The Effectiveness of Acceptance Commitment Therapy on Obsessive Compulsive Disorder: A Systematic Review and Meta-Analysis

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ABSTRACT
Acceptance Commitment Therapy (ACT) has been found promising in treating obsessive-compulsive disorder (OCD). However, there is a scarcity of systematic reviews to evaluate the effectiveness of ACT and its duration of effect. This study aims to make a comprehensive assessment of the effectiveness of ACT on OCD as well as offer further insight into its clinical usage.Records about ACT on OCD were extracted from PubMed, PsycINFO, and Medline. Meta-analysis was conducted to explore the effect on the ACT in post-treatment and follow-up studies, and subgroup analysis was further adopted to measure the influences of specific variables (age, control type, and research design). A total of seven studies were included with 395 participants indicated that ACT, in treating OCD, shows significantly higher effectiveness than other types of treatments ($g = 0.63$, $t = -2.69$, $p \leq 0.05$) at a post-treatment stage, while its effect dims in follow-up studies ($g = -0.76$, $t = -2.45$, $p = 0.058$). No significant results were found in subgroup analysis. Compared to SSRIs intervention, group ACT was found more effective ($g = -1.06$, 95% CI: -1.52 to -.59). Also, group ACT was found more effective than individual treatments ($g = -.60$, 95% CI: -.97 -.23). In conclusion, compared to other types of intervention, acceptance commitment therapy is effective in treating OCD in the short term, but further research is needed to prove its long-term benefit.

Keywords: *Obsessive-Compulsive Disorder, Acceptance and commitment therapy, systematic review, meta-analysis*

1. INTRODUCTION

Obsessive-Compulsive Disorder (OCD) is a long-lasting mental health condition marked by the presence of recurrent obsessions and/or compulsions. Obsessions are intrusive thoughts, urges, or mental images that are uncontrollable, reoccurring, and persistent [1]. Examples of obsessions could be disturbing and horrific mental images of harming others or self, excessive fear of germs, and aversive thoughts that involve religion or violence. Because it is undesirable to the person, an obsession, oftentimes, triggers negative emotions, such as frustration or anxiety. As a response, compulsions are performed to relieve the emotions or feelings ignited by obsessions. Compulsions are obtrusive and repetitive behaviors and/or mental acts that the person with OCD feels urges to do [1]. Common examples of compulsions include repeatedly washing hands, checking things frequently, and constantly rearranging things to be perfect in order.

In recent years, OCD has been recognized as one of the most serious mental conditions that lead to disability, and its morality has increased in the general population [2]. Individuals with severe obsessive-compulsive symptoms might spend hours performing ritualistic compulsive behaviors, and they might also have difficulties concentrating on work or study because of the disturbance and/or compulsive mental acts, such as constantly counting numbers. OCD is quite common with a worldwide prevalence of approximately 2% to 3% [3]. and its one to six months prevalence is 1% to 1.7% [2], while its lifetime prevalence ranges from 1% to 3% [4]. The disorder affects female adults at a higher rate compared to males, while men are more likely to be

affected in childhood in comparison with women [1]. Conventionally, OCD and its severity are assessed by either diagnostic system (e.g., Diagnostic and Statistical Manual of Mental Disorder, DSM) or well-examined measures (Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) [5]). As Y-BOCS has good within-person change reliability, meaning it is capable of meaningful changes in the person over time [6]. It is widely used in experimental settings to capture changes of severity of OCD beyond clinical settings.

Available treatments for OCD primarily aim to alleviate the severity of OCS. The first-line therapeutic methods are cognitive behavioral therapy (CBT), cognitive-coping therapy (CCT), pharmacotherapy (eg., serotonin reuptake inhibitors), and a combination of psychological and medical interventions (e.g., CBT combined with selective serotonin reuptake inhibitors). CBT is a psychological treatment that has been indicated to be effective in treating OCD. A study, conducted by Hoppen et al [7], through comparing a group of OCD patients treated by low intensity technology-delivered CBT with a group of the patients treated with other treatments or without treatment, has found that participants who received low-intensity CBT treatment score lower on Y-BOCS , Dimensional Obsessive-Compulsive Scale (DOCS) combined, and Obsessive-Compulsive-Inventory-Revised (OCIR), in comparison with the participants who are treated with other therapeutic methods or without treatment.

Although CBT is found to be an efficacious treatment for OCD, the remission rate is still low. A longitudinal study conducted by Bloch et al. [8] investigating 10 to 20-year outcome of 83 adult participants with OCD has found that only 20% (17 of 83) of them had experienced a remission of their OCS, while 49% (41 of 83) still experienced severe OCS. A large proportion of OCD patients who received treatment still suffer from low remission rates [8]. Thus, an alternative treatment that could increase the remission rates in treating OCD is needed to be explored and studied.

Acceptance and Commitment Therapy (ACT), a form of psychotherapy under the umbrella term of CBT, which has emerged as relatively a newer psychotherapeutic intervention in treating OCD, has the potential to be the alternative treatment. Based on functional contextualism and Relational Frame Theory (RFT), ACT emphasizes psychological pain and psychological problems lying in psychological rigidity as the root cause of psychotic symptoms [9]. Its therapeutic goal is to cultivate psychological flexibility helping patients to pursue improvement of life quality by increasing engagement in meaningful life activities while experiencing unwanted thoughts, negative emotions, or other obstacles [10]. ACT, overall, has significant efficacy in decreasing clinical problems and in increasing the quality of life in individuals with chronic mental health conditions. A six-month follow-up study, conducted by Burhan and Karadere [11], examining the long-term efficacy of a short-term (6 sessions) ACT in 16 participants with chronic psychotic disorders, has found that patients' psychopathological symptoms and experiential avoidance were statistically significantly decreased while their quality of life was considerably increased after 6 sessions of ACT.

