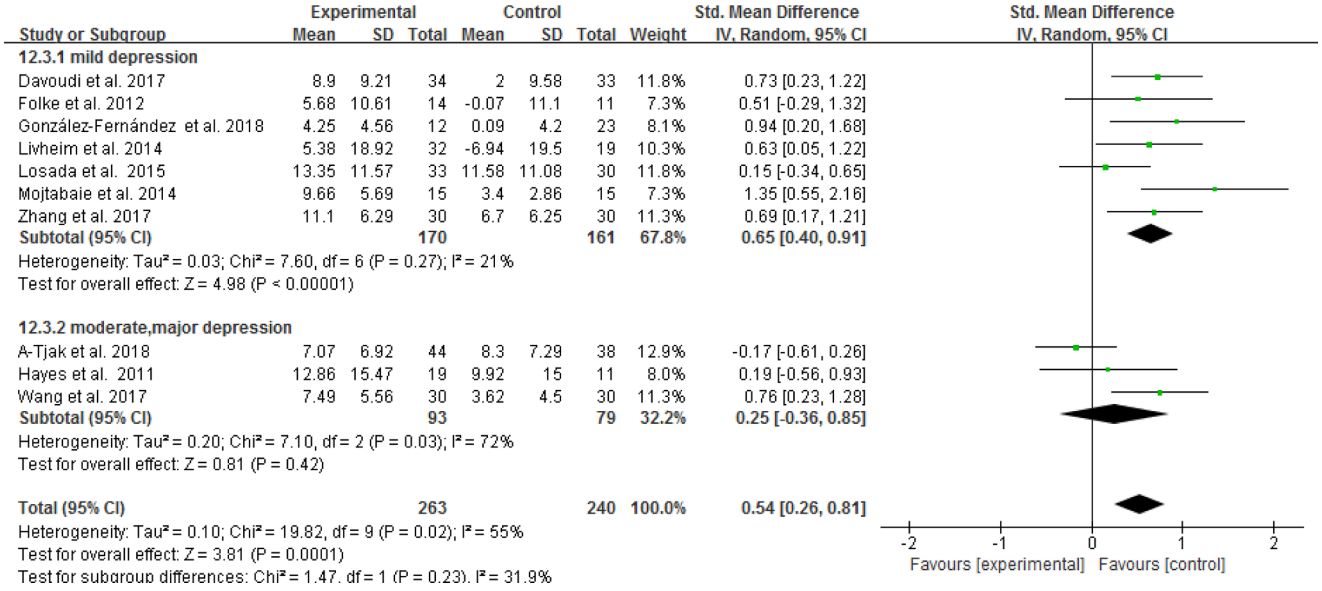

Fig. 5. depression reduction in patients with different degrees of depression.

