

What is the Evidence for the Efficacy of Self-Help Acceptance and Commitment Therapy? A Systematic Review and Meta-Analysis.

Abstract

Acceptance and Commitment Therapy (ACT¹) is a form of psychotherapy with growing evidence for its transdiagnostic effects. Traditionally face-to-face, ACT is also delivered in self-help formats. As self-help is becoming more prevalent, the demand for empirical evidence of the efficacy of ACT self-help is increasing, and there are concerns that intervention outcomes are being 'over-sold'. A systematic search of the literature was conducted to find all peer-reviewed randomized controlled trials investigating the efficacy of ACT self-help on depression, anxiety, and/or psychological flexibility (PF). Thirteen studies were identified and reviewed, totaling 2580 participants. A quality appraisal of the papers under review indicated bias in methodology and reporting that may be limit the interpretability of existing evidence. Meta-analysis showed significant small effect sizes favoring intervention for depression ($g=0.34$; 95% CIs [0.07, 0.61]; $Z=2.49$, $p=.01$), anxiety ($g=0.35$; 95% CIs [0.09, 0.60]; $Z=2.66$, $p=.008$), and PF ($g=0.42$; 95% CIs [0.14, 0.70]; $Z=2.93$, $p=.003$) outcomes. Results indicate that higher levels of clinician guidance improves outcomes but that intervention format (e.g. book/computer) is unlikely to moderate results. Analysis also showed that increases in PF were associated with reductions in depression ($\rho=-.70$, $p=.25$, $n=10$) and anxiety ($\rho=-.90$, $p<.001$, $n=10$), giving initial support for the theory that changes in PF mediate distress outcomes. Therefore, ACT self-help may be a suitable intervention, particularly when clinician guidance is given. However, due to the small effect sizes, limited number of studies, and considerable heterogeneity of results, any conclusions made are tentative.

Key Words: Acceptance and Commitment Therapy; ACT; Self-Help; Meta-Analysis; Systematic Review.

¹Abbreviations: Acceptance and Commitment Therapy (ACT), Psychological Flexibility (PF); Randomised Controlled Trial (RCT), Relational Frame Theory (RFT), Cognitive Behavioural Therapy (CBT), Intention to Treat (ITT), Confidence Interval (CI).

Introduction

Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT) is a form of psychotherapy that aims to increase psychological flexibility (PF) and support individuals to embrace all aspects of the human experience (positive and negative) and live a values-based life. It claims to achieve this through acceptance and mindfulness techniques paired with behavioral changes, and can be trans-diagnostically applied regardless of an individual's experienced difficulty (Hayes, Strosahl, & Wilson, 1999).

ACT has foundations in functional contextualism (Hayes, 1993) and Relational Frame Theory (RFT; Hayes, 1991). RFT states that language allows humans to make relational links between stimuli without direct experience, and that this ability can lead to more complex cognitions and psychological distress. By increasing PF, the impact of distressing relational links and cognitions are lessened and the individual freed to live the life they want (Hayes et al., 1999). However, ACT and RFT have been developed inductively, so more component analyses may be required to test these theoretical viewpoints (Zettle, 2005).

ACT has six 'core processes' (Table 1; Hayes, Strosahl, & Wilson, 2013). All six processes are needed for an intervention to be called 'ACT', however, many interventions are beginning to utilize various components of ACT alongside other techniques (e.g. Lappalainen et al., 2013). It is also difficult to quantify the true influence of 'ACT' as a whole, because some argue that ACT and other therapies share similar techniques but just use different terminology (Hofmann & Asmundson, 2008).

However, evidence for ACT is growing, and previous meta-analyses have shown its efficacy across several different difficulties (Öst, 2014; A-Tjak et al., 2015) and potential benefits over other therapies (Jiménez, 2012). Available evidence remains questionable because of potential bias towards the publication of positive results (Fanelli, 2012). Moreover, early estimates of efficacy may be inflated due to ACT being an 'exciting' new therapy, which may increase levels of expectation and improve outcomes (Constantino, Coyne, McVicar, & Ametrano, 2016). Öst (2014) also argued that research trials have methodological flaws and that ACT had yet to become a fully established treatment.

Table 1.

Six core processes of ACT (Hayes et al., 2013)

| <u>Core Process</u> | <u>Description</u> |
|---------------------|---|
| Acceptance | Embracing all aspects of the human experience: positive and negative. |
| Cognitive Defusion | Observing thoughts as an experience, rather than trying to modify their frequency or content. |
| Being Present | Contacting, and observing, current experiences in a non-judgmental way. |
| Self as Context | Recognizing one's experiences without investment or attachment to them |
| Values | Living life following personal values that are not based on cognitive fusion or experiential avoidance. |
| Committed Action | Creating goals and strategies to live a valued life, and committing to that behavior change. |

The Role of Self-Help in Psychotherapy

Whilst psychotherapy is traditionally face-to-face, many therapeutic models are being adapted into self-help and, guided self-help has been found to be as efficacious as face-to-face therapy (Hof, Cuijpers, & Stein, 2009; Cuijpers, Donker, van Straten, Li, & Andersson, 2010; Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014). However, forms of self-help can vary in level of guidance and format. Therefore, efficacy is hard to judge without clear definitions.

Previous definitions state self-help should “*guide and encourage the patient to make changes... rather than just provide information*” (Anderson et al., 2005; p. 387). It is stated that there are four variations of self-help: ‘self-administered’, ‘predominantly self-help’, ‘minimal contact’, and ‘predominantly therapist-administered’ (Table 2; Newman, Erickson, Przeworski, & Dzus, 2003). Previous research suggests that greater clinician input improves outcomes (van Boeijen et al., 2005; Hof et al., 2009; Lewis, Pearce, & Bisson, 2012; Richards & Richardson, 2012). Self-help can also be delivered via various formats such as bibliotherapy, internet-based, and mobile phone applications. However, there are mixed outcomes with research indicating computer-based or audio interventions have better outcomes (Jenkinson, Davison, Jones, & Hawtin, 1988; Lewis et al., 2012) but produce greater barriers to engagement (Jenkinson et al., 1988; Williams, 2002). Research also shows format of delivery to *not* impact outcomes (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Lancaster & Stead, 2005; Gellatly et al., 2007). Such variations in how self-help is defined make it difficult to establish reliable analyses of self-help findings and generalize results to any new self-help materials published (Barlow et al., 2002; Coull & Morris, 2011).

This is important because self-help is becoming more prevalent for many reasons: (1) Improving Access to Psychological Therapies (IAPT; a stepped care approach within the UK; Department of Health, 2007) uses guided self-help within their treatment pathways for individuals with mild to moderate presentations of some clinical difficulties (including depression and anxiety), (2) UK waiting lists are long (Mind, 2010, 2013) so individuals are more likely to seek self-help, and (3) improvements in technology mean that self-help is more accessible (Newman, Szkodny, Llera, & Przeworski, 2011). The evidence base is struggling to keep pace with these changes.

Table 2.

Levels of Self-Help (Newman et al., 2003; pp. 253)

| <u>Level of Self-Help</u> | <u>Description</u> |
|--|--|
| Self-Administered Therapy | Therapist may make contact for assessment. No further contact following this. |
| Predominantly Self-Help | Therapist may make contact for assessment. Therapist may have further contact for periodic check-ins, teaching clients how to use the tool, providing initial therapeutic rationale. |
| Minimal-Contact Therapy | Active involvement of therapist but to a lesser degree than traditional therapy. May help with certain aspects of the intervention (e.g. creating exposure hierarchy) |
| Predominantly Therapist-Administered Therapy | Client sees therapist for regular sessions, but self-help material may be given to supplement the therapy. |

ACT and Self-Help

ACT self-help is now readily available to the public. A search for “Acceptance and Commitment Therapy Self-Help” on *Amazon Books* (www.amazon.co.uk; 05/08/16) shows 102 hits. However, there is minimal published research investigating ACT self-help efficacy.

For research that does exist, it has been suggested that reporting standards are failing due to authors having a vested interest in promoting their interventions; for example, by focally reporting supportive outcomes, omitting data from ‘non-completer’ participants, and arguably over-claiming empirical support for published self-help books (O’Donohue et al., 2016; Rosen & Lilienfeld, 2016). A systematic review is needed to independently assess the quality of each study.

A systematic review was conducted in 2014 investigating the efficacy of acceptance and mindfulness based self-help (Cavanagh, Strauss, Forder, & Jones, 2014). However, its findings cannot be fully generalized to ACT self-help due to acceptance and mindfulness only making up two of the six core processes. If ACT is

being promoted as a complete self-help 'package' then a review is needed of interventions that include *all* six core processes. More in-depth analysis is also needed considering impacts of (1) levels of clinician guidance, (2) self-help format, and (3) changes in PF or other outcomes; comparisons not fully addressed in the Cavanagh review.

Purpose of the Systematic Review

This review aims to investigate the efficacy of ACT self-help. However, when defining 'efficacy' this review is limited to what current literature is reporting. Due to ACT's transdiagnostic nature, the outcomes range from anxiety and distress to management skills and smoking. For pragmatic reasons, focus is placed on outcomes most often reported: depression and anxiety². A third outcome, PF, is also analyzed. This enables exploration not only of the impact of intervention on PF, but also its mediating effects on depression and anxiety. As ACT is transdiagnostic, no restrictions were placed on the participant population under review.