In treating OCD, ACT targets decreasing compulsions as the primary therapeutic goal. From the ACT perspective, compulsions reflect psychological inflexibility, as the symptoms are perceived as maladaptive attempts (psychological inflexibility) to avoid or oppress obsessions-related negative thoughts or feelings [12]. Because obsessive-compulsive symptoms' severity are related to the lack of psychological flexibility, ACT treats OCD by establishing psychological flexibility through six major processes, including acceptance, defusion, self as context, being present, values, and committed action [13]. Most patients with OCD experience obsessive thoughts, which often trigger compulsions as the response to relieve or avoid negative feelings. However, as obsessions are reoccurring, the patients are thought to be trapped in a vicious circle of OCS. ACT targeting improvement of the patient's acceptance of inner experience might break the OCS circle resulting in improvement of the symptom. Therefore, the current study aims to conduct a systematic review and meta-analysis to update the previous review and further extend it to cover multiple baseline designs (which is found statistically decent in the starting phase of an investigation in treatment effect) to summarize the effect of ACT on OCD as comprehensively as possible.

2. METHOD

2.1 Identification and Selection of Studies

A systematic literature search was conducted in three databases, including PubMed, PsycINFO, and Medline. The search terms combined MeSH terms and free text words indicated 1). Acceptance and Commitment Therapy (ACT), or acceptance-based intervention, 2). Obsessive-Compulsive Disorder (OCD), or obsessive-compulsive symptoms (OCS), or obsession, or Compulsion. The full search string was presented in **Figure 1.** For study inclusion, studies needed to meet the following criteria:

a. Peer-reviewed publication

b. Studies were Randomized Controlled Trials (RCTs) or Clinical Trials

c. ACT was the examined intervention

d. OCD or OCS was the primary focus of the interventions

e. The severity of OCD or OCS was evaluated by professionals based on a well-developed questionnaire

f. Publications were excluded if they were qualitative studies, reviews, conference proceedings, or book chapters

Zotero was used to import the original research records from the databases and remove duplicates. Title/Abstract screening, full-text screening, and data extraction of records were performed by all three researchers independently, and disagreements were resolved with discussion. Studies that met inclusion criteria but did not provide sufficient data were excluded from the planned meta-analysis.

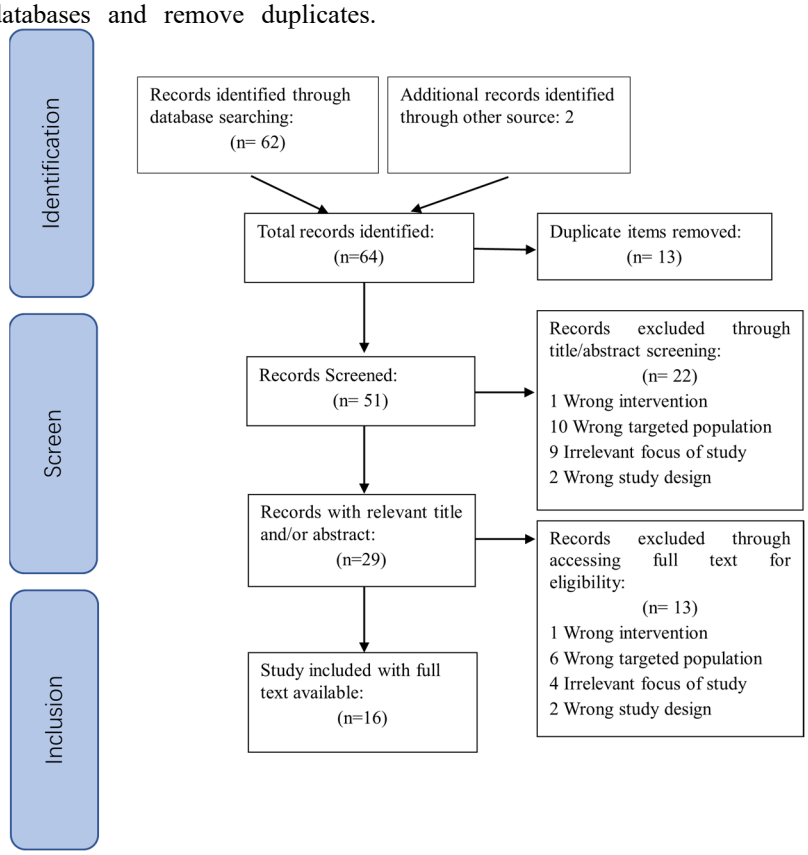

Figure 1. Screening Process

2.2. Data Extraction and Risk of Bias Assessment

Extracted information includes as follow:

1. Identification: name of the first author and publication year

2. Study population: sample size, age, and gender distribution.

3. Research design: type of research design ((cluster and individual) random controlled trials, before-and-after with/without control studies, case control study, multi-baseline study, and case series), inclusion and exclusion for participants selection, intervention details (setting, guidance and delivery, and follow-up length).

