



# Process of change and efficacy of acceptance and commitment therapy (ACT) for anxiety and depression symptoms in adolescents: A meta-analysis of randomized controlled trials

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## ABSTRACT

**Introduction:** Recent literature suggests that acceptance and commitment therapy (ACT) may be an effective approach for treating symptoms of depression and anxiety symptoms in adolescents. This review meta-analyzes the efficacy of ACT on adolescent depression and anxiety, emphasizing the role of process variables (i.e., psychological flexibility).

**Methods:** We systematically searched MedLine, PsycInfo and Scopus for randomized controlled trials (RCT) investigating the effect of ACT on anxiety/depression in adolescents. Studies were combined using the inverse variance method in a random effects model. Additional subgroup and meta-regression analyses were performed, and risk of bias was assessed. The review was pre-registered (PROSPERO registration number: CRD42023483300).

**Results:** Our review included 27 RCTs with a total of 2860 participants. ACT did not outperform CBT but was significantly more effective than other active controls (e.g., treatment as usual) for depression symptoms and inactive controls for all outcomes. ACT was more effective than inactive controls for all outcomes. Improvements in psychological flexibility significantly predicted reductions in between-group depression and anxiety. Younger age and a higher percentage of women predicted better outcomes for some outcomes.

**Limitations:** It should be noted that this results may be limited by the fact that all included studies were rated as having a high risk of bias. This is mainly due to the self-reported nature of the measures and the lack of crucial methodological information (e.g., process of randomization and allocation, treatment fidelity assessment).

**Conclusion:** Our findings support ACT's efficacy for adolescents, particularly in treating depression symptoms. The proposed mechanism of change (psychological flexibility) plays a significant role in the improvements. ACT is comparable in efficacy to CBT, suggesting its potential as an alternative to traditional cognitive-behavioral approaches.

## 1. Introduction

Adolescence is often a tumultuous transition marked by significant psychosocial and emotional changes during this period, cognitive abilities increase, and a desire for independence grows. These changes can make adolescents more vulnerable to developing emotional problems (World Health Organization, 2023). Anxiety and depression are common psychological problems in adolescents (Racine et al., 2021; Shorey et al., 2022). Making psychological changes during this time can have long-lasting effects and prevent mental health problems later in life (Johnson et al., 2018). According to Shorey et al. (2022), approximately

8 % of adolescents worldwide suffer from depression disorders, while 34 % experience clinically elevated symptoms of depression. Anxiety disorders affect around 10 % of the adolescent population, while clinically elevated anxiety symptoms affect approximately 20.5 % (Racine et al., 2021; Steinsbekk et al., 2022). Recent studies have found that these post-COVID-19 pandemic estimates are significantly higher than pre-pandemic estimates (Deng et al., 2023; Kapetanovic et al., 2022). Moreover, these problems are often found together, with a co-occurrence rate of 31.6 % (Wang et al., 2023), and are significantly more prevalent in girls (Deng et al., 2023; Shorey et al., 2022). Anxiety problems typically emerge during middle childhood and significantly

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increase during adolescence (Steinsbekk et al., 2022). In contrast, the risk of depression increases with age, reaching its peak during adolescence (Barker et al., 2019).

Depression and anxiety symptoms in adolescents are associated with higher rates of psychiatric comorbidity (Sánchez Hernández et al., 2023), impaired social and familial functioning (Carrellas et al., 2017), health-related problems (Kilpi and Howe, 2023), problems with academic performance (de Lijster et al., 2018), and increased suicidality (Miron et al., 2019). In addition, experiencing symptoms of anxiety and depression during adolescence significantly increases the risk of suicidal behavior in the long term, as well as the likelihood of developing these disorders in adulthood (Johnson et al., 2018). In terms of clinical management for these symptoms, cognitive-behavioral therapy (CBT) is widely used and is generally considered the first-line intervention for treating depression and anxiety in adolescents (National Institute for Health and Care Excellence (NICE), 2014, 2019; Oar et al., 2017). The efficacy of CBT, particularly its exposure techniques, behavioral activation, and cognitive restructuring components, has been well established (Oud et al., 2019; Stiede et al., 2023). Some studies have even found that CBT is more effective and better tolerated than pharmacotherapy, especially in the long term (Arnardóttir and Skarphedinnsson, 2023). However, although CBT relapse rates are as low as 14 % (Levy et al., 2021), it is limited by the fact that not everyone fully benefits from this type of therapy (Heiervang et al., 2018), and the observed effect sizes are small to moderate (Oud et al., 2019). Other potential limitations are that CBT has traditionally taken a disorder-specific approach and requires consistent effort and commitment from the client outside of therapy sessions (Stiede et al., 2023). Furthermore, some authors have argued that CBT often does not consider the developmental stage of the client (Petersen et al., 2022). Therefore, while CBT is a powerful tool for addressing these problems in adolescents, these limitations suggest that alternative interventions should be considered. In contrast, contextually informed therapies, which go beyond a mere focus on symptom reduction, are designed not to pave the way, but to prepare individuals for the way. In the following section, we introduce the Acceptance and Commitment Therapy (ACT) model, a process-based approach to therapy.

### 1.1. Acceptance and commitment therapy

ACT is a coherent, multilevel system of philosophical assumptions, scientific values, and methodological commitments, that drives the development of theory and technology with roots in behavior analysis (Zettle et al., 2016). It applies processes to the clinician, not just the client, and expands into more complex issues historically associated with humanistic, existential, psychodynamic, or system-oriented approaches. It is argued that ACT can be viewed within an idiographic approach to process-based functional analysis (Hayes and Hofmann, 2021). This model takes a transdiagnostic approach and aims to identify shared processes of change that promote psychological development, rather than solely reducing psychological distress (Hayes, 2019). Unlike CBT, which often focuses on symptom reduction, ACT prioritizes psychological development (Hofmann and Hayes, 2019). Nevertheless, while the primary objective of ACT is not to alleviate symptoms, this is accomplished indirectly through the mechanisms that underlie change and are included in the psychological flexibility model, which serves as the foundation of ACT (Hayes, 2019). Psychological flexibility refers to the capacity to respond to internal and external experiences in a functional and value-based manner, rather than with rigid and ineffective attempts to regulate internal experiences (Hayes et al., 2006). This model consists of six primary psychological processes of change: acceptance, cognitive defusion, flexible attention to the present, self-as-context, values, and committed action (Hayes, 2019; Hayes et al., 2006). Acceptance involves embracing inner experiences without attempting to alter their occurrence or nature. Cognitive defusion includes focusing on changing unwanted functions of private events, such as thoughts, rather

than changing their form. Flexible attention to the present entails being aware of the present moment and engaging with it fully. Self-as-context implies developing an awareness of personal experiences without becoming attached to them or fixated on particular experiences. Values includes identifying qualities of purposeful action that cannot be achieved as an object. Committed action involves larger patterns of effective action towards chosen values.

Furthermore, beyond symptom improvement, ACT is a prosocial approach (Atkins et al., 2019), that aims to enhance adolescents' skills in their family, social, and school environments. Addressing common processes in adolescence may promote prosocial behavior, improve functioning, and reduce distress and symptoms of anxiety and depression in adolescents (Petersen et al., 2022). However, these authors note that some of these processes may need to be adapted for adolescents. For instance, integrating present-moment awareness into their daily activities or discussing values more indirectly (Petersen et al., 2022). Furthermore, working in a non-invasive way by introducing complex processes using metaphors, experiential exercises, and paradoxes may be helpful (Luciano et al., 2009; Macías et al., 2022). In addition to the observed feasibility of ACT processes in adolescents, this intervention may be better suited to the developmental stage of the adolescent since it is not delivered in a manualized manner (Ong et al., 2020). In contrast to CBT, ACT is more experiential and may be more appealing to adolescents, potentially reducing the burden of completing tedious homework outside of therapy sessions (Petersen et al., 2022).

### 1.2. Efficacy of ACT for anxiety and depression symptoms in adolescents

Regarding research on the outcomes of ACT, several systematic reviews have examined its efficacy in addressing various mental health concerns in adolescents. A previous meta-analysis found that ACT was superior to treatment as usual or waitlist controls, but not to CBT, in treating anxiety and depression symptoms in children (Fang and Ding, 2020). When applied online, a meta-analytic review found that ACT was more effective than inactive controls in improving symptoms of depression, but not anxiety (Wang and Fang, 2023). Another very recent meta-analysis found that group-delivered ACT effectively reduced post-treatment anxiety symptoms and increased psychological flexibility (Burley and McAloon, 2024). Additionally, the review found that this effect increased during the follow-up period. Furthermore, a narrative review suggests that ACT may be effective in improving symptoms of anxiety and depression in secondary school-based interventions (Knight and Samuel, 2022). However, it is important to note that this review is limited by methodological shortcomings across studies. In addition to the improvements in anxiety and depression among adolescents, recent reviews have also found preliminary support for ACT in treating stress (Binder et al., 2023), anger and aggression problems (Byrne and Cullen, 2023), obsessive-compulsive behavior, anorexia nervosa, and trichotillomania (Harris and Samuel, 2020), attention-deficit/hyperactivity symptoms (Munawar et al., 2021), and disordered eating and chronic pain (Petersen et al., 2022). Previous literature has also addressed the important topic of the role of the psychological flexibility processes in improving symptoms of anxiety and depression. As expected, although the evidence is still preliminary, several meta-analytic reviews and clinical trials have found that increases in psychological flexibility mediate improvements in anxiety and depression symptoms in adults (Bluett et al., 2014; Bohlmeijer et al., 2011; Swain et al., 2015; Twohig and Levin, 2017; Zettle et al., 2011).

Despite these promising results, previous reviews in this field have some limitations that should be addressed. Specifically, none of them evaluated the mediating effect of ACT's proposed change processes (i.e., psychological flexibility), which is crucial to understanding the underlying mechanism of changes. Furthermore, previous reviews have included various study designs (e.g., RCTs, single-arm and single case studies), and have involved both adolescent and child participants (Binder et al., 2023; Fang and Ding, 2020; Wicksell et al., 2015). In

addition, several previous reviews did not perform meta-analytic procedures (Harris and Samuel, 2020; Knight and Samuel, 2022; Petersen et al., 2022; Wicksell et al., 2015), or focused only on online (Wang and Fang, 2023) or group (Burley and McAloon, 2024) interventions.