Therefore, this review focuses on published RCTs reporting the efficacy of ACT self-help for anxiety, depression, and PF. It aims to answer the following questions:

- What is the quality of current research into ACT self-help?
- What is the efficacy of ACT self-help for depression, anxiety, and PF?
- Does the format of delivery or guidance impact outcomes?
- Does PF mediate depression and anxiety outcomes?

² *Note.* ACT does not aim to reduce symptoms, but rather to increase acceptance of these, as a means of pursuing valued ends (Hayes et al, 1999). However, as clients and commissioners tend to target symptoms (Mental Health Taskforce, 2016), depression and anxiety are often favoured as outcomes.

Method

Search Strategy

A systematic search for articles was conducted across six electronic databases: Cochrane Central Register of Controlled Trials (12 June 2016), PsychARTICLES (Full Text), PsycINFO (1806 to July week 1 2016), Embase (1974 to 2016 July 13), AMED (1985 to July 2016), OvidMEDLINE(R) (In process and other non-indexed citations and OvidMEDLINE(R)), and the Joanna Briggs Institute (EBP database current to July 06 2016). The following search terms were used via a combination of key words and subject headings: ('acceptance and commitment therapy' OR 'ACT') AND ('self help' OR 'bibliotherapy' OR 'web based' OR 'internet based' OR 'application' OR 'mobile' OR 'internet' OR 'computer'). No date limit was imposed and the last search was conducted 14/07/2016. Appendix A details the search strategy.

Selection Criteria

Following the systematic search of the literature, and removal of duplicates, all titles and abstracts were reviewed for suitable articles. To ensure systematic article selection, set inclusion criteria were followed (Table 3) based upon study quality criteria (Treadwell, Singh, Talati, McPheeters, & Reston, 2011), study relevance criteria (ACT (Hayes et al., 2013), self-help criteria (Newman et al., 2003), and relevance of outcome measures to ensure that each study could contribute to the review. The search was independently conducted by two review authors. A third author was available to resolve selection disagreements; however, was not required.

Table 3.

Selection Criteria

| <u>Inclusion Criteria</u> | <u>Rationale</u> |
|---|--|
| <i>Basic Study Criteria</i> | |
| English Language Only | Pragmatic reasons due to unavailability of translation. |
| Published within a peer reviewed journal | To ensure quality that is expected as standard amongst the scientific community. |
| Uses an RCT design with a control condition (active or inactive) | Deemed gold standard for assessing efficacy. |
| The study and/or author provides sufficient data to extract appropriate effect sizes. | To enable effective analysis within the review. |

| <i>ACT Criteria</i> | |
|---|---|
| Needs to include all six core processes of ACT within the intervention | To meet criteria for ACT intervention. |
| The intervention needs to be pure ACT (Not combined with other intervention models) or the effect sizes of the ACT component need to be extractable | To ensure that the effect sizes that are extracted are truly reflective of ACT interventions. |
| Control group cannot contain components of ACT | To be able to extract impact of ACT self-help |
| <i>Self-Help Criteria</i> | |
| Self-help can be defined through Newman et al. (2003) criteria as 'self-administered therapy' or 'predominately self-help' | To meet criteria for self-help as defined in this review. |
| More than just psychological information; individual is encouraged to partake in activities tailored towards positive change | To meet the criteria for self-help as defined in this review. |
| <i>Outcome Measure Criteria</i> | |
| Must include post-intervention measures of <i>at least</i> one of the following outcomes: depression, anxiety, or PF | To be eligible for inclusion in meta-analysis |

Initial application of inclusion criteria based on titles and abstracts produced 33 potentially eligible articles. Full text versions were accessed and 14 articles excluded. The article list and inclusion criteria were then sent to experts in the field and the academic community within the Association for Contextual Behavioral Science (<https://contextualscience.org/acbs>) to check for missing articles. One article was identified (Ritzert et al., 2016) which was previously missed due to recent publication at the time of the search (July, 2016). The reference list and recorded citations of each article were reviewed and a search conducted on *ClinicalTrials.gov* for upcoming RCTs. Protocol authors were contacted ($n=8$) and four responded, however, none had yet reached publication. Newly identified articles were subject to the same inclusion criteria. Twenty articles met criteria for inclusion (Figure 1). As several articles were reporting on the same studies, this equated to 13 studies (2580 participants).

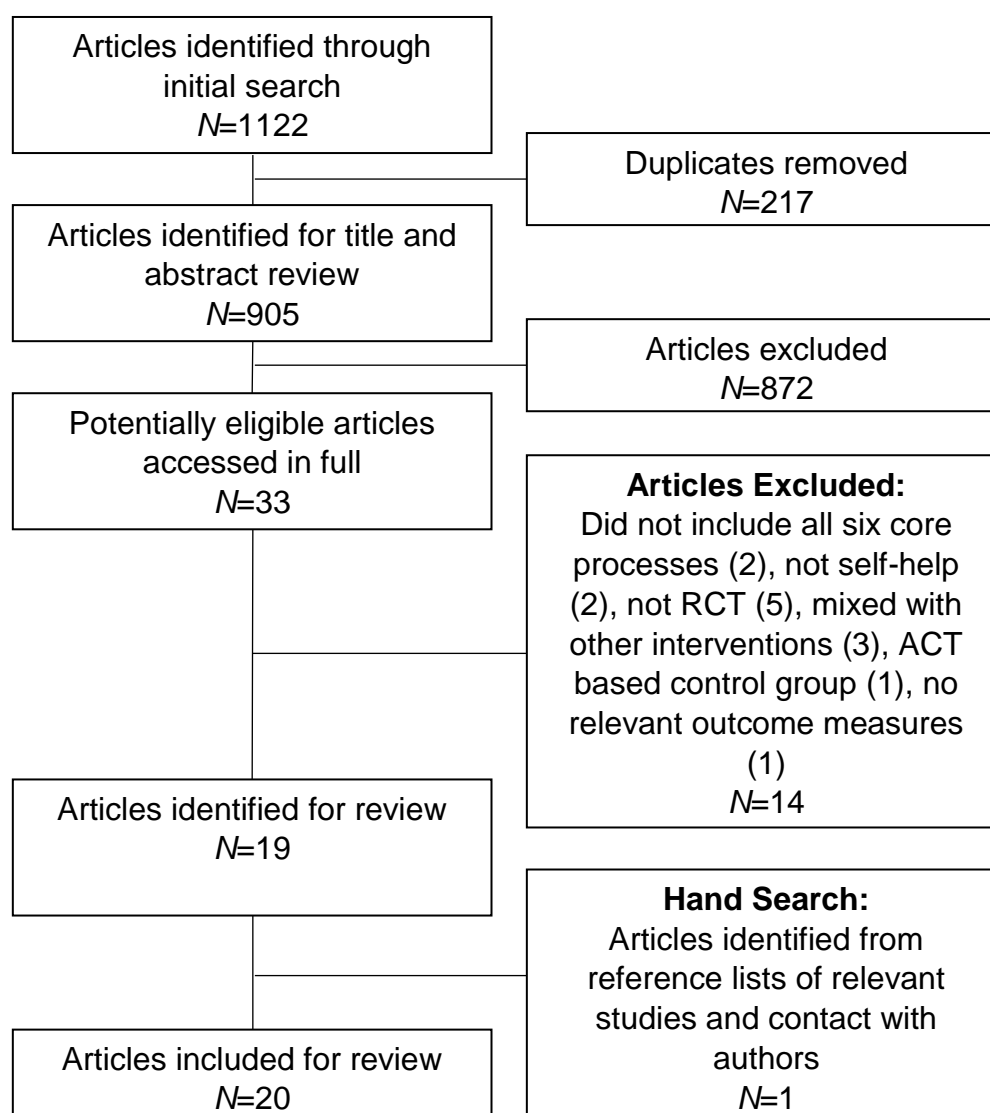


Figure 1. Flow Chart of Study Selection

Data Extraction

Participant characteristics were collected (number recruited/randomized, attrition rates, diagnoses), along with the control groups (active/passive), intervention duration and follow up, and details of each intervention's format (book-based or computer-based, and self-administered or predominantly self-help).

Post-intervention means and standard deviations were collected for all control and intervention groups. Due to wide heterogeneity in the timings of follow-up data, focus was placed on immediate post-intervention data during meta-analysis. Whenever possible, data analyzed using an Intention to Treat (ITT) protocol was collected as non-ITT data can produce misleading results (British Medical Journal, 2015). If more than one control condition existed, passive control groups were

chosen to maximize study homogeneity. Details of outcome measures used were collected, however, data was only extracted for measures quantifying depression, anxiety, or PF. If a study had multiple measures of an outcome, the measure with the best psychometric properties was used. Any analyses investigating the mediating effects of PF were also extracted. For studies missing needed post-intervention data (Bricker, Wyszynski, Comstock, & Heffner, 2013; Bricker et al., 2014; Ritzert et al., 2016), authors were contacted and relevant data received.

Data Analysis

Prior to meta-analysis, a risk of bias assessment was conducted, as less rigorous studies can lead to potentially misleading results (Detsky, Naylor, O'Rourke, McGeer, & L'Abbé, 1992). The assessment was conducted systematically following Cochrane guidelines (Higgins & Green, 2011), however, amendments were made to allow for better differentiation between studies (See 'Risk of Bias'). The assessment was conducted independently by two review authors, with a third author available to settle any disagreements and ensure group consensus. However, there a level of author interpretation and, even if a study's assessed risk of bias is 'high', findings may remain valid.