4. Methodological and Statistical: a measure of OCD, effect size definition (including posttreatment and follow-up data after intervention), incomplete data handling (intent to treat analysis)

The new Cochrane risk of bias tool (ROB2) was used to assess the quality of the included RCT studies. The following domains were evaluated: bias arising from the randomization process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in the measurement of the outcome, and bias in the section of the reported result. Two researchers (HP and PL) assessed these domains independently, and disagreements were solved with discussion. Each domain was rated from 1 to 3:

a. 1—Low risk of bias

b. 2—Some Concerns

c. 3—High risk of bias.

According to the criteria, the article was rated as low risk if the study was judged as 1 for all domains; the article was considered as having some concerns when at least one domain was rated as 2 and no domain of research was 3; the article was perceived as high risk if at least one domain for the study was marked as 3, or multiple domains for the result were rated to 2. After

evaluating all quality of studies, the *robvis* (visualization tool) was utilized to illustrate the overall quality of included articles.

2.3. Analysis

We adopted the "meta" and "dmetar" packages in the *R* program to conduct the meta-analysis. The effect sizes (Hedges' *g*) of each set of data were calculated by inputting the mean (M) and standard deviation (SD) of both experimental and control groups into the program. For studies comparing ACT with multiple other treatments, all non-ACT treatment groups were identified as controls, generating multiple sets of data in one study. Results of data sets from the same study were pooled into one to prevent inflated weights of studies including more sets of data. In addition, The Number-needed-to-treat (NNT) was also calculated. The NNT manifested the number of patients that were supposed to receive the treatment in order to obtain one more positive outcome than the comparison group [14].

We adopted a random-effects pooling model as significant heterogeneity was expected [15]. We calculated effect sizes at both post-treatment and follow-up results and the differences were compared. In heterogeneity assessment, we apllied Q statistics to illustrate the distribution of effect sizes and systematic differences [16]. I^2 was utilized to describe the proportion of all study variations. Generally, an I^2 lower than 30% was considered to have low heterogeneity, ranging from 30%-60% was perceived as moderate, 50%-90% was regarded as substantial, and 75%- 100% might be considerable [17]. Analyses of different subgroups were conducted for possible sources of variances when the I^2 was greater than 50%. To be analyzed, a subgroup was required to include at least three studies. They were performed after assessing each group's risk of bias, type of control group, type of intervention, participants' age, the intensity of intervention, and measurement.

Sensitivity tests were conducted to examine the effectiveness of ACT alone in treating OCD for avoiding the inflation of the possibility of an artificial reduction of heterogeneity. We generated funnel plots through the program to examine publication biases. Egger's tests were conducted to determine potential asymmetry in the plots [18]. We also adopted Duval and Tweedie's trim-and-fill method to assess the publication bias [19].

2.4. Qualitative synthesis

For non-RCT-designed studies, qualitative synthesis was used to summarize the status of the ACT application in these intervention studies, thereby supplementing the results of a planned meta-analysis. The major characteristics of intervention studies were synthesized by including the psychotherapy orientation (mindfulness, holisticity, etc.), the form of conducting intervention (individual, group, etc.), the quality of therapy (guide by professionals, manual-based), and format of reporting result (self-report, test report, clinician report, etc.), and possible culturalization in the intervention.

3. RESULT

3.1. Selection and Inclusion of Studies

A total of 64 studies were included in the search. 51 publications were regarded as eligible after removing repetitive ones. A further 29 articles were included, and their full texts were accessed. 13 studies were included in this systematic review (see Figure 1 for flow chart). The major criterion for exclusion was that the identified publications were:

a. Without ACT or without intervention (N=1)

b. Not OCD Participants (N=7)

c. Without a focus on the ACT and OCD (N=4)

d. Insufficient study design (N=2)

e. Older versions of publication (N=2)

Of 13 included publications, seven were randomized controlled trials (RCT), four were multiple-baseline studies, one was a single case study, and one was a non-randomized trial. Seven RCTs with available data were included in the meta-analysis. The qualitative synthesis included all 13 studies. Characteristics (including study design, setting, condition, inclusion criteria, sample size, mean age, gender proportion, follow-up length, and outcome measurement) of each study are presented in **Table 1.** (The first seven rows listed were RCTs studies, and the following six were baseline, single case studies, or non-randomized trial)

Table 1. Study Characteristics

Author, Year	Study Design	Setting	Condition	Inclusion Criteria	N(pre)	N(post)	N(follow-up)	Mean age (SD)	Female (%)	Follow-up Length	Outcome Measurement
Twohig *et. al, 2018*	RCT	Research Laboratory	ERP vs. ERP+ACT	OCD as a principal or co-principal diagnosis	58	49	47	27 (NA)	68%	6 months	Y-BOCS, DOCS