### 1.3. Objectives of the review

Therefore, the primary objective of our study was to quantitatively synthesize the evidence from randomized controlled trials (RCTs) assessing the effects of ACT on symptoms of anxiety and depression in adolescents. We also aimed to assess the potential moderating effect of ACT's change process, psychological flexibility, on these emotional outcomes. A second objective of this study was to compare the efficacy of ACT and CBT in improving anxiety and depression symptoms. Finally, we evaluated the impact of potential moderator clinical and methodological variables on the results. Examining the effectiveness of recent interventions, such as ACT, and comprehending their mechanisms of change may lead to an improvement in emotional issues during adolescence. Furthermore, this knowledge can be applied to various social contexts, such as developing more effective cultural patterns to prevent dysfunctional behaviors and improving academic, social, and family functioning.

## 2. Methods

This review adheres to the Prisma 2020 Statement (Page et al., 2021). The checklist is shown in Appendix A. It has been pre-registered at PROSPERO with the number CRD42023483300.

### 2.1. Eligibility criteria

Following a PICOS framework (Richardson et al., 1995), we included studies in which:

- **Participants** were adolescents, defined by the World Health Organization as being between 10 and 18 years of age (World Health Organization, 2023). We considered both studies in which participants were formally diagnosed with a depressive or anxiety disorder according to DSM/ICD criteria (American Psychiatric Association, 2013; World Health Organization, 2022) and/or who presented with depressive and anxiety symptoms but without a formal diagnosis.
- At least one of the study arms received an ACT **intervention**.
- At least one of the study arms did not receive an ACT intervention, which served as the **comparison** group. Both active (i.e., receiving another psychological intervention or some type of clinical care) and inactive (i.e., waitlist or no-intervention control groups) control groups were included.
- Anxiety and/or depression symptoms were included as **outcomes**, measured by a standardized and valid measure (i.e., standardized self-reports). In addition, changes in ACT change processes (i.e., psychological flexibility) were also included as treatment outcomes.

In terms of design, only randomized controlled trials were included. In addition, only articles written in English or Spanish and published in peer-reviewed journals were included.

### 2.2. Information sources and search strategy

We searched the PubMed, PsycInfo, and Scopus databases, without a time limit and filtering by “scientific articles” where available. The search strategy included the terms “acceptance and commitment” OR “ACT” (in the title), AND “anxiety”, “depress\*”, “emotional” OR “internalizing” (in the title, abstract, and keywords). The most recent search was conducted on May 4, 2024. To identify additional relevant studies, a backward search (i.e., searching the reference lists of the relevant articles found) and a forward search (i.e., searching for articles

that cited the relevant articles found) were conducted.

### 2.3. Selection process

Initially, the first author screened the search results by reading the title and abstract (see Fig. 1). The final selection of studies was made independently by the two first authors, who applied the eligibility criteria to the screened articles by reading the full text. Cohen's kappa agreement was  $k = 0.91$ , which is considered almost perfect. Disagreements were resolved by consensus. The selection form can be viewed online [here](#).

### 2.4. Data collection process and data items

After consensus was reached on the selection of studies, the two first authors independently coded and extracted the diagnoses of the sample, the mean age of the sample, and the percentage of women in the sample. They also coded and extracted the type of intervention, its setting, length and delivery, the type of control group, and the included outcomes from each study. The codebook can be consulted online [here](#). Cohen's kappa agreement ranged from  $k = 0.93$  to  $k = 1$  (almost perfect). Any disagreements were resolved by consensus. Finally, the first author extracted the data needed for the effect size calculations from each study (pre- and post-treatment means pre-treatment, standard deviation, number of participants in each group), which can be viewed online [here](#). The second author double-checked 33 % of the extracted data (randomly selecting the studies), detecting any errors.

### 2.5. Risk of bias assessment

The risk of bias was evaluated separately by the first two authors using the Cochrane Risk of Bias Tool 2 (Sterne et al., 2019). Cohen's kappa agreement for overall risk of bias was  $k = 1$  (perfect). Additional discrepancies were resolved by consensus. The form in which the process was conducted is available online [here](#). In addition, the risk of publication bias was assessed by visual inspection of the funnel plots, the Trim and Fill test (Duval and Tweedie, 2000), and the Egger test (Egger et al., 1997).

### 2.6. Data analysis

#### 2.6.1. Meta-analyses

Post-treatment and follow-up reductions of anxiety and depression symptoms were considered the primary outcomes. Change in psychological flexibility was considered the secondary outcome. The within-subject effect size (ES) was calculated by dividing the subtraction of the pre-treatment and post-treatment mean (or follow-up, where relevant) by the pre-treatment standard deviation, with a correction factor for small sample sizes (Morris, 2000). For the between-group outcomes, the ES was defined as the difference between the mean pre to post-test (or follow-up) change of the experimental and control groups, divided by a pooled estimate of the pre-test standard deviations of the two groups, again with a correction factor for small sample sizes (Morris, 2008). Sampling variances of the ESs were estimated following Morris (2000, 2008). In addition, Pearson correlations were imputed following the recommendation of Rosenthal (1991), by using  $r = 0.7$ . For the ES, estimates of 0.20, 0.50, and 0.80 were considered small, moderate, and large, respectively (Cohen, 1988).

We then combined the ES estimates from individual studies for each outcome using the inverse variance weighting method and calculated a 95 % confidence interval (CI). We chose a random effects model because we expected high heterogeneity between studies and assumed that the true effect size might vary from study to study. The  $I^2$  was calculated to estimate the variation between studies due to heterogeneity (Higgins et al., 2003).

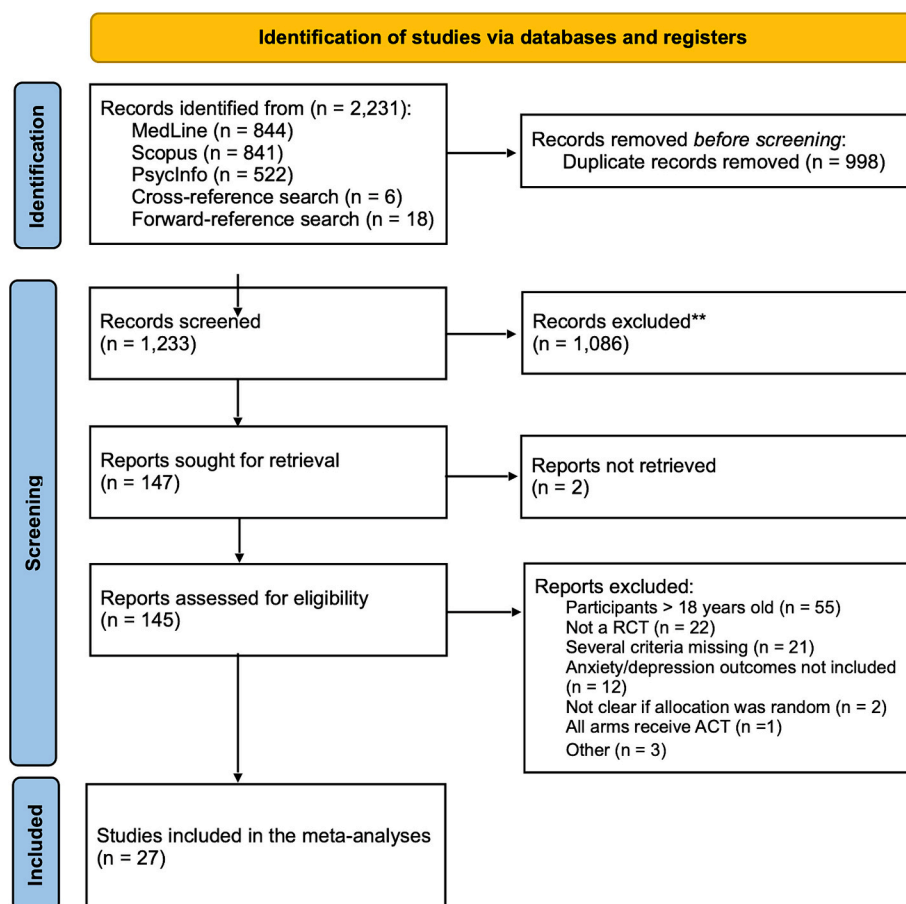


Fig. 1. PRISMA flow diagram.

### 2.6.2. Subgroup analysis and meta-regressions analyses

To assess whether psychological flexibility could predict the effect on anxiety and depression symptoms, we performed meta-regression analyses, using the former as the predictor and the latter as dependent variables. Q subgroup tests were conducted to evaluate potential moderator effects of discrete variables. The discrete variables included methodological factors, such as the type of control group, and clinical factors, such as sample diagnoses, intervention type, setting, and format. Moreover, the potential effect of continuous variables (e.g., treatment length, mean age and percentage of females in the sample) was also assessed with meta-regressions.

## 3. Results

From an initial pool of 1233 screened studies, 27 RCTs met the inclusion criteria (see Fig. 1). Full references of the included studies are shown in Appendix B. Their main characteristics are listed in Table 1. Two authors were contacted to clarify whether the allocation was random (Babalola and Ogunyemi, 2019; Saeed et al., 2016). Since we did not receive a response, their studies were therefore excluded.

The sample within these 27 RCTs consisted of a total of 1442 treated participants and 1418 controls (total  $n = 2860$ ), with a mean age of 14.86 years, of which 63.48 % were girls. The majority of studies included a sample of participants without a formal diagnosis (46 %), followed by a diagnosis of an anxiety disorder (25 %). Regarding the characteristics of the treatment, the majority (93 %) consisted of a stand-alone ACT intervention. Additionally, 64 % of the interventions were delivered in a group format, while 75 % were conducted face-to-face. The mean length of the interventions was 8.52 sessions. Regarding the measure of the outcomes, for psychological flexibility, most studies (87

%) used the *Avoidance and Fusion Questionnaire for Young* (Greco et al., 2008). The most used measure for anxiety (38 %) and depression (42 %) symptoms was the *Depression and Anxiety Scale* (DASS-21; Lovibond and Lovibond, 1995).