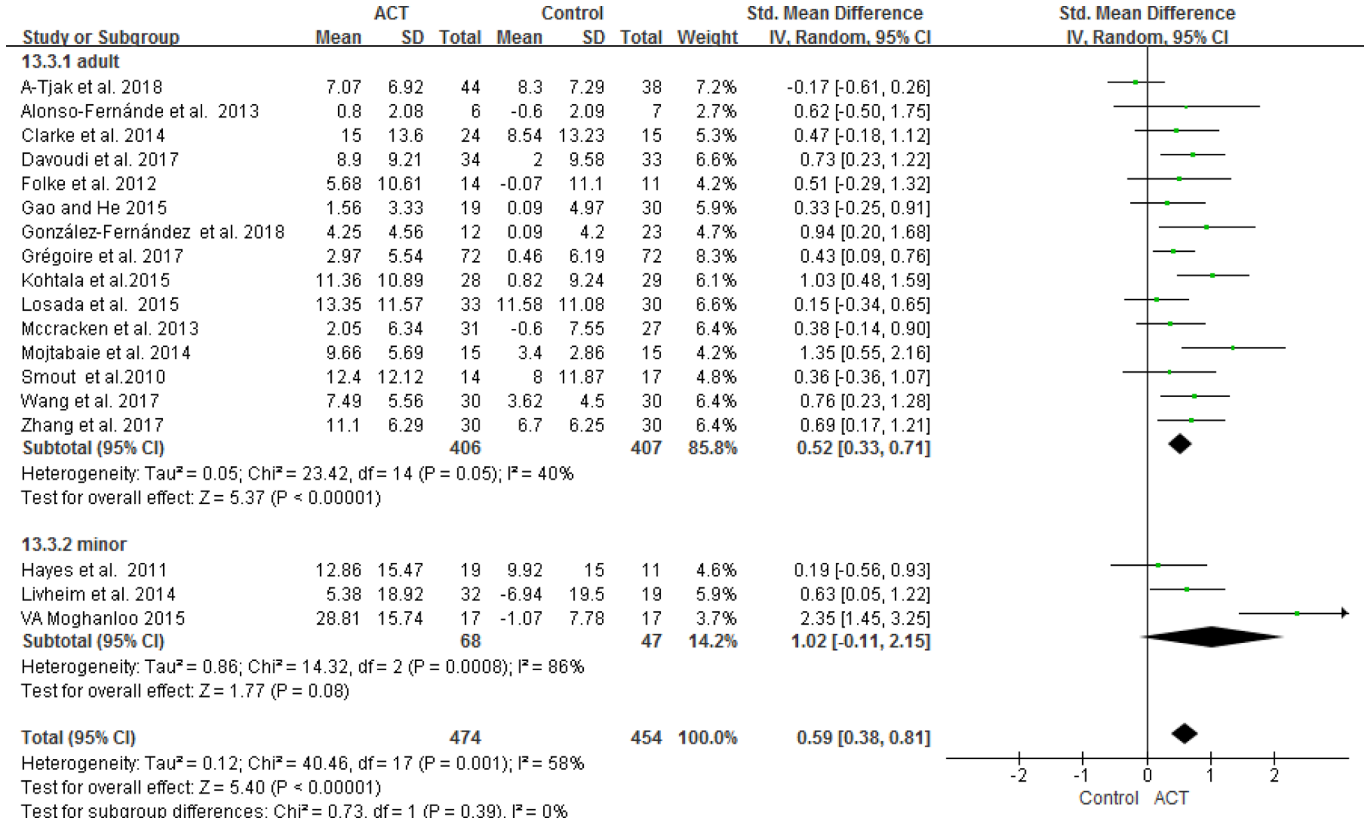

Fig. 6. Meta-analysis of depression reduction in patients of different ages.

different ages and follow-up would influence the effects of ACT on relieving depression symptoms.

The current study also further investigated the efficacy of ACT for different degrees of depression, different ages of patients and follow-up through subgroup analysis. Hacker et al. (2016) showed that there was a significant relief of depressive symptoms after ACT intervention, and interventions were more effective for moderately depressed people. Based on this finding, the current study subdivided the degrees of depression in people with mental disorders and discussed the effects of ACT on patients with different severity of depression. The current study found that the ACT was effective only for patients with mild depression, but not those with moderate or severe depression. Therefore, future research should consider further exploring the efficiency of ACT in patients with different degrees of depression.

The current study had three limitations. Firstly, the heterogeneity between the studies included, such as characteristics of the population, the diagnostic results, the sample size, the measurement tools, and the follow-up, may have caused the heterogeneity of the results. The sources of heterogeneity was not fully explored as the information we had (see Table 1) was very limited. Secondly, most of the specific methods for random sequence generation and allocation concealment

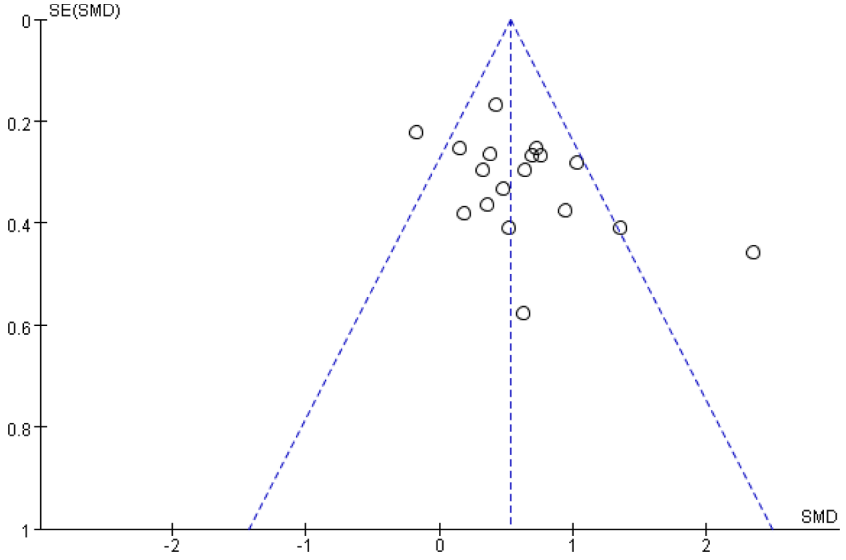

Fig. 7. Publication bias of included studies.