Twohig et al., 2010	RCT	standard therapy rooms	ACT vs. PRT	meet criteria for OCD on the SCI for DSM–IV, ≧ 18 years old	79	69	64	37 (15.5)	61%	3 months	Y-BOCS
Shabani et. al, 2019	RCT	Mental Health Institutions	ACT+SSRI vs. CBT+SSRI vs. continued SSRI	meet DSM-5 criteria for OCD; have a CYBOCS total score of 16 or higher; between the ages of 12 and 18	69	64	55	14.96(1.47)	49.90%	3 months	CY-BOCS
Fabricant et. al, 2013	RCT	University	IE vs. EW vs. ACT	High score on OCIR-O(≥4), reported an unwanted, obsession-like, intrusive thought that produced at least moderate distress	56	56	56	20.8 (NA)	39.20%	A week later	OCIR-O
Rohani et al, 2018	RCT	Mental Health Center	SSRIs vs. SSRIs + ACT	A primary diagnosis of OCD, over 17 years old, at least a high school education, female.	46	32	32	27.91(7.26)	100%	2 months	Y-BOCS-SR, AAQ, RRS
Vakill et al., 2014	RCT	Clinics	ACT vs. SSRIs vs. ACT+SSRIs	primary diagnosis of OCD; age between 18 to 50 years; OC symptoms duration of at least 1 year	27	27	NA	26.96(6.83)	44.40 %	NA	Y-BOCS
Esfahani et. al, 2015	Applied and Semi-experimental RCT	Mental Health Institutions	TPT vs. ACT vs. NT vs. WLC	meet criteria for OCD on the SCI for DSM–IV;18 years of age or older; adequate education and intelligence to participate in treatment sessions; taking no psychiatric medicine or not changing the medication program in the past six months.	60	45	45	NA	NA	2 months	Y-BOCS
Armstrong et. al, 2013	Multiple baseline study	University	ACT	between 12 and 17 years of age and meeting diagnostic criteria for OCD as measured by the Anxiety Disorders Interview Schedule for Children-Fourth Edition	3	3	3	12.33 (NA)	33.30%	3 months	CY-BOCS
Twohig et al. 2005	Multiple baseline study	University	ACT	meet criteria for OCD (as defined in the DSM IV-TR); report no recent initiations of any psychotropic medications (within previous 4 weeks); planned no changes to the dosage of currently prescribed psychotropic medications	4	4	4	33.5 (NA)	50%	3 months	OCI
Barney et. al, 2017	Multiple baseline study	Mental Health Clinic	ACT	OCD as a primary diagnosis based on Anxiety Disorders	3	3	NA	10.6 (NA)	33.30%	NA	CY-BOCS

				Interview Schedule for Children-Fourth Edition							
Whleer et al.	Single cases study	Mental Health Clinic	ACT	Symptoms with OCD	1	1	NA	Mid-20s (NA)	100%	NA	OCI, Brief Y-BOCS-SR
Davazdahemami et al, 2020	Single case baseline design	University	ACT	An OCD diagnosis; between 18 and 50 years old; the ability to speak and communicate; and minimum literacy	8	5	NA	36 (5.7)	100%	NA	Y-BOCS
Twohig et. al, 2010	Non-randomized Empirical Study	Clinic	ACT vs. CT vs. ERP	OCD as primary disorder	6	6	NA	30.16 (3.2)	66.60%	NA	Y-BOCS

Note. * RCT = Randomized control trials. ERP = Exposure and Response Prevention. ACT = Acceptance Commitment Therapy. PRT = Progressive Relaxation Training. SSRI = Selective Serotonin Reuptake Inhibitor. CBT = Cognitive Behavioral Therapy. IE = Imaginal Exposure. EW = Expressive Writing. TPT = Time Perspective Therapy. NT = Narrative Therapy. WLC = Waitlist Control. CT = Cognitive Therapy. OCD = Obsessive-Compulsive Disorder. SCI = Structured Clinical Interview. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, 4th Edition. DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, 5th Edition. CYBOCS = Children's Yale-Brown Obsessive-Compulsive Scale. OCIR-O = Obsessive-compulsive Inventory – Revised. OC = Obsessive-compulsive. DSM IV-TR = Diagnostic and Statistical Manual of Mental Disorders: Text Revision. CADIS-IV = Anxiety Disorders Interview Schedule for Children-Fourth Edition. N(pre) = Sample Size (pretreatment). N(post) = Sample Size (posttreatment). N(follow-up) = Sample Size (follow-up). NA = Data Not Available. SD = Standard Deviation. Y-BOCS = Yale-Brown Obsessive-Compulsive Scale. DOCS = Dimensional Obsessive-Compulsive Scale. AAQ = Acceptance and Action Questionnaire. RRS = Ruminative Response Scale. OCI = Obsessive-Compulsive Inventory. Y-BOCS-SR = Yale-Brown Obsessive-Compulsive Scale – Self Report.
* Blanks are marked as "NA" when the corresponding data is not directly indicated in the study.

3.2 Characteristics of Included RCTs and Clinical Trials

The seven included studies [13], [20], [21], [25], [26], [27], [31] had a total of 395 participants (N=170 were in the ACT group; N=225 were in the other intervention groups) who have completed pre-treatment measurements. Among all participants, 342 (N=151in the ACT group, N=191 in the other intervention groups) have completed posttreatment measurements. One of the studies [20], with a total of 60 participants divided into four groups, did not provide detailed information of its group distribution, so we counted each group having 15 participants. The follow-up length ranges from one week to six months (N= 1 in 1 week, N=2 in two months, N=2 in three months, and N=1 in 6 months), and 1 study did not report any follow-up data.

Among all seven studies, four studies compared ACT or a combination of ACT and other psychological intervention to one or multiple psychotherapeutic methods (e.g., ACT vs. PRT (progressive relaxation training), ERP (exposure and response prevention) vs. a combination of ERP and ACT, and ACT vs. TPT (time perspective therapy) vs. NT (narrative therapy). Three studies compared ACT or ACT combined with pharmacotherapy to medical intervention or a combination of other psychological intervention and medication (e.g., ACT combined with SSRIs (selective serotonin reuptake inhibitors) vs. CBT combined with SSRIs and ACT vs. SSRIs vs. ACT combined with SSRIs). One result with ACT compared with waitlist control (WLC) was removed from the meta-analysis, because it was the only finding of ACT compared to WLC that we currently could find in RCT studies.