### 3.1. Risk of bias analyses

#### 3.1.1. Cochrane risk of bias assessment tool 2 results

The summary of the risk of bias assessment is shown in Fig. 2. All included studies were assessed with an overall high risk of bias, mainly due to the self-reported nature of the measurement of the outcome. Furthermore, many of the included studies lacked information regarding the randomization/allocation process (57 %), deviations from the intended intervention (36 %), or missing outcome data (36 %). On the other hand, the selection of the reported result was assessed with a low risk of bias in all studies.

#### 3.1.2. Publication bias test results

The trim and fill test did not impute a study for any outcome (see Appendix C). The Egger test was significant for all depression outcomes. Additionally, it was significant for both psychological flexibility at post-treatment outcomes and for within-subject anxiety at follow-up. Visual inspection of the funnel plots of depression outcomes at follow-up supported the trim and fill tests since no clear asymmetry was observed. For the other outcomes in which the Egger test was significant, visual inspection of funnel plots suggests that it could be due to a few outliers.

### 3.2. ACT effect on primary and secondary outcomes

The main results of the meta-analyses for the primary and secondary

**Table 1**  
Main characteristics of the included studies.

Study (first author, year of publication)	Randomized participants (n)		Sample			Intervention				Comparison
	Treated	Controls	Diagnosis	Mean age	% of females	Type	Sessions	Setting	Format	
Adeyinka 2020	56	55/46	No diagnosis	N/A	47.70 %	ACT	8	N/A	N/A	Social skills training and wait list
Alho 2022	36	36	Diabetes	13.4	63 %	ACT	5	Face-to-face	Group	TAU (visits to the pediatric clinic every 3 months to Meet a doctor, a nurse and other healthcare professionals)
Azadeh 2015	15	15	Anxiety	15.43	100 %	ACT	10	Face-to-face	Group	No intervention
Babaie 2019	10	10	Other	N/A	50 %	ACT	8	Face-to-face	N/A	No intervention
Bernal-Manrique 2020	21	21	No diagnosis	14.52	71.40 %	ACT	3	Face-to-face	Group	Wait list
Burckhardt 2016	139	128	No diagnosis	16.35	39 %	ACT + positive psychology	16	Face-to-face	Group	'Pastoral Care' classes
Burckhardt 2017	63	61	No diagnosis	15.64	42 %	ACT	7	Face-to-face	Group	'Pastoral Care' classes
Ebrahimi 2024	15	15/15	Anxiety	16.09	65 %	ACT	8	Face-to-face	Group	Cognitive-behavioral therapy and wait list
Guerrini Usubini 2021	25	24	Obesity	15.5	79.41 %	ACT + weight loss program	3	Face-to-face	N/A	TAU (standard 3-week multidisciplinary rehabilitation program, including medical, dietetical, physical and psychological interventions; psychological intervention including weekly individual counselling sessions of one hour)
Habibollahi 2015	30	30	No diagnosis	16.31	0 %	ACT	8	Face-to-face	Group	No intervention
Hancock 2018	68	63/62	Anxiety	11.2	58 %	ACT	10	Face-to-face	Group	Cognitive-behavioral therapy and wait list
Hayes 2011	22	16	Depression	14.9	68.50 %	ACT	N/A	Face-to-face	Individual	Cognitive-behavioral therapy
Karimi 2018	15	15	No diagnosis	N/A	100 %	ACT	8	Face-to-face	Group	No intervention
Lappalainen 2021	165	84	No diagnosis	15.27	49 %	ACT	5 weeks+2 calls	Online / Face-to-face	Individual	No intervention
Lappalainen 2023	232	116	No diagnosis	15.01	67 %	ACT	5 weeks+2 calls	Online	Individual	No intervention
Livheim 2015 (Australian)	40	26	No diagnosis	14.6	100 %	ACT	8	Face-to-face	Group	TAU (12-weeks of monitoring support from the school counselor)
Livheim 2015 (Swedish)	15	17	No diagnosis	N/A	71.80 %	ACT	8	Face-to-face	Group	Treatment as usual (individual support by the school nurse)
Moghanloo 2015	20	20	Diabetes	10.47	50 %	ACT	N/A	N/A	N/A	No intervention
Nissling 2023	27	27	Anxiety	16.61	82.60 %	ACT	10 weeks	Online	Individual	Wait list
Petersen 2023	13	13	No diagnosis	15.7	73.10 %	ACT	16	Face-to-face	Group	Wait list
Petersen 2024	14	12	Anxiety	14.2	66.7 %	ACT	10	Online	Individual	Wait list
Rostami 2014	20	20	Learning disability	N/A	0 %	ACT	10	Face-to-face	Group	No intervention
Shabani 2019	22	22/25	Anxiety	14.96	44.90 %	ACT	10	Face-to-face	Group	Cognitive-behavioral therapy and serotonin selective reuptake inhibitors
Swain 2015	16	10/23	Anxiety	13.8	63.30 %	ACT	10	Face-to-face	Group	Cognitive-behavioral therapy and wait list
Talaeizadeh, 2020	15	15/15	No diagnosis	N/A	100 %	ACT	8	Face-to-face	Group	Cognitive-behavioral therapy and no intervention
Van der Gucht 2017	288	298	No diagnosis	17	47 %	ACT	4	Face-to-face	Group	No intervention
Wicksell 2009	16	16	Chronic pain	14.8	78.10 %	ACT	10	Face-to-face	Individual	Multidisciplinary treatment plus amitriptyline
Zemestani 2022	24	47	Anxiety	15.2	100 %	ACT	8	Online	Group	Wait list

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Adeyinka 2020	?	?	?	✗	+	✗
Alho 2022	?	+	+	✗	+	✗
Azadeh 2015	?	?	?	✗	+	✗
Babaie 2019	?	?	?	✗	+	✗
Bernal-Manrique 2020	+	-	+	✗	+	✗
Burckhardt 2016	-	+	✗	✗	+	✗
Burckhardt 2017	-	+	+	✗	+	✗
Ebrahimi 2024	?	?	?	✗	+	✗
Guerrini Usubini 2021	?	-	-	✗	+	✗
Habibollahi 2015	?	?	?	✗	+	✗
Hancock 2018	+	+	+	✗	+	✗
Hayes 2011	+	+	+	✗	+	✗
Karimi 2018	?	?	?	✗	+	✗
Lappalainen 2021	+	+	-	✗	+	✗
Lappalainen 2023	+	+	✗	✗	+	✗
Livheim 2014 (Australian)	?	+	+	✗	+	✗
Livheim 2014 (Swedish)	-	-	-	✗	+	✗
Moghanloo 2015	?	?	?	✗	+	✗
Nissling 2023	-	+	-	✗	+	✗
Petersen 2023	?	+	+	✗	+	✗
Petersen 2024	?	+	+	✗	+	✗
Rostami 2014	?	?	+	✗	+	✗
Saaeed 2016	?	?	?	✗	+	✗
Shabani 2019	+	+	+	✗	+	✗
Swain 2014	?	+	?	✗	+	✗
Talaeizadeh 2020	?	?	?	✗	+	✗
Van der Gucht 2016	+	-	+	✗	+	✗
Wicksell 2009	+	+	+	✗	+	✗
Zemestani 2022	-	-	-	✗	+	✗

Domains:  
D1: Bias arising from the randomization process.  
D2: Bias due to deviations from intended intervention.  
D3: Bias due to missing outcome data.  
D4: Bias in measurement of the outcome.  
D5: Bias in selection of the reported result.

Judgement  
High (Red circle with ✗)  
Some concerns (Yellow circle with ?)  
Low (Green circle with +)  
No information (Blue circle with ?)  
(Black circle with -)

Fig. 2. Cochrane Risk of Bias Tool 2.0 assessment results.

outcomes are shown in Table 2. Compared to active controls, ACT was significantly more effective for depression symptoms at post-treatment (see Fig. 3), with ES increasing to large at follow-up. In contrast, there was no difference in anxiety symptoms (see Fig. 4), or psychological flexibility compared to active controls. On the other hand, ACT was superior to inactive controls for all outcomes except psychological flexibility at follow-up, with the largest ES estimates for depression symptoms. In terms of within-subject change, the ES was moderate to large for all outcomes.

3.2.1. ACT versus CBT results

The results of the meta-analyses of studies comparing ACT to CBT (Adeyinka and Olusakin, 2020; Ebrahimi et al., 2024; Hancock et al., 2018; Hayes et al., 2011; Shabani et al., 2019; Swain et al., 2015; Talaeizadeh, 2020) revealed no significant differences in all outcomes.

**Table 2**  
Standardized mean differences (SMD), 95 % confidence intervals, heterogeneity analyses (I<sup>2</sup>), and risk of bias for between-groups and within-group outcomes.