Bias was also assessed via funnel plots created through Review Manager (RevMan) version 5.3 (Cochrane Collaboration, 2014). Whilst funnel plots can effectively identify reporting bias (Higgins & Green, 2011), visual analysis is vulnerable to individual opinion and misinterpretation (Terrin, Schmid, & Lau, 2005). An alternative is the *fail-safe N* (Rosenthal, 1979), however, due to unreliable variations in implementation, guidelines advise against this (Higgins & Green, 2011).

The results are expected to be heterogeneous due to natural clinical and methodological diversity found in psychological intervention studies (Higgins, Thompson, Deeks, & Altman, 2003). Therefore, guidelines advise use of standard mean difference (*SMD*) calculations within a random effects model (Higgins & Green, 2011). This produces more conservative pooled effect size estimates, less susceptible to the impact of heterogeneity.

Therefore, for each meta-analysis, the post-intervention means (*m*), standard deviations (*sd*), and participant numbers (*n*) of intervention and control groups were entered in RevMan. The overall effect size estimate was calculated using Hedge's *G* which is a more precise variation of Cohen's *D* due to correction of biases in small effect sizes (Hedges & Olkin, 1985). 95% Confidence Intervals (CI) were calculated to improve certainty when stating significance (Sapp, 2004). The pooled effect size was calculated as follows:

$$SMD_i = \frac{m_{1i} - m_{2i}}{s_i} \times \left(1 - \frac{3}{4N_i - 9}\right) \quad S_i = \sqrt{\frac{(n_{1i} - 1)sd_{1i}^2 + (n_{2i} - 1)sd_{2i}^2}{N_i - 2}}$$

The magnitude of Hedge's G can be defined as small (0.2), medium (0.5), and large (0.8) following Cohen's (1988) convention (Higgins & Green, 2011). Some argue these definitions are overgenerous and that $g=0.41$ needs to be reached for "practical significance" (Ferguson, 2009), because significant results do not necessarily mean an individual has experienced a level of change that is 'significant' to them. However, rigid adherence to such criterion may be inappropriate as it still does not guarantee that change is meaningful, and so results should be interpreted with this limitation in mind.

Forest plots were produced to illustrate effect sizes, and heterogeneity of results. The heterogeneity was quantified (I^2) within RevMan as follows³:

$$I^2 = \left(\frac{Q - df}{Q} \right) \times 100\%$$

The I^2 value can be interpreted as insignificant (<40%), moderate (30-60%), substantial (50-90%), or considerable (>75%). However, the size, direction, and significance of the results also impact such judgments (Higgins & Green, 2011). Therefore, a level of individual interpretation should be used. Further sensitivity analyses were conducted to observe the impact of removing potentially 'heterogeneous' studies from meta-analysis. This tested whether certain assumptions of homogeneity (Blundel, 2014) were influencing results.

Therefore, analyses were conducted looking at the removal of studies that (1) appeared to be outliers (from inspection of funnel-plots and/or non-overlap of CIs with pooled CIs), (2) had active controls, (3) had high risk of bias, or (4) had intervention durations falling ± 2 sds from average duration length. Pre-planned subgroup analyses were also conducted investigating the pooled effect sizes of (1) self-administered versus predominantly self-help studies, and (2) book-based versus computer-based studies.

³ Q =chi-squared statistic; df =degrees of freedom

Results

Study Characteristics

Study characteristics are summarized in Table 4. For ease of reading, studies will be referred to by the first set of authors indicated in bold. Tabulated measures are those for which participants provided (at minimum) pre- and post-intervention responses; thus, for Bricker et al. (2013) a depression screen administered at a single (pre-intervention) time-point (single yes/no question “In the past 3 months, did you have a period of one week when you lost interest in most things like work, hobbies, and other things you usually enjoy?” from Means-Christensen, Sherbourne, Roy-Byrne, Craske, & Stein, 2006) is not included.

Table 4.

Characteristics of Studies Selected for Review

| Authors | Participants | Intervention | Comparison (n=number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|--|---|--|--|--------------|---|--------------------------------------|---|-------------------|
| Bricker et al. (2013) and Jones et al. (2015) | Adults smoking five or more cigarettes daily | (CB) Website: <i>webquit.org</i> | (1) Experimental website <i>webquit.org</i> (n=111) (2) Government website <i>smokefree.gov</i> (n=111) | (SA) None | Eight modules self-paced over three months Three month follow up | N/A | AIS-27: Psychological Flexibility | Smoking status |
| Bricker et al. (2014) and Heffner, Villardaga, Mercer, Kientz, & Bricker (2015) | Adults smoking five or more cigarettes daily | (CB) Smartphone application: <i>SmartQuit</i> | (1) ACT application <i>SmartQuit</i> (n=98) (2) Cancer Institute application <i>QuitGuide</i> (n=98) | (SA) None | Self-paced over two months No follow up | N/A | AIS-9: Psychological Flexibility | Smoking status |

| Authors | Participants | Intervention | Comparison (n=number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|---|--|---|--|---|---|--|--|-----------------------|
| Buhrman et al. (2013) | Adults with chronic pain | (CB) Website with audio exercises | (1) Experimental Intervention (n=38) (2) Waiting List (n=38) | (PSH) Homework feedback weekly via email. Two <30 min phone calls. | Seven modules over seven weeks Six month follow up | HADS: Anxiety and Depression | CPAQ: Psychological Flexibility | CSQ, MPI, PAIRS, QOLI |
| Fledderus, Bohlmeijer, Pieterse, & Schreurs (2012), Fledderus, Bohlmeijer, Fox, Schreurs & Spinhoven (2013) and Bohlmeijer, Lamers, & Fledderus (2015) | Adults with mild to moderate depression. | (BB) Book: <i>Voilet Leven (Living Life to the Full;</i> Bohlmeijer & Hulsbergen, 2009) | (1) Minimal email support (n=125) (2) Extensive email support (n=125) (3) Waiting list control (n=126) | (PSH) Email based support | Nine modules over nine weeks Three month follow up | CES-D: Depression HADS-A: Anxiety | AAQ-II (10 items): Psychological Flexibility | CIS, MHC-SF, FFMQ |

| Authors | Participants | Intervention | Comparison (<i>n</i> =number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|---|--------------------------|---|---|-------------------------------------|---|--|---|-----------------------------------|
| Hesser et al. (2012) | Adults with tinnitus | (CB) Website | (1) ACT intervention (<i>n</i> =35) (2) CBT intervention (<i>n</i> =32) (3) Online discussion forum (<i>n</i> =32) | (PSH) Email based support | Eight modules therapist- paced over 8 weeks One year follow up | HADS: Anxiety and Depression | TAQ: Psychological Flexibility | THI, PSS, ISI, QOLI |
| Jeffcoat & Hayes (2012) | Teachers | (BB) Book: <i>Get out of your mind and into your life</i> (Hayes & Smith, 2005) | (1) ACT intervention (<i>n</i> =121) (2) Waiting List (<i>n</i> =115) | (SA) None | Eight weeks to read book and complete quizzes Ten week follow up | DASS-21: Anxiety and Depression | AAQ-II (10 items): Psychological flexibility | GHQ- 12, KIMS |
| Johnston, Foster, Shennan, Starkey, & Johnson (2010) | Adults with chronic pain | (BB) Book: <i>Living Beyond your Pain</i> (Dahl & Lundgren, 2006) along with workbook | (1) ACT intervention (<i>n</i> =12) (2) Waiting list control (<i>n</i> =12) | (PSH) Weekly phone support | Six weeks No follow up | CMDI: Depression BAI: Anxiety | CPAQ: Psychological Flexibility | QOLI, SWLS, CPVI, MPQ-SF |

| Authors | Participants | Intervention | Comparison (<i>n</i> =number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|--|---|--|--|--------------|--|--|--|--|
| Levin, Hayes, Pistorello, & Seeley (2016) | Adult students | (CB) ACT multimedia program online with two core sessions and interactive exercises | (1) ACT intervention (<i>n</i> =110) (2) Mental Health Education multimedia program (<i>n</i> =118) | (SA) None | Three weeks One and three month follow up | DASS-21: Anxiety and Depression | AFQ-Y: Psychological Flexibility | MHC- SF, FFMQ, AKQ, SUS |
| Moffitt & Mohr (2015) | Adults screened as wanting to increase physical activity | (CB) ACT DVD | (1) ACT and walking intervention (<i>n</i> =39) (2) Walking intervention (<i>n</i> =37) | (SA) None | Five modules to watch prior to walking intervention over 3 months Four, eight, and 12 week follow up | N/A | AAQ (16 items): Psychological Flexibility | IPAQ, VLQ, Step count, Goals |

| Authors | Participants | Intervention | Comparison (n=number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|---|---|---|---|-------------------------------|---|--|---|-------------------|
| Muto, Hayes, & Jeffcoat (2011) | Japanese students living abroad | (BB) Book: <i>Get out of your Mind and into your Life</i> (Hayes & Smith, 2005) | (1) ACT intervention (n=35) (2) Waiting List (n=35) | (SA) None | 8 Weeks to read book Two month follow up | DASS-21: Anxiety and Depression | AAQ (10 items): Psychological flexibility | GHQ-12 |
| Pots et al. (2016a) and Pots, Trompetter, Schreurs, & Bohlmeijer (2016b) | Adults with mild to moderate depression | (CB) Web-based version of book: <i>Voilet Leven (Living Life to the Full;</i> Bohlmeijer & Hulsbergen, 2009) | (1) ACT intervention (n=82) (2) Expressive Writing (n=67) (3) Waiting List (n=87) | (PSH) Weekly email support | 9 modules over 12 weeks Six and 12 month follow up | CES-D: Depression HADS-A: Anxiety | AAQ-II (10 items): Psychological Flexibility | FFMQ, MHC-SF |