In regard to trial settings, two studies were conducted in a university setting, and five were recruited in mental health institutions. Among included studies, the number of ACT sessions delivered ranged from 2 to 16 (one study with 2 sessions, five studies with 8 sessions, one study with 10 sessions, and one with 16 sessions).

3.3 Multiple Baseline Studies

The six included multiple-baseline studies [12], [23], [24], [28], [29], [30] had a total of 21 participants (N=6 with age ranging from 10-13, N=14 with age ranging from 19 to 45, and N=1 with age 63) treated with ACT. Two studies provided 3-month length follow-up data, and four studies did not report any follow-up information. The number of ACT sessions delivered ranged from 5 to 13 (N=2 participants completed 5 sessions of therapy, N=1 completed 7 sessions, N=11 finished 8 sessions, N=3 completed 9 sessions, N=1 finished 10 sessions, N=2 completed 12 sessions, and N=1 completed 13 sessions). All participants showed decreases in the measurement scores indicating severity level of OCD symptoms after treatment. Two participants achieved symptom remission after treatments. The two studies with follow-up data exhibited maintenance and continuous improvement of OCD symptoms after completing ACT treatment. Detailed results of OCD severity change in multiple baseline studies are summarized in **Table 2.**

Table 2. Results of the OC symptoms decrease in baseline studies

Author	n. p	p#	Pre-treatment	Post-treatment	Follow-up	Follow-up Length	Pub Year	Age/Sex	# of Sessions	Measurement	Study Design
Armstrong et al.	3	p1	23	13 (-10)	12 (-1)	3 months	2013	12 years old /female	8	CY-BOCS	Multiple Baseline
		p2	16	14 (-2)	14			13 years old /male	8		
		p3	23	18 (-5)	9 (-4)			12 years old /male	10		
Twohig et al.	4	p1	Freq=61 Dis=69	Freq=14 (-47) Dis=11 (-58)	Freq=5 (-7) Dis=2 (-9)	3 months	2005	19 years old /male	8	OCI	Multiple Baseline
		p2	Freq=36 Dis=38	Freq=27 (-9) Dis=33 (-5)	Freq=16 (-11) Dis=7 (-26)			63 years old /male	8		
		p3	Freq=74 Dis=64	Freq=16 (-58) Dis=0 (-64)	Freq=11 (-5) Dis=5 (+5)			20 years old /female	8		
		p4	Freq=60 Dis=66	Freq=30 (-30) Dis=19 (-47)	Freq=28 (-2) Dis=17 (-2)			32 years old /female	8		
Barney et al.	3	p1	20	11 (-9)	N/A	N/A	2017	10 years old /male	9	CY-BOCS	Multiple Baseline
		p2	31	15 (-16)	N/A	N/A		10 years old /female	9		
		p3	31	17 (-14)	N/A	N/A		11 years old /female	9		
Wheeler	1	p1	73; 29	23 (-50); 15 (-14)	N/A	N/A		mid-20s /female	13	OCI ; Brief Y-BOCS-SR	Single Case Study
Davazdahemami et al.	8	p1	27	13 (-14)	N/A	N/A	2020	28-45 years old /female	8	Y-BOCS	Single Case Baseline study
		p2	27	11 (-16)	N/A	N/A		28-45 years old /female	8		
		p3	30	12 (-18)	N/A	N/A		28-45 years old /female	8		
		p4	26	12 (-14)	N/A	N/A		28-45 years old /female	8		
		p5	26	10 (-16)	N/A	N/A		28-45 years old /female	8		
		p6	24	21 (-3) (Dropped at session 6)	N/A	N/A		28-45 years old /female	5		
		p7	24	19 (-5) (Dropped at session 6)	N/A	N/A		28-45 years old /female			
		p8	23	15 (-8) (Dropped at session 8)	N/A	N/A		28-45 years old /female	7		
Twohig et al.	2	p1	22	1 (-21)	N/A	N/A	2010	25 years old /male	12	Y-BOCS	Non-randomized empirical study
		p2	18	1 (-17)	N/A	N/A		36 years old /female	12		

Note: *n.p = number of participants. ACT = Acceptance Commitment Therapy. CT = Cognitive Therapy. ERP = Exposure and Response Prevention. p# = participant number (labeled). CY-BOCS = Children's Yale-Brown Obsessive-Compulsive Scale. OCI = Obsessive-Compulsive Inventory. Brief Y-BOCS-SR = Brief Yale-Brown Obsessive-Compulsive Scale – Self Report. Freq = OC Symptom Frequency (scale of measurement). Dis = Distress (scale of measurement). N/A = Information Not Available.