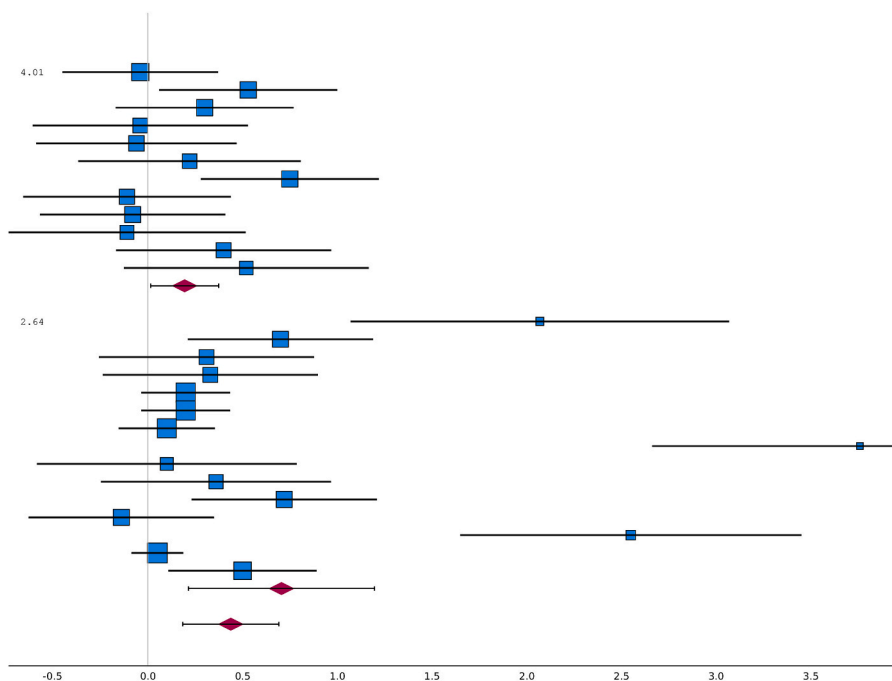
Variable	Assess-ment	Between-groups outcomes (vs active control groups)				Between-groups outcomes (vs inactive control groups)				Within-subject outcomes			
		k	n	SMD	95 % CI	I <sup>2</sup>	RoB	k	n	SMD	95 % CI	I <sup>2</sup>	RoB
Depression symptoms	PT	12	445	0.19	0.01 to 0.37	90 %	High	15	1368	0.71	0.21 to 1.20	90 %	High
	FU	5	142	0.73	0.06 to 1.40	92 %	High	6	558	0.69	0.13 to 1.25	92 %	High
Anxiety symptoms	PT	10	530	0.12	-0.13 to 0.38	87 %	High	15	1325	0.72	0.45 to 0.99	87 %	High
	FU	5	222	0.10	-0.11 to 0.31	76 %	High	7	658	0.59	0.22 to 0.96	76 %	High
Psychological flexibility	PT	6	342	0.68	-0.20 to 1.57	95 %	High	10	1362	0.46	0.15 to 0.78	95 %	High
	FU	Insufficient studies						4	625	0.39	-0.46 to 1.25	93 %	High

Note: PT = post-treatment; FU = follow-up; SMD = standardized mean differences; RoB = Risk of bias.

Forest Plot

■ Effect size of each study  
 ◆ Estimated overall effect size  
 I Estimated overall confidence interval

Comparison	ID	Effect Size	Lower	Upper	Weight	Weight (%)
Active control	Alho 2022	-0.04	-0.45	0.37	2.39	4.01
	Burckhardt 2016	0.53	0.06	1.00	2.31	3.88
	Burckhardt 2017	0.30	-0.17	0.77	2.31	3.88
	Ebrahimi 2024 (ACT vs ...)	-0.04	-0.61	0.53	2.18	3.66
	Guerrini-Ursabini 2021	-0.06	-0.59	0.47	2.23	3.75
	Hayes 2011	0.22	-0.37	0.81	2.15	3.61
	Livheim 2015 (Australian)	0.75	0.28	1.22	2.31	3.88
	Livheim 2015 (Swedish)	-0.11	-0.66	0.44	2.21	3.71
	Shabani 2019 ACTvsCBT	-0.08	-0.57	0.41	2.29	3.84
	Swain 2015 ACTvsCBT	-0.11	-0.74	0.52	2.10	3.52
	Talaeizadeh 2020 ACTvsCBT	0.40	-0.17	0.97	2.18	3.66
	Wicksell 2009	0.52	-0.13	1.17	2.07	3.47
	Subgroup Overall	0.19	0.01	0.37		
Inactive control	Babaie 2019	2.07	1.07	3.07	1.58	2.64
	Bernal-Manrique 2020	0.70	0.21	1.19	2.29	3.84
	Ebrahimi 2024 (ACT vs WL)	0.31	-0.26	0.88	2.18	3.66
	Karimi 2018	0.33	-0.24	0.90	2.18	3.66
	Lappalainen 2021 (iACT...)	0.20	-0.04	0.44	2.57	4.32
	Lappalainen 2021 (iACT...)	0.20	-0.04	0.44	2.57	4.32
	Lappalainen 2023	0.10	-0.15	0.35	2.55	4.29
	Moghanloo 2015	3.76	2.66	4.86	1.45	2.44
	Petersen 2023	0.10	-0.59	0.79	2.01	3.38
	Petersen 2024	0.36	-0.25	0.97	2.12	3.57
	Shabani 2019 ACTvsWLC	0.72	0.23	1.21	2.29	3.84
	Swain 2015 ACTvsWLC	-0.14	-0.63	0.35	2.29	3.84
	Talaeizadeh 2020 ACTvsWLC	2.55	1.65	3.45	1.71	2.86
	Van der Gucht 2017	0.05	-0.09	0.19	2.63	4.42
	Zemestani 2022	0.50	0.11	0.89	2.41	4.05
	Subgroup Overall	0.71	0.21	1.20		
Overall		0.44	0.18	0.69		



Model: Random-effects model  
 Heterogeneity: Tau-squared = 0.37, I-squared = 9.87, H-squared = 26, p-value = 0.90  
 Homogeneity: Q = 113.03, df = 26, p-value = 0.00  
 Test of overall effect size: z = 3.38, p-value = 0.00  
 Test of between-subgroup homogeneity: Q = 3.67, df = 1, p-value = 0.06

Fig. 3. Forest plot for between-group depression outcomes.

■ Effect size of each study  
 ◆ Estimated overall effect size  
 I Estimated overall confidence interval

Comparison	ID	Effect Size	Lower	Upper	Weight	Weight (%)
Active control	Adeyinka 2020 ACTvsSoc...	-0.04	-0.33	0.25	3.60	4.54
	Alho 2022	0.46	0.05	0.87	3.34	4.22
	Burckhardt 2016	0.01	-0.44	0.46	3.24	4.10
	Burckhardt 2017	0.28	-0.19	0.75	3.20	4.04
	Guerrini-Ursabini 2021	-0.71	-1.26	-0.16	3.00	3.78
	Hancock 2018 ACTvsCBT	-0.21	-0.50	0.08	3.60	4.54
	Livheim 2015 (Swedish)	0.49	-0.06	1.04	3.00	3.78
	Shabani 2019 ACTvsCBT	0.56	0.05	1.07	3.10	3.91
	Swain 2015 ACTvsCBT	-0.18	-0.81	0.45	2.80	3.53
	Wicksell 2009	0.70	0.09	1.31	2.85	3.59
	Subgroup Overall	0.12	-0.13	0.38		
Inactive control	Adeyinka 2020 ACTvsWLC	1.80	1.41	2.19	3.39	4.28
	Azadeh 2015	0.99	0.36	1.62	2.80	3.53
	Bernal-Manrique 2020	0.70	0.21	1.19	3.15	3.97
	Rabibollahai 2015	0.96	0.53	1.39	3.29	4.16
	Hancock 2018 ACTvsWLC	0.55	0.24	0.86	3.56	4.49
	Karimi 2018	1.11	0.46	1.76	2.75	3.47
	Lappalainen 2023	0.30	0.06	0.54	3.71	4.68
	Nissling 2023	0.68	0.19	1.17	3.15	3.97
	Petersen 2023	0.15	-0.54	0.84	2.65	3.34
	Petersen 2024	0.30	-0.31	0.91	2.85	3.59
	Rostami 2014	1.93	1.26	2.60	2.70	3.40
	Shabani 2019 ACTvsWLC	0.44	-0.03	0.91	3.20	4.04
	Swain 2015 ACTvsWLC	0.56	0.05	1.07	3.10	3.91
	Van der Gucht 2017	0.14	0.00	0.28	3.84	4.85
	Zemestani 2022	0.50	0.11	0.89	3.39	4.28
	Subgroup Overall	0.72	0.45	0.99		
Overall		0.49	0.27	0.71		

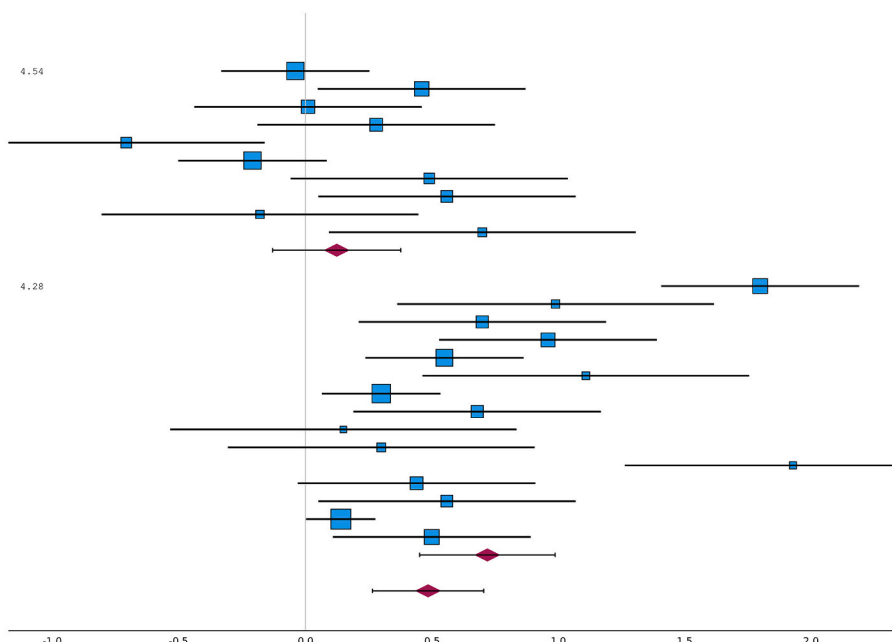


Fig. 4. Forest plot for between-group anxiety outcomes.