| Authors | Participants | Intervention | Comparison (n=number randomized) | Support | Duration | Depression/ Anxiety Measure(s) | Psychological Flexibility Measure | Other Measures |
|--|--------------------------|---|---|--------------|--|--|--|---|
| Ritzert et al. (2016) | Adults with anxiety | (BB) Book: <i>Mindfulness and Acceptance Workbook for Anxiety</i> (Forsyth & Eifert, 2007) | (1) ACT intervention (n=256) (2) Waiting List (n=247) | (SA) None | 12 weeks to complete book Six and nine week follow up | BDI-II: Depression BAI: Anxiety | AAQ (16 items): Psychological flexibility | ASI, PSWQ, QOLI, BAFT, MAAS, SCS |
| Trompetter, Bohlmeijer, Veehof, & Schreurs (2015b), Trompetter, Bohlmeijer, Fox, & Schreurs (2015a) and Trompetter, Bohlmeijer, Lamers, & Schreurs (2016) | Adults with chronic pain | (CB) Internet version of book: <i>Voilet Leven (Living Life to the Full;</i> Bohlmeijer & Hulsbergen, 2009) | (1) ACT intervention (n=82) (2) Expressive Writing (n=79) (3) Waiting List (n=77) | (SA) None | Nine modules over 12 weeks Six month follow up | HADS: Anxiety and Depression | PIPS: Psychological flexibility | MPI, PNRS, PDI, MHC-SF, FFMQ-SF, ELS, PCS |

Note. SA: Self-Administered; PSH: Predominantly Self-Help; BB: Book-Based; CB: Computer-Based; Measures: AAQ (II): Acceptance and Action Questionnaire (II); AFQ-Y: Avoidance and Fusion Questionnaire for Youth; AIS-27 & AIS-9: Avoidance and Inflexibility Scale; AKQ: ACT Knowledge Questionnaire; ASI: Anxiety Sensitivity Index; BAFT: Believability of Anxious Feelings and

Thoughts Questionnaire; BAI: Beck Anxiety Inventory; BDI (II): Beck Depression Inventory (II); CES-D: Center for Epidemiologic Studies Depression Scale; CIS: Checklist Individual Strength; CMDI: Chicago Multi-scale Depression Inventory; CPAQ: Chronic Pain Acceptance Questionnaire; CPVI: Chronic Pain Values Inventory; CSQ: Coping Strategies Questionnaire; DASS-21: Depression, Anxiety, and Stress Scale; FFMQ: Five Facet Mindfulness Questionnaire (SF: Short Form); GHQ (12): General Health Questionnaire (12); ELS: Engaged Living Scale; HADS: Hospital Anxiety and Depression Scale; IPAQ: International Physical Activity Questionnaire; ISI: Insomnia Index Severity; KIMS: Kentucky Inventory of Mindfulness Skills; MAAS: Mindful Attention Awareness Scale; MHC-SF: Mental Health Continuum – Short Form; MPI: Multidimensional Pain Questionnaire; MPQ-SF: McGill Pain Questionnaire Short Form; PAIRS: Pain and Impairment Relationship Scale; PCS: Pain Catastrophising Scale; PDI: Pain Disability Index; PIPS: Psychological Inflexibility in Pain Scale; PNRS: Pain Numeric Rating Scale; PSS: Perceived Stress Scale; PSWQ: Penn State Worry Questionnaire; QOLI: Quality of Life Inventory; SCS: Self-Compassion Scale; SUS: System Usability Scale; SWLS: Satisfaction with Life Scale; TAQ: Tinnitus Acceptance Questionnaire; THI: Tinnitus Handicap Inventory; VLQ: Valued Living Questionnaire.

Study Designs. All studies were RCTs with a mixture of passive control groups ($n=5$), active control groups ($n=4$), or both ($n=4$). Ten studies included depression and anxiety outcomes. All 13 studies included PF outcomes. Four studies investigated relationships between PF and depression and/or anxiety outcomes.

Fledderus et al. (2012) had two interventions classified as 'predominantly self-help': minimal or extensive guidance. However, a later paper (Fledderus et al., 2013) combined the data of both interventions. Therefore, data from this later paper was extracted to avoid duplication of control group data in the analyses.

Jeffcoat and Hayes (2012) analyzed sub-groups depending on pre-treatment depression or anxiety scores. Therefore, for depression outcomes, both intervention and control group data was split according to pre-intervention scores (i.e. depressed/not depressed). Similar sub-groups were made for anxiety outcomes. Therefore, two sets of results have been extracted from the study for the analyses of each outcome. Analysis of PF outcomes was conducted on the group as a whole.

Sample Sizes. Sample sizes ranged 24-503 with a total of 2590 participants. 1269 were allocated to intervention conditions, 1133 to control conditions, and the final 188 to conditions not under review. Discrepancies can be observed between intervention and control group sizes due to these other conditions, as well as six studies only displaying completer data.

Participants had a wide range of characteristics. Seven studies (59.9% of participants) recruited from a clinical population with either mental or physical health symptoms: depression (2 studies, $n=612$), anxiety (1 study, $n=503$), chronic pain (3 studies, $n=338$), and tinnitus (1 study, $n=99$). Six studies recruited from a non-clinical population: smokers (2 studies, $n=418$), teachers (1 study, $n=236$), students (2 studies, $n=298$), and those wishing to exercise more (1 study, $n=76$). All participants were 18+ years with a mean age of 41.4 years; the majority were female (72.96%).

Intervention Characteristics. More studies had self-administered interventions ($n=8$) than predominantly self-help ($n=5$), and computer-based interventions ($n=8$) were more common than book-based ($n=6$). Across the computer-based interventions were four different formats: website ($n=4$), smartphone application ($n=1$), DVD ($n=1$), and books accessed online ($n=2$). The format of the intervention (book versus computer) was not significantly impacted by the level of clinician guidance used (Predominantly self-help: computer-based $n=3$, book-based $n=2$; Self-administered: computer-based $n=5$, book-based $n=3$).

Intervention duration ranged from 3-12 weeks (mean=9 weeks; $SD=2.86$). 11 studies included one or more follow up data collections with final follow ups ranging 1 to 12 months post-intervention (mean=5.8 months, $SD=4.21$). However, there was high heterogeneity; eight studies all used different time points within the first three months, three studies each followed up at three and six months respectively and one

at two years. Due to this heterogeneity, along with loss of waiting list control groups at follow up, meta-analysis has retained focus on immediate post-intervention data.

Intervention Attrition and Engagement. All studies include attrition data. An average of 78.7% of participants (range:53.6%-97.0%) completed post-treatment outcomes. Control groups had higher completion rates (mean=83.2%, range:53.2%-100%) than intervention groups (mean=75.4%, range:44.1%-94.3%) regardless of whether the control was active or passive.

Participants were more likely to complete treatment when the intervention was predominantly self-help (mean=80.1%, range:50%-94.3%) compared to self-administered (mean=71.9%, range:44.1%-86.0%). There was also a slightly higher level of completion in computer-based interventions (mean=77.1%, range:54.1%-94.3%) than book-based interventions (mean=73.1%, range:44.1%-88.8%).

Risk of Bias. The risk of bias was assessed systematically following Cochrane guidelines (Tables 5 & 6; Higgins & Green, 2011). The seventh domain ("other") was amended to consider parity of demographic and pre-score data between control and intervention groups, and whether differences were controlled for during analysis. Due to the nature of psychotherapeutic intervention, RCTs often struggle to 'blind' participants and personnel to the treatment; consequently, any participant- or personnel-reported outcome assessments are also unblinded. This is highlighted within the assessment of risk as all studies are deemed 'high risk' in blinding domains. Also, all studies have unclear risk in the 'selective reporting' domain. Therefore, a new amended rating was calculated, excluding these three domains, to allow better differentiation between studies. However, this does not negate the fact that all studies have a threat of bias due to these difficulties. Using the amended rating, two studies were assessed as 'high risk' in comparison to the other studies, therefore, sensitivity analyses were conducted to observe their effects on heterogeneity and overall effect sizes.

Table 5.

Risk of Bias Criterion (Higgins & Green, 2011; British Medical Journal, 2011)

| <u>Risk of Bias</u> | <u>Interpretation</u> | <u>Criteria</u> | <u>Rating</u> |
|----------------------|--|---|---------------|
| Low risk of bias | Bias, if present, is unlikely to alter the results seriously | Low risk of bias for all key domains | L |
| Unclear risk of bias | A risk of bias that raises some doubt about the results | Low or unclear risk of bias for all key domains | U |
| High risk of bias | Bias may alter the results seriously | High risk of bias for one or more key domains | H |

Note. L = Low Risk; H = High Risk; U = Unknown Risk.