3.4 Risk of Bias in RCT Studies

The overall risk of bias of the studies that we included is scored high, with four studies scored as having "high risk" of bias and three studies scored as having "some concerns". Study [25] and study [27] were rated as having a high risk of bias because of the lack of information in the measurements of outcome. Study [13] was rated as "high risk" of bias due to unknown reasons for the missingness of outcome data (scoring as "high risk" in D3). Study [20] was rated as "high risk" of bias because it scored high in D2, D3, and D4. Study [31] [26], and [21] were rated as with "some concerns" because they contained one or more domains that were scored as "some concern." Detailed information on the risk of bias analysis is presented in **Figure 2.**

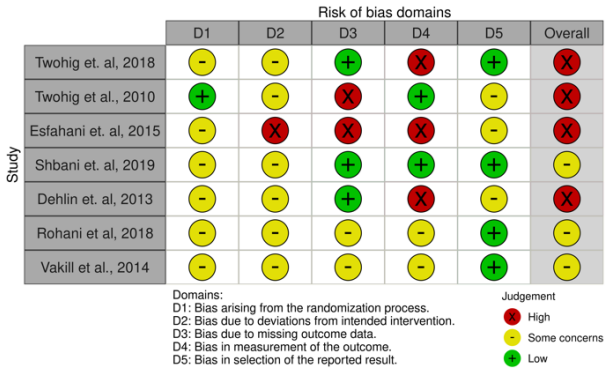

Figure 2 Results of risk of bias analysis

3.5 Results of Quantitative Synthesis

Only one study was identified comparing ACT with WLC. The result was significant (g = 14.40, SE = 1.04, p<0.001) [20].

Overall Effectiveness of ACT compared to other interventions

Post-treatment (see Figure 3.) Based on all seven studies, compared to other types of interventions, the overall result of the current meta-analysis showed that the effectiveness of ACT was significantly higher than other types of treatments (t = -2.69, p = 0.03) at a post-treatment stage with a medium to large effect size (g = 0.63, 95% CI: -1.16 to -.11). Heterogeneity among studies was found to be significant (Q= 17.88, p = .01), with an I square equal to 66.4% (95% CI: 25.1% to 85%), and a tau^2 equal to .21, 95% CI: .03 to 1.51. However, sensitivity analysis, which excluled those studies with ACT combining with other treatments, yielded a standardized mean difference without statistical significance (g = -1.26, 95% CI: -2.57 to .05, t = -4.14, p = .05) with low to moderate level of heterogeneity (Q = 4.90, p = .09, I^2 = 59.2%, 95% CI: 0.00 to 88.4%, tau^2 = .19, 95% CI: 0 to 9.43).

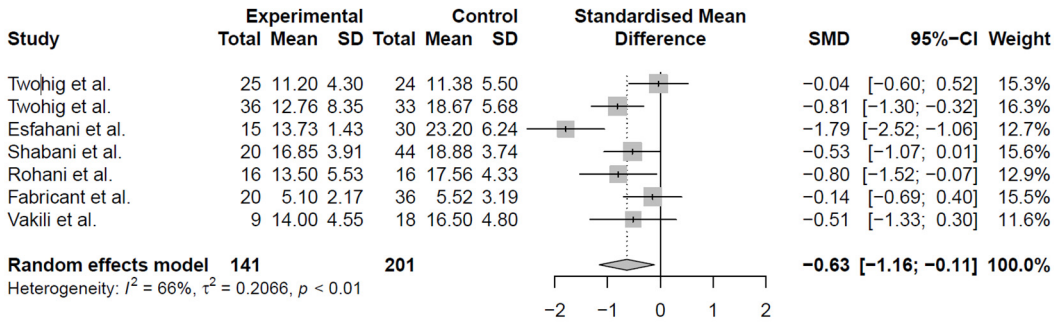

Figure 3. Results of post-treatment analysis

Follow-up Analysis (see Figure 4.). Six of the seven studies reported follow-up data. The analysis of the follow up data did not reveal significant treatment effect of ACT (t = -2.45, p = .06), and the effect size was from medium to large (g = -.76) with zero falling into its confidence interval (95% CI: -1.56 to .04). Heterogeneity among studies was found to be substantial in the follow-up stage (Q = 24.8, p = .00, I^2 = 79.8%, 95% CI: 56.20% to 90.70%, tau^2 = .45, 95% CI: .11 to 3.49). After removing the studies combining ACT with other types of treatments as experimental groups (k = 2), the sensitivity test showed a similar result (t = -2.06, p = .29; g =-.97, 95% CI: -6.92 to 4.99). Heterogeneity among the follow-up measures remained high after the removal of combined treatments (Q = 4.62, p = .03, I^2 = 78.3%, 95% CI: 5.7% to 95.0%, tau^2 = .35).

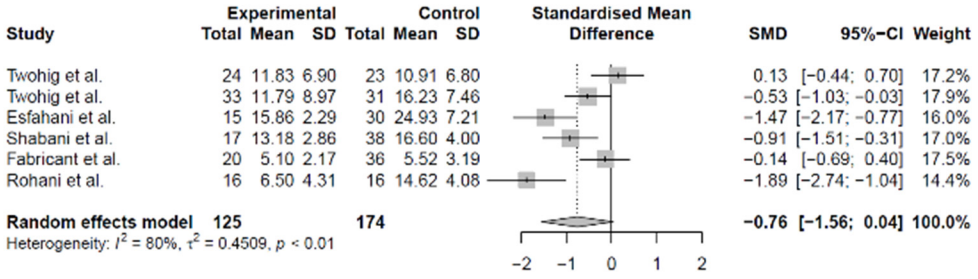

Figure 4. Results of follow-up analysis

Publication Bias (see Figure 5.) No significant results were revealed by Egger's test (Intercept: -9.83, 95%CI: -17.48 to -2.20, p = .07), indicating no presence of funnel plot asymmetry, which did not indicate the existence of publication bias.