### 3.3. Meta-regression results

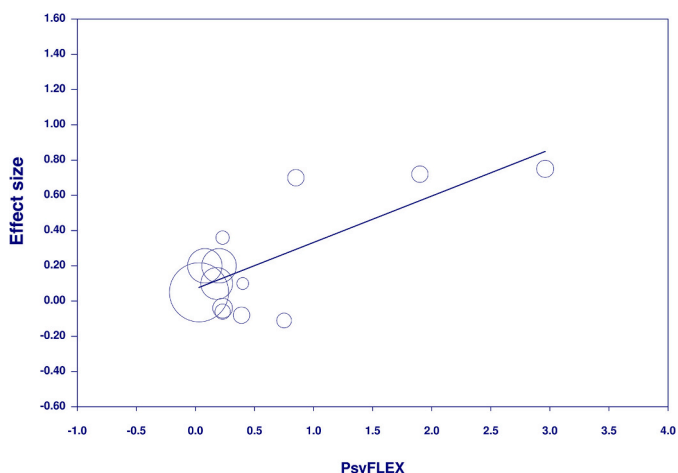
The main results of the meta-regressions are presented in Table 3. The results indicate that an increase in psychological flexibility

significantly and positively predicted a reduction in between-groups depression and anxiety symptoms at post-treatment (see Figs. 5 and 6). This was also maintained at follow-up and observed in within-subject change for the depression outcomes. Thus, increases in psychological

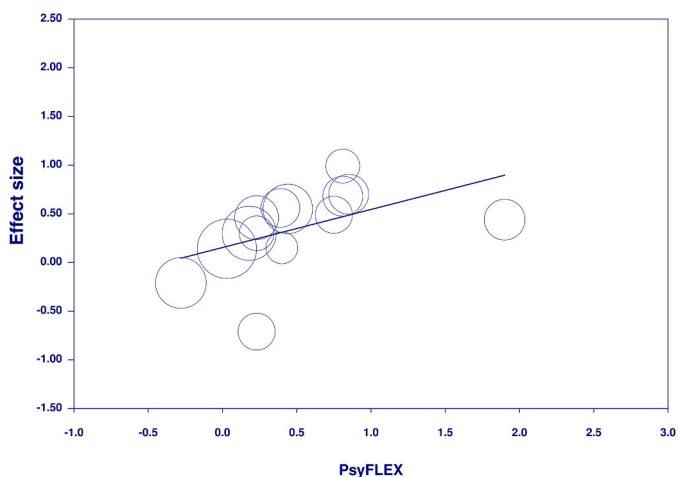
**Table 3**  
Results of the meta-regressions.

Dependent variable	Predictor	Assess-ment	Between-groups outcomes				Within-subject outcomes			
			Coefficient	Standard error	p-value	R <sup>2</sup>	Coefficient	Standard error	p-value	R <sup>2</sup>
Depression symptoms	Psychological flexibility	PT	<b>0.26</b>	<b>0.07</b>	<b>&lt; 0.01</b>	<b>1.00</b>	<b>0.42</b>	<b>0.18</b>	<b>0.02</b>	<b>0.10</b>
		FU	<b>0.68</b>	<b>0.32</b>	<b>0.03</b>	<b>0.67</b>	-0.21	0.38	0.56	0.00
	Sample mean age	PT	<b>-0.23</b>	<b>0.08</b>	<b>&lt; 0.01</b>	<b>0.01</b>	-0.14	0.10	0.18	0
		FU	-0.14	0.20	0.47	0.15	-0.10	0.18	0.57	0
	% of females in the sample	PT	0.01	0.01	0.42	0	0.01	0.01	0.87	0
		FU	0.01	0.01	0.46	0.01	0.01	0.01	0.57	0.07
Number of sessions	PT	0.01	0.03	0.82	0	0.04	0.03	0.27	0	
	FU	0.03	0.07	0.69	0.11	0.06	0.05	0.21	0	
Anxiety symptoms	Psychological flexibility	PT	<b>0.39</b>	<b>0.16</b>	<b>0.01</b>	<b>0.44</b>	-0.04	0.05	0.43	0
		FU	-0.04	0.23	0.84	0	Insufficient studies			
	Sample mean age	PT	0.03	0.05	0.59	0	0.02	0.09	0.82	0
		FU	-0.02	0.06	0.73	0	-0.04	0.08	0.62	0
	% of females in the sample	PT	-0.01	0.01	0.26	0	<b>-0.01</b>	<b>0.01</b>	<b>0.06</b>	<b>0</b>
		FU	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.45</b>	0.01	0.01	0.54	0.06
Number of sessions	PT	0.01	0.04	0.88	0	0.06	0.04	0.15	0	
	FU	0.01	0.04	0.65	0	0.09	0.07	0.18	0	

Note: PT = post-treatment; FU = follow-up; significant meta-regressions are shown in bold.



**Fig. 5.** Scatter plot for meta-regression of between-group depression outcome (psychological flexibility as predictor variable).



**Fig. 6.** Scatter plot for meta-regression of between-group anxiety outcome (psychological flexibility as predictor variable).

flexibility predicted better outcomes on our dependent variables. The percentage of variance explained was 100 % at post-treatment and 67 % at follow-up, while for anxiety it was 44 %. At post-treatment, younger

age significantly predicted greater improvements in depression between groups. A higher percentage of females significantly predicted higher between-group anxiety symptom improvements at follow-up and within-subject anxiety (at post-treatment). Finally, the number of sessions did not significantly predict treatment outcomes for any measure.

### 3.4. Subgroup analyses results

#### 3.4.1. Diagnosis of the participants

The significant subgroup analysis results are shown in Appendix D. In these analyses, we compared treatment outcomes between studies that included a sample of participants with a formal clinical diagnosis (e.g., anxiety, depression, or other disorders) and those who did not receive a formal diagnosis. We only found significant differences in between-group ( $Q = 18.76; p > 0.01$ ) and within-subject ( $Q = 16.85; p > 0.01$ ) anxiety outcomes. Similarly, we found statistically significant differences in between-group depression ( $Q = 14.45; p > 0.01$ ) and within-subject ( $Q = 14.51; p = 0.01$ ) outcomes. For these outcomes, the results showed a significantly greater effect for those with other diagnoses (stuttering and learning disability). However, for each outcome, the “other diagnosis” subgroup included only one study, which, when removed, made these differences nonsignificant.

#### 3.4.2. Control group

The effect was significantly lower for comparisons with active control groups, in contrast to comparisons with inactive controls (such as wait-list or no intervention), for between-group anxiety symptoms at post-treatment ( $Q = 10.02; p > 0.01$ ) and at follow-up ( $Q = 5.11; p = 0.02$ ).

#### 3.4.3. Intervention characteristics

Statistically significant differences were found only for between-group anxiety symptoms outcome, with stand-alone ACT being more effective than the other interventions at post-treatment ( $Q = 5.45; p = 0.02$ ). No statistically significant differences were found in terms of intervention format (individual vs. group) or intervention delivery (face-to-face vs. online) for any of the outcomes.

## 4. Discussion

This meta-analytic review focused on a quantitative synthesis of the efficacy of ACT on symptoms of anxiety and depression in adolescents. In addition, we assessed whether there was a moderating effect of ACT’s proposed mechanism of change, psychological flexibility. We also examined whether ACT is superior to the more established CBT in the



treatment of these problems.

One of the initial noteworthy findings is the rapid and substantial increase in the number of studies since the last reviews in this field. For instance, we included twice as many studies as in the last comprehensive meta-analysis conducted only four years ago (Fang and Ding, 2020). This increase could be interpreted as a result of the growing interest in interventions based on functional contextualism, particularly in ACT, in recent years (Hayes, 2019). It may also help us improve our understanding of both the clinical utility of ACT in this population and its mechanism of change. Given the significant worsening of anxiety and depression among adolescents following the COVID-19 pandemic (Wang et al., 2022), it is critical to develop evidence-based interventions such as ACT. This contextual-behavioral approach, as proposed by the latest process-based evolutionary meta-model (Hofmann and Hayes, 2019), allows for the inclusion of social and environmental factors (e.g., school, family, peers), in case conceptualization and therapeutic process. Moreover, this increase is also a significant advantage as it increases the statistical power of the current study and thus the validity of our results.

Regarding the treatment outcomes of ACT, our results suggest that it was more effective than waitlist or no-treatment controls, with a moderate ES for the treatment of anxiety and a large ES for the treatment of depression. However, compared to active controls (i.e., clinic visits, multidisciplinary rehabilitation, school counselor visits, school nurse support, regular classes), ACT was superior only for depression but not for anxiety. These findings are consistent with the meta-analyses by Fang and Ding (2020), although our ES estimates are lower. They also found that ACT was superior to treatment as usual comparators for anxiety symptoms. The meta-analysis by Burley and McAloon (2024), limited only to group interventions, also found a moderate ES in comparison to control groups, although they did not distinguish between active and inactive controls. The meta-analysis by Wang and Fang (2023), which examined the effect of ACT applied online, found the same results as our study. This superiority over active comparators suggests that certain therapeutic elements unique to ACT may be specifically effective. For example, the promotion of psychological flexibility may play a key role in addressing these mental health problems. In contrast, standard interventions that lack these components and offer only unspecific support may be less effective. This finding reinforces the value of ACT as a targeted intervention for improving mental health outcomes in adolescents with anxiety and depression. Furthermore, this effect appears to be specific and not due to a placebo effect, as it is superior to other active comparisons. Another relevant finding in our review is that the ES for depression was greatly increased at follow-up, which is partially inconsistent with findings in adult studies (Bai et al., 2020). On the other hand, Burley and McAloon (2024) reported a long-term increase in the effect in adolescents, but for anxiety symptoms, which is not supported by our results. Therefore, our results may mean that ACT may be particularly beneficial for depressive symptoms in adolescents, even though the focus of ACT is not only on symptom reduction (Hofmann and Hayes, 2019). ACT can be particularly beneficial for depression, where rigid, negative thinking patterns are common. By encouraging teens to engage with their values and act despite depressed feelings, this approach helps them break out of the cycle of avoidance and passivity that often characterizes depression. On the other hand, while ACT addresses anxiety by helping individuals accept and defuse anxious thoughts, its broader focus on values and acceptance may not always directly address the immediate physical symptoms of anxiety, making improvements less noticeable for some adolescents struggling with this issue. Another important clinical implication is that these benefits are not only maintained but increased over time. Although this improvement after follow-up is not yet fully understood, some authors have suggested that it may indicate that the change processes are integrated by the participants and generalized to their daily lives (Von Brachel et al., 2019). On the other hand, the more limited effect on anxiety symptoms could be interpreted as a sign that ACT needs to be better adapted by the clinician to the developmental level of the

adolescent (Petersen et al., 2022), as its efficacy is better established for adults (Gloster et al., 2020). However, the within-subject results showed that the effect of ACT after the intervention and at follow-up was moderate to large for all outcomes. This may mean that the control groups also improved significantly, although generally to a lesser extent than those who received ACT.