Table 6

Risk Bias of Selected Studies (Higgins & Green, 2011; British Medical Journal, 2011)

| Study | Criteria | | | | | | | | | |
|---------------------------|----------------------------|------------------------|-------------------------------------|--------------------------------|-------------------------|---------------------|---------------------------|----------------|-----------------|--|
| | Random Sequence Generation | Allocation Concealment | Blinding of participants/ personnel | Blinding of outcome assessment | Incomplete outcome data | Selective reporting | Other: Parity of baseline | Overall Rating | Amended Rating* | |
| Bricker et al. (2013) | L | L | H | H | H | U | L | H | H | |
| Bricker et al. (2014) | L | L | H | H | U | U | U | H | U | |
| Buhrman et al. (2013) | L | L | H | H | L | U | U | H | U | |
| Fledderus et al. (2012) | L | L | H | H | L | U | L | H | L | |
| Hesser et al. (2012) | L | L | H | H | L | U | L | H | L | |
| Jeffcoat & Hayes (2012) | L | L | H | H | L | U | L | H | L | |
| Johnston et al. (2010) | H | H | H | H | H | U | H | H | H | |
| Levin et al. (2016) | L | L | H | H | L | U | L | H | L | |
| Moffitt & Mohr (2015) | L | U | H | H | L | U | L | H | U | |
| Muto et al. (2011) | U | U | H | H | L | U | L | H | U | |
| Pots et al. (2016a) | U | U | H | H | L | U | L | H | U | |
| Ritzert et al. (2016) | L | L | H | H | L | U | L | H | L | |
| Trompetter et al. (2015b) | L | U | H | H | L | U | L | H | U | |

Note. *The risk domains of *Blinding of participants and personnel*, *Blinding of outcome assessment*, and *Selective reporting* have been excluded from the

'Amended Rating 'to allow better differentiation between studies. L=Low Risk;
H=High Risk; U=Unknown Risk

Meta-Analysis

Funnel plots were produced to check for bias in results and outliers (Figure 2). Whilst visual inspection of the funnel plots shows symmetry, indicative of minimal bias across the results, the Ritzert (2016) study (topmost data-point) was identified as a probable outlier in all three plots: as the study with greatest size and precision, we would expect the topmost effect-estimate to center on the pooled point-estimate (vertical dashed line) but it consistently deviates from this (most obviously in Figure 2c); the outlying nature of the study is supported by subsequent inspection of overlap with pooled CIs (Figures 3-5). Therefore, sensitivity analyses were conducted to observe its effects on heterogeneity and overall effect size.

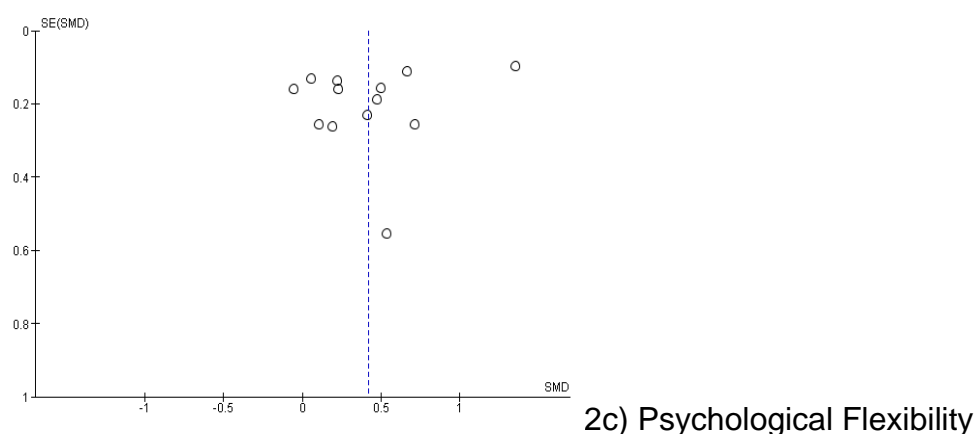
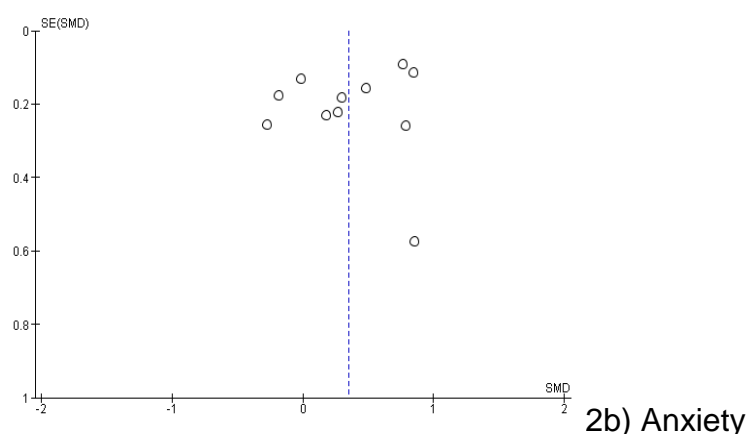
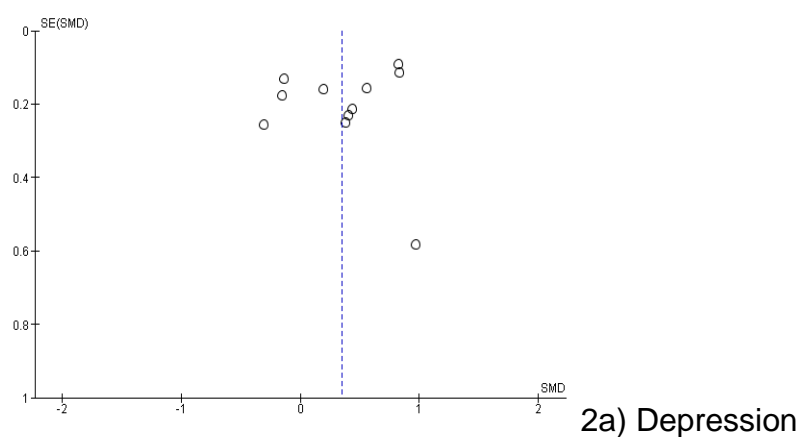


Figure 2. Funnel plots of post-intervention effect sizes by standard error

Depression Outcomes. Ten studies included measures of depression. After splitting Jeffcoat and Hayes' (2012) results into "depressed" and "not depressed" subgroups, 11 sets of results (1870 participants) were included in the meta-analysis (Table 7; Figure 3).

Table 7.

Depression Symptom Outcomes

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference | | |
|--|-----------|--------|----------------------------|-------|-----|-----------------------|-------|-----|----------|--------------------------|-------|------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Buhrman et al. (2013) (HADS-D) | PSH | CB | 8.85 | 4.40 | 38 | 10.52 | 3.77 | 38 | 8.7% | 0.40 | -0.05 | 0.86 |
| Fledderus et al. (2012) (CES-D) | PSH | BB | 13.33 | 7.28 | 250 | 19.76 | 8.48 | 126 | 10.7% | 0.80 | 0.54 | 1.05 |
| Hesser et al. (2012) (HADS-D) | PSH | CB | 3.48 | 2.43 | 33 | 4.59 | 3.29 | 32 | 8.4% | 0.38 | -0.11 | 0.87 |
| Jeffcoat & Hayes (2012) Dep (DASS-D) | SA | BB | 11.07 | 9.90 | 45 | 15.18 | 8.96 | 44 | 9.0% | 0.43 | 0.01 | 0.85 |
| Jeffcoat & Hayes (2012) Not Dep (DASS-D) | SA | BB | 4.79 | 6.50 | 64 | 3.98 | 3.71 | 66 | 9.7% | -0.15 | -0.50 | 0.19 |
| Johnston et al. (2010) (CMDI) | PSH | BB | 89.0 | 23.9 | 6 | 113.9 | 24.4 | 8 | 3.8% | 0.96 | -0.18 | 2.10 |
| Levin et al. (2016) (DASS-D) | SA | CB | 8.79 | 11.59 | 110 | 7.31 | 9.60 | 118 | 10.4% | -0.14 | -0.4 | 0.12 |
| Muto et al. (2011) (DASS-D) | SA | BB | 11.33 | 7.56 | 30 | 9.10 | 7.00 | 31 | 8.2% | 0.30 | -0.81 | 0.20 |
| Pots et al. (2016a) (CES-D) | PSH | CB | 14.68 | 8.05 | 82 | 19.34 | 8.55 | 87 | 10.0% | 0.56 | 0.25 | 0.87 |
| Ritzert et al. (2016) (BDI) | SA | BB | 14.18 | 11.18 | 256 | 24.41 | 13.69 | 247 | 11.0% | 0.81 | 0.64 | 0.99 |
| Trompetter et al. (2015b) (HADS-D) | SA | CB | 5.1 | 3.7 | 82 | 5.8 | 3.5 | 77 | 10.0% | 0.19 | -0.12 | 0.51 |

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference | | |
|----------------|-----------|--------|----------------------------|----|---|-----------------------|----|---|----------|--------------------------|------|------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Total (95% CI) | | | 874 | | | 996 | | | 100% | 0.34 | 0.07 | 0.61 |

Note. Standard Mean Difference calculated as Hedge's G. PSH = Predominantly Self-Help; SA = Self-Administered; CB = Computer Based; BB = Book Based; M = Mean; SD = Standard Deviation; N = Number of participants included in analysis; LCI = Lower Confidence Interval; UCI = Upper Confidence Interval