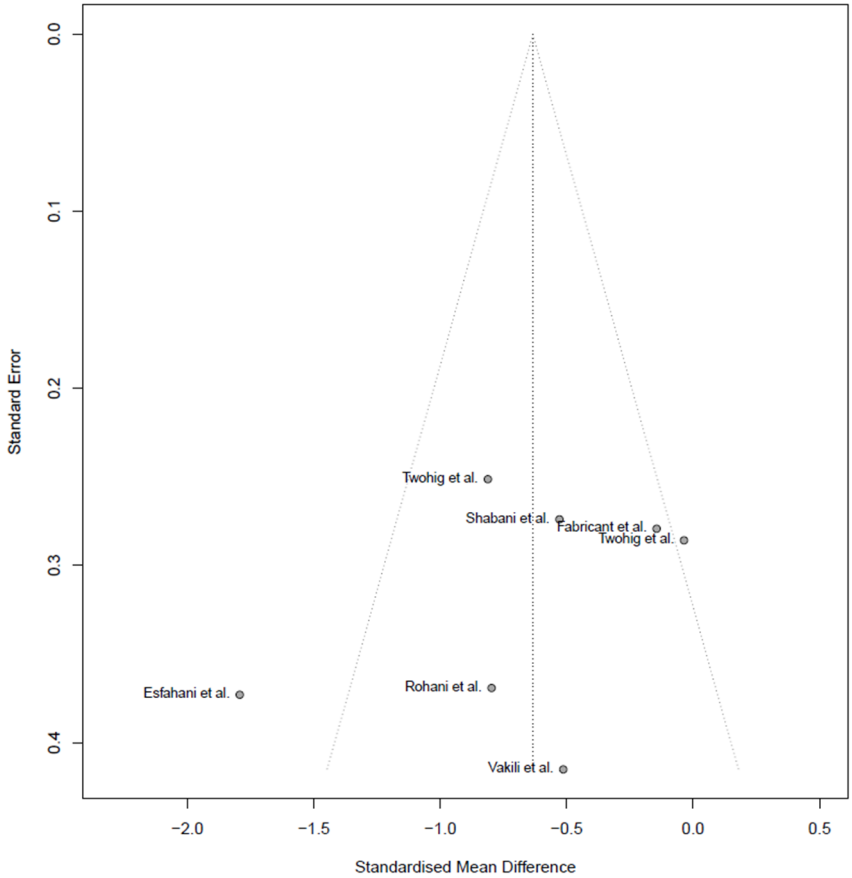

Figure 5. Funnel plot of publication biases

Subgroup Analysis. We conducted three sets of subgroup analyses based on age, the format of therapy, type of comparator (types of the treatments used as controls). Detailed results of all 3 analyses of both post-treatment and follow-up measurements were displayed in **Table 3**. One of our analyzed RCTs did not include a follow-up measurement [21], resulting the inclusion of both of the groups "controlled with medication treatment" and "group therapy format" in the follow-up stage was smaller than 3 (k = 2). Therefore these subgroups were excluded from the follow-up analysis. Results of subgroup analyses showed that the overall effect size was not associated with the age group, the format of therapy, or the type of comparators. Despite that, we found that ACT in group therapy format was more effective than other control treatments at **(at what?)** (g = -.60, 95% CI: -.97, -.23). Compared with the medical treatment, its effectiveness also shown statistically more significant at post-treatment stages (g = -1.06, 95% CI: -1.52, -0.60).

Table 3. Results of subgroup analysis

Stage of measurement	Subgroup	# of studies	Hedges' g (95%CI)	I^2	tau^2	Q	p-value
Post-treatment	Age group					0.24	0.62
	General population	4	-0.53[-1.14; .08]	37.10%	0.07		
	Minority	3	-0.79[-2.91; 1.32]	84.50%	0.61		
Follow-up	Age group					0.02	0.89
	General population	3	-.72[-3.23; 1.79]	86.60%	0.88		
	Minority	3	-0.82[-2.47; .83]	78%	0.34		
Post-treatment	Control group					0.01	0.91
	Medication control	4	-1.06*[-1.52; -.59]	0%	0		
	Psychotherapy control	6	-1.14[-2.98; .70]	88.80%	2.62		
Follow-up	Control group					N/A	N/A
	Medication control	2	N/A	N/A	N/A	N/A	N/A
	Psychotherapy control	4	N/A	N/A	N/A	N/A	N/A
Post-treatment	Treatment format					0.03	0.86
	Individual therapy	4	-.67[-1.93; .59]	82.80%	0.51		
	Group therapy	3	-0.60*[-.97; -.23]	0%	0		
Follow-up	Treatment format					N/A	N/A
	Individual therapy	4	N/A	N/A	N/A	N/A	N/A
	Group therapy	2	N/A	N/A	N/A	N/A	N/A

Note. * CI = Confidence Interval. "*" indicates a confidence interval with significant effect.
* Subgroup analysis of "Control group" and "Treatment format" are removed from follow-up analysis because the # of included studies is smaller than three in one of the comparison groups (k<3).

4. DISCUSSION

Overall, the studies included in our systematic review provided an encouraging overview of the potential effectiveness of ACT in treating OCD. The pattern of the improvements in the extracted data suggested the possibilities that: (a) more therapeutic sessions of ACT tended to have greater effectiveness in reducing OC symptoms; (b) the effectiveness for mid-age adults seemed to be greater when compared to that for teenagers and the older; (c) ACT could yield lasting effectiveness for OCD, and might further improve the symptom severity over time instead of simply maintaining the treatment outcomes. However, these analyses shall be only treated as an illustration of the potentialities of ACT in the treatments of OCD. More reliable RCT about these fields are promising in the future. Also, the potential pattern **(2)** was not supported by our subgroup analyses which examined the relationship between age and treatment outcomes.