Concerning the effects of ACT on psychological flexibility, the results are very similar to those found with anxiety symptoms. The fact that ES was null compared to active controls suggests that certain mechanisms shared between the ACT and TAU/CBT groups contribute to an increase in psychological flexibility as well. Some authors interpret this as change processes in ACT and CBT may not be as distinct as previously hypothesized (Harris and Samuel, 2020). For instance, CBT often includes exposure and behavioral activation techniques (Stiede et al., 2023) which share some principles with the six basic change processes of ACT. In fact, the direct comparison of CBT vs. ACT showed no significant differences between these interventions in any of the outcomes. Our results are consistent with those of previous reviews in children (Fang and Ding, 2020) and adults (A-Tjak et al., 2021). From a clinical perspective, these results could be considered optimistic. As previously mentioned, CBT has limitations for many adolescents (Stiede et al., 2023). Therefore, having an equally effective alternative like ACT expands treatment options, making it easier to find an intervention that better suits the needs of each adolescent. For instance, ACT may be more suitable for adolescents who respond well to experiential exercises, while CBT may be better suited for individuals who benefit more from rational coping strategies (Petersen et al., 2022). However, new process-based research may provide further insights into this topic in the future (Moskow et al., 2023). In accordance with the process-based meta-model proposed by Hofmann and Hayes (2019), contemporary clinical psychology science should prioritize identifying the core biopsychosocial processes to target each client based on their individual goals and circumstances. This approach differs from the development of new approaches, as it focuses on determining the most efficient and effective methods for change.

Following this path, as expected, the meta-regression results showed that increases in psychological flexibility significantly predicted the improvements in anxiety and depression. However, that was not true for anxiety symptoms in the follow-up. These results support the underlying premise of ACT (Hayes, 2019), and are consistent with previous research (Stockton et al., 2019; Twohig and Levin, 2017). Moreover, previous research conducted network analysis and identified inaction, fusion, contact with values, and self-as-context as central processes of change in the psychological flexibility model (Parker et al., 2024). Our meta-regression results support this research and suggest that increases in psychological flexibility are one of the main mechanisms of change for symptom improvement in adolescents, even in the long term for depression symptoms. It is important to note that these findings should be interpreted with caution. Some research suggests that common measures of psychological flexibility are highly correlated with distress itself, rather than with flexible responses to distress (Doorley et al., 2020). On the other hand, treatment duration did not significantly predict treatment efficacy. Given that the number of sessions ranged substantially from 3 to 16, this could be interpreted to mean that even “small doses” of ACT may be beneficial for adolescents’ emotional problems. This could be of great help in contexts such as school-based interventions or public health services, where time resources are often scarce.

Although our subgroup and meta-regression analyses were limited by small sample sizes in some subgroups, we found additional results that may have clinical significance. For instance, older participants appeared to respond worse to treatment on some depression outcomes. One possible explanation for this is that older adolescents experience more severe episodes than their younger counterparts (Miller and Campo, 2021). Therefore, clinicians should be aware of this when treating older adolescents with depression and may need to provide

more intensive or longer treatment. In addition, a higher proportion of females significantly predicted better results. A reasonable explanation for this is that women have higher prevalence rates of both depression and anxiety problems (Deng et al., 2023; Shorey et al., 2022), and there is more room for improvement. These results suggest that clinicians should pay special attention to girls with emotional problems, as they may benefit more from ACT. As expected, for the anxiety outcomes, results were significantly better when compared to inactive groups, suggesting some placebo effect. In contrast, ACT was equally effective in treating depression when compared to active or inactive control groups. Finally, the subgroup analysis of intervention characteristics found no differences in stand-alone ACT versus its combination with other interventions, individual versus group format, and online versus face-to-face. This suggests that the delivery of ACT could be a versatile treatment option for adolescents, which could improve the accessibility of evidence-based interventions for this population.

#### 4.1. Limitations

While our study sheds some light on key aspects, it is important to acknowledge its limitations to ensure a balanced interpretation of the findings within the scope of our research. Firstly, we observed high levels of heterogeneity in each outcome, which may limit the reliability and interpretability of our results. This could be due to the variability of the samples included in each study and methodological differences between studies. However, we addressed this by conducting a random-effects meta-analysis, assuming that the true effect size varies across studies, and performing subgroup and meta-regression analyses. Second, all studies were judged to have a high risk of bias, mainly because all outcomes were self-reported. On the one hand, in addition to the fact that participants were aware of their experimental condition, these measures are inherently subjective. This introduces potential biases, such as social desirability bias or recall bias, which may threaten the validity of our findings. On the other hand, some authors have argued that when applying the Cochrane Risk of Bias 2.0 tool in the context of psychotherapy research, it is important to consider that there is limited evidence that self-reports may lead to an overestimation of effects (Munder and Barth, 2018). However, future studies would need to include more objective measures, such as independent observers blinded to treatment conditions, to reduce this bias. Another aspect that introduced some risk of bias was the lack of information about the randomization and allocation processes and how the researchers ensured treatment fidelity. This would also need to be improved in future studies by clearly describing these processes and introducing methods to ensure treatment fidelity. Finally, another aspect that may limit the interpretation of the results is the insufficient description of some active comparators, especially some TAU control groups. Future studies must provide a more detailed description of these active comparators in order to draw more accurate interpretations of the implications of the results.

#### 5. Conclusions

The meta-analytic review suggests that ACT may be an effective treatment for depression and, to a lesser extent, anxiety in adolescents. The review also found that these benefits are maintained and even enhanced over the long term. We also found preliminary empirical support for the proposed mechanism of change of ACT in adolescents, the increase in psychological flexibility that mediates these improvements. These findings may have important clinical implications given that research on adolescent adaptations of ACT is a relatively new field and may provide an effective intervention approach for them at a crucial life stage. Nevertheless, much remains to be done. We should improve our understanding of ACT in the context of adolescent development, incorporating developmental theories into the psychological flexibility model. There is also a need to conduct larger RCTs, preferably with active comparisons, and to extend research to other diverse adolescent

populations (e.g., ethnic or gender minorities) to further understand the efficacy of ACT. At the same time, however, there is a need to develop well-conducted, high data-density single-case designs to explore more deeply the process of change underlying ACT in adolescents. Finally, drawing on the work of B.F. Skinner, perhaps the key to preventing the reinforcement of psychopathological behavior patterns lies in the design of more effective cultural norms (Skinner, 1953, p. 424). In this context, this text encourages readers to look beyond traditional psychotherapy, which typically addresses emotional problems after they have manifested, and instead consider earlier prevention through the modification of macro-contingencies to discourage rigid behavioral patterns. In conclusion, this paper aims to make a modest contribution to the exploration of the clinical process of change more deeply, facilitating the application of behavioral science technology to aid adolescents in their personal development.

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#### CRedit authorship contribution statement

**Carlos López-Pinar:** Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Lucía Lara-Merín:** Writing – review & editing, Investigation. **Juanjo Macías:** Writing – review & editing.

#### Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used DeepL Pro in order to improve readability and language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2024.09.076>.

#### References

- Adeyinka, T.J., Olusakin, B.O., 2020. Effects of acceptance-commitment therapy and social skills training on anxiety of adolescent students from father-absent families in Lagos state. *Int. J. Educ. Res.* 7 (1).
- American Psychiatric Association, 2013. *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>.
- Arnardóttir, A., Skarphedinsson, G., 2023. Comparative effectiveness of cognitive behavioral treatment, serotonin, and serotonin noradrenaline reuptake inhibitors for anxiety in children and adolescents: a network meta-analysis. *Nord. J. Psychiatry* 77 (2), 118–126. <https://doi.org/10.1080/08039488.2022.2069858>.
- A-Tjak, J.G.L., Morina, N., Topper, M., Emmelkamp, P.M.G., 2021. One year follow-up and mediation in cognitive behavioral therapy and acceptance and commitment therapy for adult depression. *BMC Psychiatry* 21 (1). <https://doi.org/10.1186/s12888-020-03020-1>.