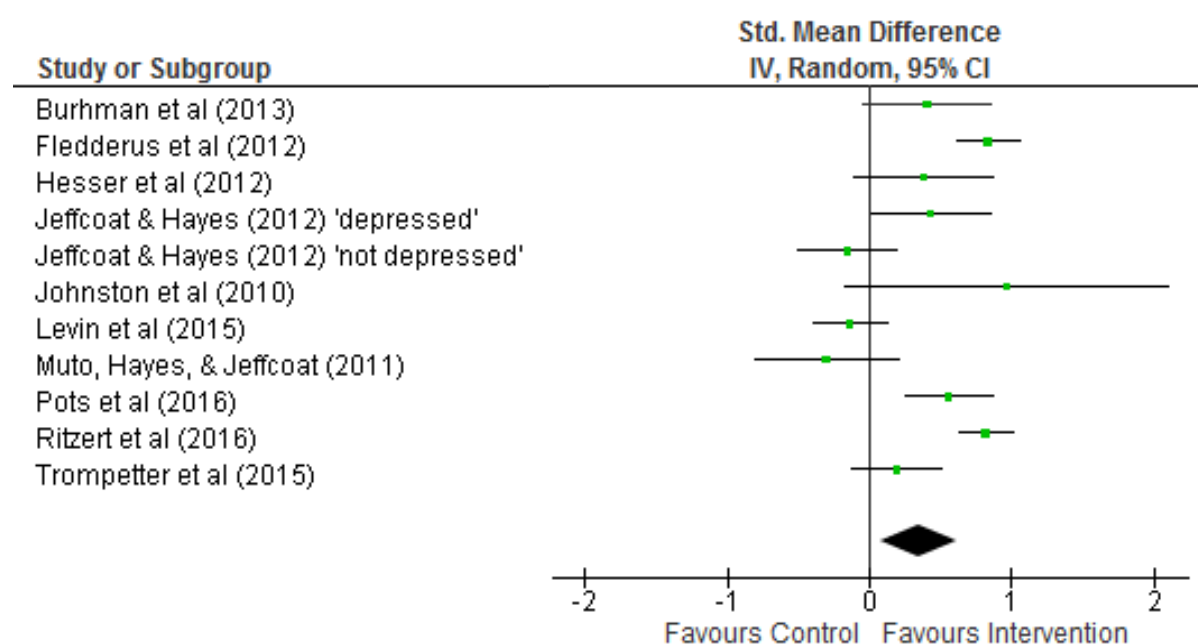


Figure 3. Depression Outcomes Forest Plot

The results show a significant small pooled effect size estimate ($g=0.34$; 95% CIs [0.07, 0.61]; $Z=2.49$, $p=.01$) favoring intervention. However, the criterion for 'practical significance' (>0.41) was not met. As predicted, outcomes showed considerable heterogeneity ($I^2=86\%$), therefore, sensitivity analyses were conducted.

The Ritzert et al. (2016) study was an outlier on the funnel plot, and did not have CIs overlapping the pooled effect size. Removing this study had minimal impact on heterogeneity ($I^2=82\%$), and the pooled effect size was reduced ($g=0.28$; 95% CIs [0.01, 0.56]; $Z=2.01$, $p=.04$) but remained significant and in the same direction.

Sensitivity analyses also investigated the impact of removing studies with high risk of bias (Johnston et al., 2010). Heterogeneity remained considerable ($I^2=87\%$) and the pooled effect size remained significant and in the same direction ($g=0.32$; 95% CIs [0.04, 0.59]; $Z=2.49$, $p=.01$).

The pooled effect size remained significant and increased slightly to $g=0.40$ when limiting analysis to studies with passive controls (95% CIs [0.13, 0.68]; $Z=2.86$, $p=.004$), or studies applying interventions of comparable length (95% CIs [0.15, 0.66]; $Z=3.07$, $p=.002$). Heterogeneity remained considerable in both cases ($I^2=89\%$ and 81% respectively).

Levels of Guidance: Self-Administered vs. Predominantly Self-Help. Limiting analysis to predominantly self-help studies ($n=5$) reduced heterogeneity to a non-significant level ($I^2=27\%$) and the pooled effect size increased to a significant medium effect size ($g=0.63$; 95% CIs [0.43, 0.83]; $Z=6.05$, $p<.00001$) that meets the threshold for 'practical significance'. Limiting analysis to self-administered studies

($n=6$) maintained considerable heterogeneity ($I^2=91\%$) and the pooled effect size reduced to a non-significant level ($g=0.16$; CIs [-0.26, 0.57]; $Z=0.74$, $p=.46$). It is worth noting that removal of the larger ‘outlier’ study, Ritzert et al (2016), reduced the self-administered pooled effect size to almost zero ($g=0.01$; 95% CIs [-0.23, 0.24]; $Z=0.07$, $p=.95$). When comparing the study-subgroups directly, testing indicated that effect sizes were significantly greater for predominantly self-help (versus self-administered) studies: both with ($\text{Chi}^2=4.06$, $df=1$, $p=.04$; $I^2=77\%$) and without ($\text{Chi}^2=15.41$, $df=1$, $p<.001$; $I^2=94\%$) the potentially outlying estimate (Ritzert, 2016). These results suggest that predominantly self-help interventions have a greater impact on depressive symptoms than self-administered interventions, indicating benefits of clinician involvement; however, differences between sub-grouped studies may be attributable to other sources of variability (besides differential levels of guidance).

Format of Intervention: Computer-Based vs. Book-Based. Limiting analysis to computer-based studies ($n=5$) reduced heterogeneity ($I^2=69\%$) and the pooled effect size dropped to a non-significant level ($g=0.26$; 95% CIs [-0.02, 0.54]; $Z=1.80$, $p=.07$). Limiting analysis to book-based studies ($n=6$) led to an increased pooled effect size ($g=0.41$; 95% CIs [0.01, 0.81]; $Z=2.00$, $p=.05$) at a ‘practically significant’ level. However, heterogeneity remained considerable ($I^2=88\%$); moreover, when the largest ‘outlier’ study, Ritzert et al. (2016), was excluded the book-based outcome dropped and lost significance ($g=0.31$; 95% CIs [-0.22, 0.84]; $Z=1.14$, $p=.25$). Comparing the study-subgroups directly, testing indicated no significant difference between computer- versus book-based studies ($\text{Chi}^2=0.36$, $df=1$, $p=.55$; $I^2=0\%$) – and this comparison remained non-significant when excluding the outlier (Ritzert, 2016). On balance, available evidence does not support clear conclusions about the impact of intervention format.

Anxiety Outcomes. 10 studies included measures of anxiety. After splitting Jeffcoat and Hayes (2012) into “anxious” and “not anxious” subgroups, a total of 11 sets of results (1824 participants) were included in the meta-analysis (Table 8; Figure 4).

Table 8.

Anxiety Symptom Outcomes

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference | | |
|--|-----------|--------|----------------------------|-------|-----|-----------------------|-------|-----|----------|--------------------------|-------|------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Buhrman et al. (2013) (HADS-A) | PSH | CB | 8.97 | 4.33 | 38 | 9.67 | 3.50 | 38 | 8.7% | 0.18 | -0.27 | 0.63 |
| Fledderus et al. (2012) (HADS-A) | PSH | BB | 6.12 | 2.96 | 250 | 8.69 | 3.19 | 126 | 10.9% | 0.80 | 0.54 | 1.05 |
| Hesser et al. (2012) (HADS-A) | PSH | CB | 4.21 | 2.25 | 33 | 6.78 | 3.98 | 32 | 8.1% | 0.79 | 0.28 | 1.29 |
| Jeffcoat & Hayes (2012) Anx (DASS-A) | SA | BB | 12.21 | 8.02 | 39 | 14.46 | 8.82 | 42 | 8.8% | 0.26 | -0.17 | 0.70 |
| Jeffcoat & Hayes (2012) Not Anx (DASS-A) | SA | BB | 4.66 | 5.46 | 64 | 3.75 | 4.05 | 66 | 9.8% | -0.19 | -0.53 | 0.16 |
| Johnston et al. (2010) (BAI-II) | PSH | BB | 12.0 | 8.7 | 6 | 20.0 | 8.80 | 8 | 3.6% | 0.86 | -0.27 | 1.98 |
| Levin et al. (2016) (DASS-A) | SA | CB | 7.05 | 9.34 | 110 | 6.94 | 8.68 | 118 | 10.6% | -0.01 | -0.27 | 0.25 |
| Muto et al. (2011) (DASS-A) | SA | BB | 12.53 | 8.2 | 30 | 10.45 | 6.75 | 31 | 8.2% | -0.27 | -0.78 | 0.23 |
| Pots et al. (2016a) (HADS-A) | PSH | CB | 6.15 | 3.25 | 82 | 7.82 | 3.62 | 87 | 10.2% | 0.48 | 0.18 | 0.79 |
| Ritzert et al. (2016) (ASI) | SA | BB | 18.22 | 12.41 | 256 | 28.25 | 13.91 | 247 | 11.3% | 7.84 | 7.32 | 8.35 |
| Trompetter et al. (2015b) (HADS-A) | SA | CB | 5.0 | 3.8 | 59 | 6.1 | 3.6 | 62 | 9.7% | 0.30 | -0.06 | 0.65 |

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference | | |
|----------------|-----------|--------|----------------------------|----|---|-----------------------|----|---|----------|--------------------------|------|------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Total (95% CI) | | | 857 | | | 967 | | | 100% | 0.35 | 0.09 | 0.60 |

Note. Standard Mean Difference calculated as Hedge's G. PSH = Predominantly Self-Help; SA = Self-Administered; CB = Computer Based; BB = Book Based; M = Mean; SD = Standard Deviation; N = Number of participants included in analysis; LCI = Lower Confidence Interval; UCI = Upper Confidence Interval