Our analysis of the 7 RCTs indicated an overall moderately higher efficacy of ACT in improving the symptoms of the OCD compared to other types of psychotherapies and mediation (SMD = -.63) in the post-treatment measures. That was consistent with the finding of the previous meta-analysis, which ACT has shown superiority compared with both other psychological treatments (including ERP, TPT, and NT) and SSRIs [9]. However, our sensitivity test that only analyzed "pure" ACT treatment results failed to maintain the significant difference (p = .05). This was in line with another relevant review in which the researcher suggested that the effectiveness of ACT did not surpass the first-line psychotherapy for OCD [22]. For which reason, in the current review, we deemed that it was still difficult to determine whether ACT could be considered as a better treatment option or no-inferior option compared to other treatments for patients with OCD. While as suggested by a previous review, also supported by our observation in baseline studies, it was at least appropriate to consider ACT as a secondary viable substitute when patients displayed hesitation towards other first-line treatments [22]. It was also likely that ACT had the potential in amplifying the effect of other first-line treatments for OCD such as SSRIs, CBT, and ERP based on the fact that our analysis with the inclusion of combined treatments indicated significantly higher effectiveness.

The results yielded from the follow-up measurements of our included studies did not support that ACT had a greater lasting effect compared with control treatments. This might carry the implication that in regard to long-term effectiveness, ACT might still at best shall be only considered as a potential alternative treatment to other first-line interventions. Nevertheless, the marginal p-value yielded in follow-up analysis (p = .07) suggested that the trend of the effect while more statistical powers needed to detect it. Moreover, although our subgroup analysis indicated no subgroup significantly associated

with the overall effect size, there were two groups with significant differences compared to other treatments, which were found respectively when ACT was delivered through group treatments and when it was controlled with SSRIs treatment.

This result corresponded to the finding of the 2021 meta-analysis [9] and suggested that ACT might be considered a better option than SSRIs in treating OCD. However, interpretation of this result requires further cautious investigation. Indeed, although one of the strengths of our study is that we included the most updated RCTs in our meta-analysis compared to the previous empirical reviews, the overall number of studies that we have included is still insufficient, resulting in a weak statistical power of our analysis. One of the reasons for this situation is that ACT is still a comparatively new psychotherapy, with limited RCTs have been conducted since we have tried our best to include the latest resources with the maximum access that we could achieve. Another strength of our study is that the results we included in our analysis are based on samples from both North America and the Middle East (mostly Iran), therefore, the result might have cross-cultural and international representation.

Our study nonetheless has some limitations besides previously mentioned that the limited power of our analysis might challenge our ability to detect some significant outcomes. First of all, the overall heterogeneity among our studies is high, which makes the results less applicable to the general population suffering from OCD. However, our sensitivity test came out with a nonsignificant between-group heterogeneity, which is encouraging since ACT is promised as a treatment comparable with other firstline interventions for OCD. Second, even though Egger's test did not indicate asymmetry in the funnel plot that was yielded from our study, showing no publication bias of our analytic results, it was possible that this outcome was due to a small number of studies included and a weak statistical power. Third, our risk of bias analysis indicated that the overall quality of our literature included was not reliable with a high risk of bias, which might raise the question that whether the results that came out from our analysis were generally biased. This concern might be relevant to two potential reasons. First, the current meta-analysis included studies that were conducted by research teams from the different coutries, where the research guideline may not be identical. Also, even if the same guideline was followed, due to ethical concerns and the nature of psychotherapy, it was hard to conduct a double-blind study in clinical trials when testing the efficacy of certain psychotherapy, which might influence both of the treatment providers' fidelity as well as the sampled patient's treatment coherence.

The current study has several clinical implications. First, by partly replicating the results of previous studies, we conclude that ACT has the potential to be a good option for treatments of OCD or OC symptoms, though it is yet to be better alternative than the first-line treatments. Second, there is a potential that the number of sessions is related to the overall effectiveness of ACT. About seven treatment sessions are assumed to be apropos to yield a good treatment outcome. However, We did not test the subgroup differences in numbers of treatment sessions because the studies included did not contain required variations to be categoriezed (one study has two sessions and another has sixteen sessions, while the other (majority) have a number of sessions range from eight to ten). Third, if ACT shall be considered as a first-line treatment for OCD, the long-term effects of it may support it as a viable candidate, since the reduction after termination indicated in the baseline studies is impressive [23, 24]. Fourth, ACT delivered through group therapy format may have a unique value in clinical practice, which might not only reduce the cost of treatments but also yield comparable outcomes of improvements. Based on the current study, future research should focus on (1) conducting more RCTs with ACT as an independent treatment for OCD and including more follow-up measurements to test ACT's long-term effectiveness maintenance; (2) examining the existence of the correlation between a number of ACT sessions and its effectiveness in reducing OC symptoms; (3) replicating the current meta-analysis when more RCTs in this field are available to see if ACT should be truly considered as the superior intervention; (4) including more group treatments of ACT in treating OCD to confirm the possible superiority of group interventions in this case.

5. CONCLUSION

All things considered, this study provides solid support to the effectiveness of ACT on OCD treatment even when some of these interventions deviate from the prototypical 'Western' guideline of RCT designs. The findings call for more studies to figure out the long-term treatment effect of ACT in order to promote proper usage of the therapy in clinical settings. In addition, ACT combined with medication or in group forms is highly recommended to be examined to consolidate their advantages in achieving positive results of the therapy.

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