- Atkins, P.W.B., Wilson, D.S., Hayes, S.C., 2019. *Prosocial: Using Evolutionary Science to Build Productive, Equitable, and Collaborative Groups*. Context Press/New Harbinger Publications.
- Babalola, S.O., Ogunyemi, A.O., 2019. Efficacy of acceptance and commitment therapy in the treatment of social phobia among adolescents in secondary schools in Oyo state, Nigeria. *Ann. J. Tech. Univ. Varna* 3 (2), 54–61. <https://doi.org/10.29114/ajtuv.vol3.iss2.136>.
- Bai, Z., Luo, S., Zhang, L., Wu, S., Chi, I., 2020. Acceptance and Commitment Therapy (ACT) to reduce depression: a systematic review and meta-analysis. *J. Affect. Disord.* 260, 728–737. <https://doi.org/10.1016/j.jad.2019.09.040>.
- Barker, M.M., Beresford, B., Bland, M., Fraser, L.K., 2019. Prevalence and incidence of anxiety and depression among children, adolescents, and young adults with life-limiting conditions: a systematic review and meta-analysis. *JAMA Pediatr.* 173 (9), 835–844. <https://doi.org/10.1001/jamapediatrics.2019.1712>.
- Binder, F., Mehl, R., Resch, F., Kaess, M., Koenig, J., 2023. Interventions based on acceptance and commitment therapy for stress reduction in children and adolescents: a systematic review and meta-analysis of randomized controlled trials. *Psychopathology*. <https://doi.org/10.1159/000535048>.
- Bluett, E.J., Homan, K.J., Morrison, K.L., Levin, M.E., Twohig, M.P., 2014. Acceptance and commitment therapy for anxiety and OCD spectrum disorders: an empirical review. *J. Anxiety Disord.* 28 (6), 612–624. <https://doi.org/10.1016/j.janxdis.2014.06.008>.
- Bohlmeijer, E.T., Fledderus, M., Rokx, T.A.J.J., Pieterse, M.E., 2011. Efficacy of an early intervention based on acceptance and commitment therapy for adults with depressive symptomatology: evaluation in a randomized controlled trial. *Behav. Res. Ther.* 49 (1), 62–67. <https://doi.org/10.1016/j.brat.2010.10.003>.
- Burley, J., McAloon, J., 2024. Group acceptance and commitment therapy for adolescent anxiety: a systematic review and meta-analysis. *J. Contextual Behav. Sci.* 31. <https://doi.org/10.1016/j.jcbs.2023.11.003>.
- Byrne, G., Cullen, C., 2023. Acceptance and commitment therapy for anger, irritability, and aggression in children, adolescents, and young adults: a systematic review of intervention studies. *Trauma Violence Abuse*. <https://doi.org/10.1177/15248380231167393>.
- Carrellas, N.W., Biederman, J., Uchida, M., 2017. How prevalent and morbid are subthreshold manifestations of major depression in adolescents? A literature review. *J. Affect. Disord.* 210, 166–173. <https://doi.org/10.1016/j.jad.2016.12.037>.
- Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Erlbaum.
- de Lijster, J.M., Dieleman, G.C., Utens, E.M.W.J., Dierckx, B., Wierenga, M., Verhulst, F.C., Legerstee, J.S., 2018. Social and academic functioning in adolescents with anxiety disorders: a systematic review. *J. Affect. Disord.* 230, 108–117. <https://doi.org/10.1016/j.jad.2018.01.008>.
- Deng, J., Zhou, F., Hou, W., Heybati, K., Lohit, S., Abbas, U., Silver, Z., Wong, C.Y., Chang, O., Huang, E., Zuo, Q.K., Moskalyk, M., Ramaraju, H.B., Heybati, S., 2023. Prevalence of mental health symptoms in children and adolescents during the COVID-19 pandemic: a meta-analysis. *Ann. N. Y. Acad. Sci.* 1520 (1), 53–73. <https://doi.org/10.1111/nyas.14947>.
- Doorley, J.D., Goodman, F.R., Kelso, K.C., Kashdan, T.B., 2020. Psychological flexibility: what we know, what we do not know, and what we think we know. *Soc. Personal. Psychol. Compass* 14 (12), 1–11. <https://doi.org/10.1111/spc3.12566>.
- Duval, S., Tweedie, R., 2000. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* 56 (2), 455–463. <https://doi.org/10.1111/j.0006-341X.2000.00455.x>.
- Ebrahimi, S., Moheb, N., Alivani Vafa, M., 2024. Comparison of the effectiveness of cognitive-behavioral therapy and acceptance and commitment therapy on cognitive distortions and rumination in adolescents with social anxiety disorder. *Pract. Clin. Psychol.* 12 (1), 81–94. <https://doi.org/10.32598/jpcp.12.1.922.1>.
- Egger, M., Smith, G.D., Schneider, M., Minder, C., 1997. Bias in meta-analysis detected by a simple, graphical test. *Bmj* 315, 629–634. <https://doi.org/10.1136/bmj.315.7109.629>.
- Fang, S., Ding, D., 2020. A meta-analysis of the efficacy of acceptance and commitment therapy for children. *J. Contextual Behav. Sci.* 15, 225–234. <https://doi.org/10.1016/j.jcbs.2020.01.007>.
- Gloster, A.T., Walder, N., Levin, M.E., Twohig, M.P., Karekla, M., 2020. The empirical status of acceptance and commitment therapy: a review of meta-analyses. *J. Contextual Behav. Sci.* 18, 181–192. <https://doi.org/10.1016/j.jcbs.2020.09.009>.
- Greco, L.A., Lambert, W., Baer, R.A., 2008. Psychological inflexibility in childhood and adolescence: development and evaluation of the avoidance and fusion questionnaire for youth. *Psychol. Assess.* 20 (2), 93–102. <https://doi.org/10.1037/1040-3590.20.2.93>.
- Hancock, K.M., Swain, J., Hainsworth, C.J., Dixon, A.L., Koo, S., Munro, K., 2018. Acceptance and commitment therapy versus cognitive behavior therapy for children with anxiety: outcomes of a randomized controlled trial. *J. Clin. Child Adolesc. Psychol.* 47 (2), 296–311. <https://doi.org/10.1080/15374416.2015.1110822>.
- Harris, E., Samuel, V., 2020. Acceptance and commitment therapy: a systematic literature review of prevention and intervention programs for mental health difficulties in children and young people. *J. Cogn. Psychother.* 34 (4), 280–305. <https://doi.org/10.1891/JCPSY-D-20-00001>.
- Hayes, S.C., 2019. Acceptance and commitment therapy: towards a unified model of behavior change. *World Psychiatry* 18 (2), 226–227. <https://doi.org/10.1002/wps.20626>.
- Hayes, S.C., Hofmann, S.G., 2021. “Third-wave” cognitive and behavioral therapies and the emergence of a process-based approach to intervention in psychiatry. *World Psychiatry* 20 (3), 363–375. <https://doi.org/10.1002/wps.20884>.
- Hayes, S.C., Luoma, J.B., Bond, F.W., Masuda, A., Lillis, J., 2006. Acceptance and commitment therapy: model, processes and outcomes. *Behav. Res. Ther.* 44 (1), 1–25. <https://doi.org/10.1016/j.brat.2005.06.006>.
- Hayes, L., Boyd, C.P., Sewell, J., 2011. Acceptance and commitment therapy for the treatment of adolescent depression: a pilot study in a psychiatric outpatient setting. *Mindfulness* 2 (2), 86–94. <https://doi.org/10.1007/s12671-011-0046-5>.
- Heiervang, E.R., Villabø, M.A., Wergeland, G.J., 2018. Cognitive behavior therapy for child and adolescent anxiety disorders: an update on recent evidence. In: *Current Opinion in Psychiatry*, vol. 31, Issue 6. Lippincott Williams and Wilkins, pp. 484–489. <https://doi.org/10.1097/YCO.0000000000000457>.
- Higgins, J.P.T., Thompson, S.G., Deeks, J.J., Altman, D.G., 2003. Measuring inconsistency in meta-analyses. *BMJ Br. Med. J.* 327 (7414), 557–560. <https://doi.org/10.1136/bmj.327.7414.557>.
- Hofmann, S.G., Hayes, S.C., 2019. The future of intervention science: process-based therapy. *Clin. Psychol. Sci.* 7 (1), 37–50. <https://doi.org/10.1177/2167702618772296>.
- Johnson, D., Dupuis, G., Piche, J., Clayborne, Z., Colman, I., 2018. Adult mental health outcomes of adolescent depression: a systematic review. *Depress. Anxiety* 35 (8), 700–716. <https://doi.org/10.1002/da.22777>.
- Kapetanovic, S., Chen, S., Barakat, M., Serafini, G., Xiao, Y., 2022. Depression and anxiety among children and adolescents pre and post COVID-19: a comparative meta-analysis. *Front. Psych.* 13 (917552), 1–10. <https://doi.org/10.3389/fpsy.2022.917552>.
- Kilpi, F., Howe, L.D., 2023. Early-life socioeconomic circumstances and the comorbidity of depression and overweight in adolescence and young adulthood: A prospective study. *SSM – Popul. Health* 24. <https://doi.org/10.1016/j.ssmph.2023.101494>.
- Knight, L., Samuel, V., 2022. Acceptance and commitment therapy interventions in secondary schools and their impact on students’ mental health and well-being: a systematic review. *J. Contextual Behav. Sci.* 25, 90–105. <https://doi.org/10.1016/j.jcbs.2022.06.006>.
- Levy, H.C., O’Byrne, E.M., Tolin, D.F., 2021. A meta-analysis of relapse rates in cognitive-behavioral therapy for anxiety disorders. *J. Anxiety Disord.* 81. <https://doi.org/10.1016/j.janxdis.2021.102407>.
- Lovibond, P.F., Lovibond, S.H., 1995. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the Beck depression and anxiety inventories. *Behav. Res. Ther.* 33 (3), 335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U).
- Luciano, M.C., Salas, S.V., Gutiérrez Martínez, O., Ruiz, F.J., Blarrina, M.P., 2009. Brief acceptance-based protocols applied to the work with adolescents. *Int. J. Psychol. Psychol. Ther.* 9, 237–257.
- Macías, J.J., Schosser, K.K., Bond, F.W., Blanca, M.J., Valero-Aguayo, L., 2022. Enhancing students’ well-being with a unified approach based on contextual behavioural science: a randomised experimental school-based intervention. *Appl. Psychol. Health Well Being* 14 (3), 1022–1036. <https://doi.org/10.1111/aphw.12365>.
- Miller, L., Campo, J.V., 2021. Depression in adolescents. *N. Engl. J. Med.* 385 (5), 445–449. <https://doi.org/10.1056/nejmra2033475>.
- Miron, O., Yu, K.-H., Wilf-Miron, R., Kohane, I.S., 2019. Suicide rates among adolescents and young adults in the United States, 2000–2017. *JAMA* 321 (23), 2362. <https://doi.org/10.1001/jama.2019.5054>.
- Morris, S.B., 2000. Distribution of the standardized mean change effect size for meta-analysis on repeated measures. *Br. J. Math. Stat. Psychol.* 53 (1), 17–29. <https://doi.org/10.1348/000711000159150>.
- Morris, S.B., 2008. Estimating effect sizes from pretest-posttest-control group designs. *Organ. Res. Methods* 11 (2), 364–386. <https://doi.org/10.1177/1094428106291059>.
- Moskow, D.M., Ong, C.W., Hayes, S.C., Hofmann, S.G., 2023. Process-based therapy: a personalized approach to treatment. *J. Exp. Psychopathol.* 14 (1). <https://doi.org/10.1177/20438087231152848>.
- Munawar, K., Choudhry, F.R., Lee, S.H., Siau, C.S., Kadri, N.B.M., Binti Sulong, R.M., 2021. Acceptance and commitment therapy for individuals having attention deficit hyperactivity disorder (ADHD): a scoping review. *Heliyon* 7 (8). <https://doi.org/10.1016/j.heliyon.2021.e07842>.
- Munder, T., Barth, J., 2018. Cochrane’s risk of bias tool in the context of psychotherapy outcome research. *Psychother. Res.* 28 (3), 347–355. <https://doi.org/10.1080/10503307.2017.1411628>.
- National Institute for Health and Care Excellence (NICE), 2014. *Anxiety Disorders: Quality Standard [QS53]*.
- National Institute for Health and Care Excellence (NICE), 2019. *Depression in children and young people: identification and management [NG134]*. [www.nice.org.uk/guidance/ng134](http://www.nice.org.uk/guidance/ng134).
- Oar, E.L., Johnco, C., Ollendick, T.H., 2017. Cognitive behavioral therapy for anxiety and depression in children and adolescents. *Psychiatr. Clin. N. Am.* 40 (4), 661–674. <https://doi.org/10.1016/j.psc.2017.08.002>.
- Ong, C.W., Levin, M.E., Twohig, M.P., 2020. Beyond acceptance and commitment therapy: process-based therapy. *Psychol. Rec.* 70 (4), 637–648. <https://doi.org/10.1007/s40732-020-00397-z>.
- Oud, M., de Winter, L., Vermeulen-Smit, E., Bodden, D., Nauta, M., Stone, L., van den Heuvel, M., Al Taher, R., de Graaf, I., Kendall, T., Engels, R., Stikkelbroek, Y., 2019. Effectiveness of CBT for children and adolescents with depression: a systematic review and meta-regression analysis. *Eur. Psychiatry* 57, 33–45. <https://doi.org/10.1016/j.eurpsy.2018.12.008>.
- Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E.,