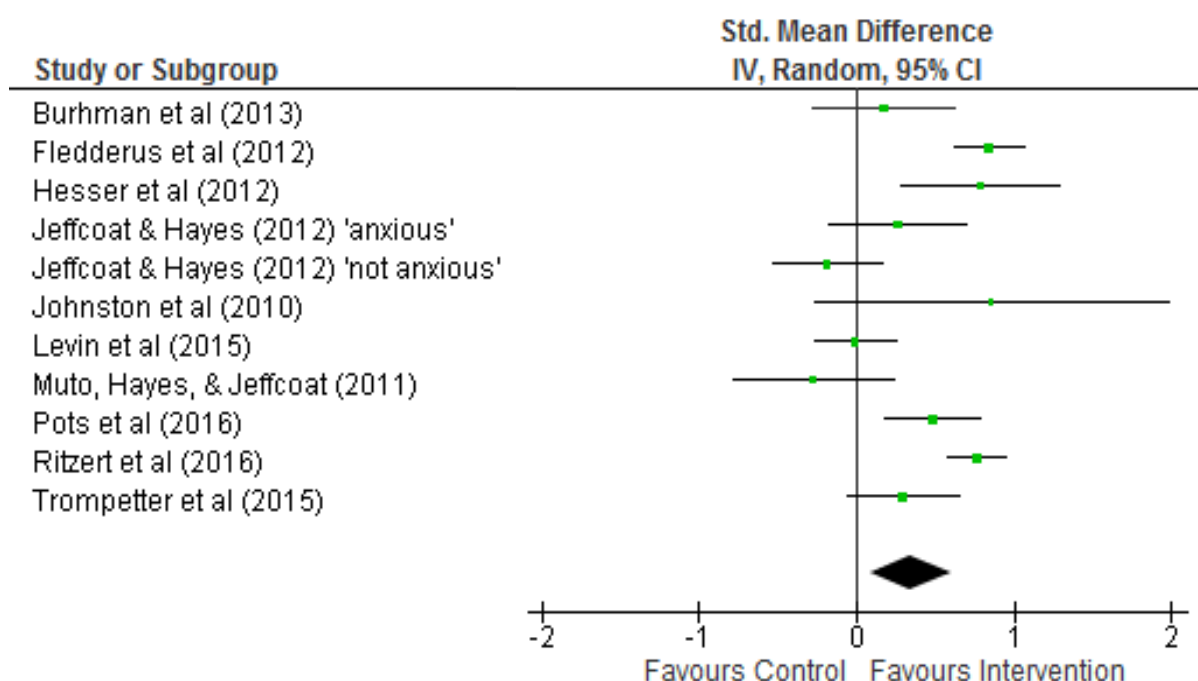


Figure 4. Anxiety Outcomes Forest Plot

The results showed a small significant pooled effect size ($g=0.35$; 95% CIs [0.09, 0.60]; $Z=2.66$, $p=.008$) favoring intervention, however, 'practical significance' was not reached. Heterogeneity was considerable ($I^2=84\%$), therefore, further sensitivity analyses were conducted.

Removal of the study without CIs overlapping with the overall effect size (Fledderus et al., 2012) did not significantly impact heterogeneity ($I^2=81\%$). The effect size was slightly reduced ($g=0.29$; 95% CIs [0.02, 0.55]; $Z=2.12$, $p=.03$) but remained significant. As per the funnel plots, removal of the outlier study (Ritzert et al., 2016) again did not impact the heterogeneity ($I^2=81\%$) and the effect size was slightly reduced ($g=0.30$; 95% CIs [0.02, 0.57]; $Z=2.13$, $p=.03$) but remained significant.

Sensitivity analyses were conducted that investigated the removal of the studies assessed as having a high risk of bias (Johnston et al., 2010). The pooled effect size remained significant at a similar level ($g=0.33$; 95% CIs [0.07, 0.59]; $Z=2.45$, $p=.01$) and heterogeneity remained considerable (85%).

The pooled effect size remained significant and at a similar level when analysis was limited to studies with passive controls ($g=0.35$; 95% CIs [0.08, 0.63]; $Z=2.49$, $P=.01$), or studies with similar length interventions ($g=0.39$; 95% CIs [0.13, 0.65]; $Z=2.98$, $p=.003$). In both cases heterogeneity remained considerable ($I^2=83\%$ and 81% respectively).

Levels of Guidance: Self-Administered vs. Predominantly Self-Help. When limiting analysis to predominantly self-help studies ($n=5$), heterogeneity dropped ($I^2=54\%$) and the pooled effect size increased to a significant medium size ($g=0.61$; 95% CIs [-0.34, 0.88]; $Z=4.43$, $p=.00001$) with 'practical significance'. Limiting analysis to self-administered studies ($n=6$) reduced the pooled effect size to a non-significant level ($g=0.16$; 95% CIs [-0.22, 0.54]; $Z=0.83$, $p=.41$) and heterogeneity remained considerable ($I^2=88\%$). Removing the larger 'outlier' study (Ritzert, 2016) led to a greatly reduced heterogeneity ($I^2=36\%$) and the pooled effect size of the self-administered studies dropped to non-significant levels close to zero ($g=0.02$; 95% CIs [-0.18, 0.23]; $Z=0.22$, $p=.82$). When comparing the study-subgroups directly, testing indicated a non-significant trend towards greater effect-sizes for predominantly self-help (versus self-administered) studies ($\text{Chi}^2=3.65$, $df=1$, $p=.06$; $I^2=73\%$) which reached significance when excluding the outlier (Ritzert, 2016) study ($\text{Chi}^2=11.58$, $df=1$, $p<.001$; $I^2=91\%$). Overall, analyses again indicated that clinician involvement may be beneficial, with evidence of practically significant effects on anxiety in studies testing predominantly self-help – but not self-administered – interventions. However, as study-subgroups may differ in other ways (beyond level of guidance) only tentative inferences could be made about the value of clinician involvement; moreover, direct testing of subgroup differences in effect size did not reach significance for this outcome (anxiety) until a potential outlying estimate was removed.

Format of Intervention: Computer-Based vs. Book-Based. Limiting analysis to the computer-based studies ($n=5$) led to a reduced heterogeneity ($I^2=62\%$) and had minimal impact on the size, direction, or significance of the pooled effect size ($g=0.31$; 95% CIs: [0.05, 0.58]; $Z=2.35$, $p=.02$). Limiting analysis to book-based studies ($n=6$) also led to a similar pooled effect size but was non-significant ($g=0.36$; 95% CIs [-0.04, 0.76]; $Z=1.75$, $p=.08$) with considerable heterogeneity ($I^2=88\%$). Removal of the larger 'outlier' study, Ritzert et al. (2016), maintained considerable heterogeneity ($I^2=88$) and the book-based pooled effect size was reduced and remained non-significant ($g=0.26$; 95% CIs [-0.28, 0.81] $Z=0.94$, $p=.35$). Comparing the study-subgroups directly, testing indicated no significant difference between computer- versus book-based studies ($\text{Chi}^2=0.03$, $df=1$, $p=.85$; $I^2=0\%$) – and this result was unchanged when excluding the outlier (Ritzert, 2016). These results suggest that it is unlikely that the intervention format is a moderator of anxiety outcomes.

Psychological Flexibility Outcomes. All 13 studies (2194 participants) utilized measures of PF and were included in the meta-analysis (Table 9; Figure 5). A variety of different PF measures were used, therefore, there is variation in the interpretation of high scores. The entering of data into *RevMan* was adapted accordingly.

It is worth noting that Bricker et al. (2013), following contact for results, found errors in the initial analyses of AIS-27 scores and so corrected values are used.

Table 9.

Psychological Flexibility Outcomes

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference (Hedge's D) | | |
|----------------------------------|-----------|--------|----------------------------|-------|-----|-----------------------|-------|-----|----------|--------------------------------------|-------|------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Bricker et al. (2013) (AIS) | SA | CB | 3.17 | 0.60 | 59 | 2.92 | 0.44 | 57 | 8.0% | 0.47 | 0.10 | 0.84 |
| Bricker et al. (2014) (AIS) | SA | CB | 3.00 | 0.57 | 78 | 3.03 | 0.53 | 78 | 8.3% | -0.05 | -0.37 | 0.26 |
| Buhrman et al. (2013) (CPAQ) | PSH | CB | 50.84 | 18.23 | 38 | 43.58 | 16.58 | 38 | 7.4% | 0.41 | -0.04 | 0.87 |
| Fledderus et al. (2012) (AAQ-II) | PSH | BB | 49.29 | 9.08 | 250 | 43.00 | 10.27 | 126 | 8.7% | 0.66 | 0.44 | 0.88 |
| Hesser et al. (2012) (TAQ) | PSH | CB | 44.27 | 9.69 | 33 | 36.81 | 10.95 | 32 | 7.1% | 0.71 | 0.21 | 1.22 |
| Jeffcoat & Hayes (2012) (AAQ-II) | SA | BB | 51.35 | 11.29 | 103 | 48.87 | 11.08 | 109 | 8.5% | 0.22 | -0.05 | 0.49 |
| Johnston et al. (2010) (CPAQ) | PSH | BB | 59.00 | 8.2 | 6 | 52.3 | 13.80 | 8 | 3.9% | 0.53 | -0.55 | 1.62 |
| Levin et al. (2016) (AFQ-Y) | SA | CB | 35.37 | 12.27 | 110 | 36.11 | 13.51 | 118 | 8.6% | 0.06 | -0.20 | 0.32 |