were not clear, and it was not explicitly mentioned whether blinding of subjects, testers, and outcome assessors were operated, resulting in implementation bias and measurement bias. Thirdly, only published studies in Chinese and English were searched, leading to a lack of gray and paper documents in the current review. The literature search was also limited as a hand search of journals was not conducted. The authors failed to contact researches in the field for potential non-published studies, because the authors of this paper were only able to communicate in English and Chinese. This may have induced study selection bias. We recommend that future systematic reviews should include gray literature, unpublished literature and contact experts in this field for new studies.

4.3. Implications

Practically, ACT can be conducted in research of depressive symptoms, which can promote mental health management in patients with depressive symptoms, relieve depressive symptoms, and improve quality of life. ACT can not only treat typical mental illnesses, but also help in non-clinical applications such as daily life. Clinicians often need to use different forms of knowledge to assess the symptoms and the needs of their clients to determine interventions. Since this study has found that ACT was effective in relieving depressive symptoms, clinicians can now directly use the therapy to intervene according to the actual situation, so as to improve service efficiency and effects. ACT can only be conducted by professional psychologists, so the practice or popularization of ACT is bound up with medical institution and professional psychologists. ACT was effective in patients with mild depression, but not in patients with moderate or severe depression. We suggest more shrinks use ACT for mild depression patients in the practice. While the practice of ACT is kind of limited, it's possible that the combinations of antidepressants and ACT are more effective for moderate or severe depression. Depressive symptoms were relieved significantly after ACT intervention and at three months of follow-up, but the effects decreased eventually, and no difference was found between two groups at six months of follow-up. Thus, a potential benefit of ACT over existing treatments is its potential to remain effective over a longer period of time. ACT was an effective intervention for depressed adults but not minors. Therefore, larger trials of ACT for the treatment of adolescent depression should be carried out to further evaluate the effects of ACT for depressed adolescents.

In the future, researchers should pay more attention to the quality of their studies, for example, by clarifying random sequence generation and allocation concealment. The following types of systematic reviews are urgently needed to be carried out: systematic review of different populations and different symptoms by ACT, systematic assessment of other interventions that alleviate depressive symptoms, comparisons of the effects of different interventions, and whether comprehensive interventions (e.g., a combination of antidepressants and ACT) are more effective than a single type of intervention.

5. Conclusion

The current study found that ACT was positive for relieving depression compared with the control group. For patients with mild depression and depressed adults, depressive symptoms reduced significantly immediately after the intervention as well as at the three months of follow-up. Given the fact that many of the studies included in the current review were only of moderate quality, more high quality studies are needed for the investigation of the effects of ACT for adolescents, patients with moderate and severe depression, as well as long-term follow-up.

CRediT authorship contribution statement

Bai Zhenggang: Conceptualization, Data curation, Writing - original draft. **Luo Shiga:** Data curation, Formal analysis, Writing - original draft. **Zhang Luyao:** Methodology, Writing - original draft. **Wu Sijie:** Software, Formal analysis. **Chi Iris:** Supervision, Writing - original draft.

Declaration of Competing Interest

There is no conflict of interests.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.09.040.

Appendix 1. Literature Searching Strategy(Pubmed)

1. depressive disorder.mp. or exp Depressive Disorder/
2. exp Depression/ or depression.mp.
3. depress*.mp.
4. bipolar depression.mp. or exp Bipolar Depression/
5. exp mood disorders/
6. dysthym*.mp.
7. ((mood or affective*) adj3 disorder*).mp.
8. (bipolar or manic or mania or hypomani*.tw.
9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10. Acceptance and Commitment Therapy.mp
11. ACT*.mp.
12. 11 or 10
13. 9 and 12
14. animals/not humans/
15. 13 not14.

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