- McDonald, S., Moher, D., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* n71. <https://doi.org/10.1136/bmj.n71>.
- Parker, F., Rogge, R.D., Drake, C.E., Fogle, C., 2024. A fresh lens on psychological flexibility: using network analysis and the unified flexibility and mindfulness model to uncover paths to wellbeing and distress. *J. Contextual Behav. Sci.* 100753. <https://doi.org/10.1016/j.jcbs.2024.100753>.
- Petersen, J.M., Zurita Ona, P., Twohig, M.P., 2022. A review of acceptance and commitment therapy for adolescents: developmental and contextual considerations. *Cogn. Behav. Pract.* <https://doi.org/10.1016/j.cbpra.2022.08.002>.
- Racine, N., McArthur, B.A., Cooke, J.E., Eirich, R., Zhu, J., Madigan, S., 2021. Global prevalence of depressive and anxiety symptoms in children and adolescents during COVID-19: a meta-analysis. *JAMA Pediatr.* 175 (11), 1142–1150. <https://doi.org/10.1001/jamapediatrics.2021.2482>.
- Richardson, W.S., Wilson, M.C., Nishikawa, J., Hayward, R.S., 1995. The well-built clinical question: a key to evidence-based decisions. *ACP J. Club* 123 (3), A12–A13.
- Rosenthal, R., 1991. *Meta-Analytic Procedures for Social Research*, ed. rev. Sage.
- Saeed, H., Ahmad, A., Farah, N., Mohammad Mehdi, M., 2016. The effectiveness of acceptance and commitment therapy (ACT) on test anxiety and psychological well-being in high-school students. *Int. J. Humanit. Cult. Stud.* 1582–1590.
- Sánchez Hernández, M.O., Holgado-Tello, F.P., Carrasco, M., 2023. The dynamics of psychological attributes and symptomatic comorbidity of depression in children and adolescents. *Soc. Psychiatry Psychiatr. Epidemiol.* <https://doi.org/10.1007/s00127-023-02532-x>.
- Shabani, M.J., Mohsenabadi, H., Omid, A., Lee, E.B., Twohig, M.P., Ahmadvand, A., Zanjani, Z., 2019. An Iranian study of group acceptance and commitment therapy versus group cognitive behavioral therapy for adolescents with obsessive-compulsive disorder on an optimal dose of selective serotonin reuptake inhibitors. *J. Obsessive-Compulsive Relat. Disord.* 22. <https://doi.org/10.1016/j.jocrd.2019.04.003>.
- Shorey, S., Ng, E.D., Wong, C.H.J., 2022. Global prevalence of depression and elevated depressive symptoms among adolescents: a systematic review and meta-analysis. *Br. J. Clin. Psychol.* 61 (2), 287–305. <https://doi.org/10.1111/bjc.12333>.
- Skinner, B.F., 1953. *Science and Human Behavior*. Macmillan.
- Steinsbekk, S., Ranum, B., Wichstrøm, L., 2022. Prevalence and course of anxiety disorders and symptoms from preschool to adolescence: a 6-wave community study. *J. Child Psychol. Psychiatry Allied Discip.* 63 (5), 527–534. <https://doi.org/10.1111/jcpp.13487>.
- Sterne, J., Savović, J., Page, M.J., Elbers, R.G., Blencowe, N.S., Boutron, I., Cates, C.J., Cheng, H.-Y., Corbett, M.S., Eldridge, S.M., Emberson, J.R., Hernán, M.A., Hopewell, S., Hróbjartsson, A., Junqueira, D.R., Jüni, P., Kirkham, J.J., Lasserson, T., Li, T., Higgins, J.P.T., 2019. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 14898. <https://doi.org/10.1136/bmj.14898>.
- Stiede, J.T., Trent, E.S., Viana, A.G., Guzik, A.G., Storch, E.A., Hershfield, J., 2023. Cognitive behavioral therapy for children and adolescents with anxiety disorders. *Child Adolesc. Psychiatr. Clin. N. Am.* 32 (3), 543–558. <https://doi.org/10.1016/j.chc.2022.12.001>.
- Stockton, D., Kellett, S., Berrios, R., Sirois, F., Wilkinson, N., Miles, G., 2019. Identifying the underlying mechanisms of change during acceptance and commitment therapy (ACT): a systematic review of contemporary mediation studies. *Behav. Cogn. Psychother.* 47 (3), 332–362. <https://doi.org/10.1017/S1352465818000553>.
- Swain, J., Hancock, K., Hainsworth, C., Bowman, J., 2015. Mechanisms of change: exploratory outcomes from a randomised controlled trial of acceptance and commitment therapy for anxious adolescents. *J. Contextual Behav. Sci.* 4 (1), 56–67. <https://doi.org/10.1016/j.jcbs.2014.09.001>.
- Talaeizadeh, F., 2020. Comparison of acceptance commitment therapy (ACT) and cognitive behavioral therapy (CBT) in reducing depression symptoms and increasing happiness of Iranian adolescent girl students. *J. Intellect. Disabil.-Diagn. Treat.* 8, 16–24.
- Twohig, M.P., Levin, M.E., 2017. Acceptance and commitment therapy as a treatment for anxiety and depression: a review. *Psychiatr. Clin. N. Am.* 40 (4), 751–770. <https://doi.org/10.1016/j.psc.2017.08.009>.
- Von Brachel, R., Hirschfeld, G., Berner, A., Willutzki, U., Teismann, T., Cwik, J.C., Velten, J., Schulte, D., Margraf, J., 2019. Long-term effectiveness of cognitive behavioral therapy in routine outpatient care: a 5- to 20-year follow-up study. *Psychother. Psychosom.* 88 (4), 225–235. <https://doi.org/10.1159/000500188>.
- Wang, J., Fang, S., 2023. Effects of internet-based acceptance and commitment therapy (IACT) on adolescents: a systematic review and meta-analysis. In: *International Journal of Mental Health Promotion*, vol. 25, issue 4. Tech Science Press, pp. 433–448. <https://doi.org/10.32604/ijmhp.2023.025304>.
- Wang, S., Chen, L., Ran, H., Che, Y., Fang, D., Sun, H., Peng, J., Liang, X., Xiao, Y., 2022. Depression and anxiety among children and adolescents pre and post COVID-19: a comparative meta-analysis. *Front. Psych.* 13. <https://doi.org/10.3389/fpsy.2022.917552>.
- Wang, M., Mou, X., Li, T., Zhang, Y., Xie, Y., Tao, S., Wan, Y., Tao, F., Wu, X., 2023. Association between comorbid anxiety and depression and health risk behaviors among Chinese adolescents: cross-sectional questionnaire study. *JMIR Public Health Surveill.* 9. <https://doi.org/10.2196/46289>.
- Wicksell, R.K., Kanstrup, M., Kemani, M.K., Holmström, L., Olsson, G.L., 2015. Acceptance and commitment therapy for children and adolescents with physical health concerns. *Curr. Opin. Psychol.* 2, 1–5. <https://doi.org/10.1016/j.copsyc.2014.12.029>.
- World Health Organization, 2022. *International Classification of Diseases, Eleventh Revision (ICD-11)*.
- World Health Organization, 2023. *Adolescent health*. [https://www.who.int/health-topics/Adolescent-Health#tab=tab\\_1](https://www.who.int/health-topics/Adolescent-Health#tab=tab_1).
- Zettle, R.D., Rains, J.C., Hayes, S.C., 2011. Processes of change in acceptance and commitment therapy and cognitive therapy for depression: a mediation reanalysis of zettle and rains. *Behav. Modif.* 35 (3), 265–283. <https://doi.org/10.1177/0145445511398344>.
- Zettle, R.D., Hayes, S.C., Barnes-Holmes, D., Biglan, A., 2016. *The Wiley Handbook of Contextual Behavioral Science*. Wiley. <https://doi.org/10.1002/9781118489857>.