| Study | Sub-group | | Intervention Group Outcome | | | Control Group Outcome | | | Weight % | Standard Mean Difference (Hedge's D) | | |
|----------------------------------|-----------|--------|----------------------------|-------|------|-----------------------|-------|------|----------|--------------------------------------|-------|-------|
| | Support | Format | M | SD | N | M | SD | N | | Effect | LCI | UCI |
| Moffitt & Mohr (2015) (AAQ) | SA | CB | 64.55 | 19.96 | 32 | 67.85 | 12.87 | 27 | 7.0% | 0.19 | -0.32 | 0.70 |
| Muto et al. (2011) (AAQ) | SA | BB | 44.30 | 6.67 | 30 | 43.48 | 8.63 | 31 | 7.1% | 0.10 | -0.40 | -0.16 |
| Pots et al. (2016a) (AAQ-II) | PSH | CB | 47.74 | 9.24 | 82 | 43.04 | 9.60 | 87 | 8.3% | 0.50 | 0.19 | 0.80 |
| Ritzert et al. (2016) (AAQ) | SA | BB | 61.33 | 6.75 | 256 | 76.03 | 13.88 | 247 | 8.8% | 1.35 | 1.16 | 1.55 |
| Trompetter et al. (2015b) (PIPS) | SA | CB | 40.70 | 13.80 | 82 | 43.80 | 13.10 | 77 | 8.3% | 0.23 | -0.08 | 0.54 |
| Totals | | | | | 1148 | | | 1046 | 100% | 0.42 | 0.14 | 0.70 |

Note. Standard Mean Difference calculated as Hedge's G. PSH = Predominantly Self-Help; SA = Self-Administered; CB = Computer Based; BB = Book Based; M = Mean; SD = Standard Deviation; N = Number of participants included in analysis; LCI = Lower Confidence Interval; UCI = Upper Confidence Interval

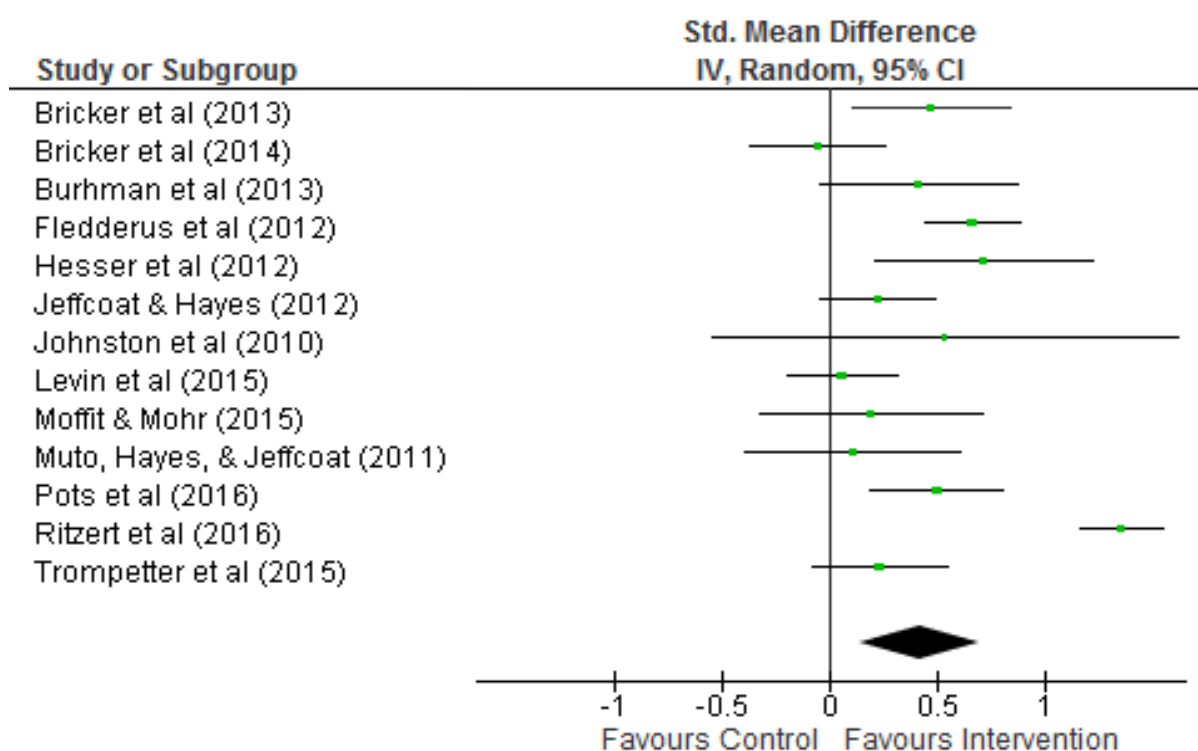


Figure 5. Psychological Flexibility Outcomes Forest Plot

The results show a significant small pooled effect size estimate ($g=0.42$; 95% CIs [0.14, 0.70]; $Z=2.93$, $p=.003$) favoring intervention that meets criteria for 'practical significance'. Heterogeneity was considerable ($I^2=89\%$), therefore, further sensitivity analyses were conducted.

The Ritzert et al. (2016) study was an outlier on the funnel plot and does not have CIs overlapping with the pooled effect size. Its removal led to a slight drop in the effect size ($g=0.32$; 95% CIs [0.16, 0.48]; $Z=3.99$, $p<.0001$), but this remained significant. Heterogeneity reduced to a 'substantial' level ($I^2=56\%$).

A sensitivity analysis was conducted investigating the impact of removing the studies assessed as having a high risk of bias (Bricker et al., 2013; Johnston et al., 2010). This led to negligible change in the pooled effect size ($g=0.41$; 95% CIs [0.10, 0.72]; $Z=2.57$, $p=.01$) and heterogeneity remained considerable ($I^2=91\%$).

The pooled effect size remained significant and increased in size when analysis was limited to studies with passive controls ($g=0.52$; 95% CIs [0.15, 0.88]; $Z=2.76$, $p=.0006$), or studies with similar length interventions ($g=0.45$; 95% CIs [0.16, 0.74]; $Z=3.04$, $p=.002$). In both cases heterogeneity remained considerable ($I^2=90\%$ and 89% respectively).

Levels of Guidance: Self-Administered vs. Predominantly Self-Help. Limiting analysis to predominantly self-help studies ($n=5$) led to a significant medium pooled

effect size ($g=0.59$; 95% CIs [0.44, 0.75]; $Z=7.43$, $p<.00001$) with no heterogeneity ($I^2=0\%$). Limiting analysis to self-administered studies ($n=8$) reduced the effect size to a small and non-significant level ($g=0.33$; 95% CIs [-0.10, 0.76]; $Z=1.51$, $p=.13$) with considerable heterogeneity ($I^2=94\%$). Removal of the large ‘outlier’ study (Ritzert, 2016), reduced the heterogeneity to $I^2=0\%$ and the pooled effect size, whilst significant, greatly reduced ($g=0.16$; 95% CIs [0.04, 0.29]; $Z=2.51$, $p=.01$). When comparing the study-subgroups directly, testing indicated no significant difference between predominantly self-help versus self-administered studies ($Chi^2=1.26$, $df=1$, $p=.26$; $I^2=21\%$); although removal of the outlier (Ritzert, 2016) led to a difference favoring predominantly self-help ($Chi^2=17.87$, $df=1$, $p<.001$; $I^2=94\%$). Again, subgrouped results evidenced practically significant effects in studies testing predominantly self-help – but not self-administered – interventions. However, apparently differing patterns of results may reflect other (confounding) factors that vary between study-subgroups – and direct testing of subgroup differences only reached significance when excluding a potential outlier.

Format of Intervention: Computer-Based vs. Book-Based. Sub-group analysis was conducted looking at the pooled effect sizes of computer-based and book-based studies. Limiting analysis to the computer-based interventions ($n=8$) reduced heterogeneity to a ‘substantial’ level ($I^2=48\%$) with a smaller but significant pooled effect size ($g=0.28$; 95% CIs [0.11, 0.46]; $Z=3.16$, $p=.002$). Limiting analysis to book-based interventions ($n=5$) increased results to a significant medium effect size ($g=0.60$; 95% CIs [0.07, 1.13]; $Z=2.20$, $p=.03$) but maintained considerable heterogeneity ($I^2=93\%$). Removal of the large ‘outlier’ study, Ritzert (2016), led to the heterogeneity reducing ($I^2=63\%$) and a smaller significant pooled effect size ($g=0.38$; 95% CIs [0.06, 0.70]; $Z=2.36$, $p=.02$). When comparing the study-subgroups directly, testing indicated no significant difference between computer- versus book-based studies ($Chi^2=1.21$, $df=1$, $p=.27$; $I^2=17\%$)– and this comparison remained non-significant when excluding the outlier (Ritzert, 2016). On balance, results suggest that it is unlikely that the intervention format is a moderator of PF outcomes.

Impact of ACT Processes on Anxiety and Depression Outcomes. Ten studies included outcomes for all three measures. Four studies had further analyses investigating the effect of PF on anxiety and/or depression symptoms. Significant mediating relationships were found with anxiety outcomes (Fledderus et al., 2013; Levin et al., 2016), depression outcomes (Fledderus et al., 2013; Levin et al., 2016; Pots et al., 2016b), and overall HADS score (Trompetter et al., 2015b).

As changes in PF are expected to directly relate to changes in depression and anxiety scores it is expected that (when scored/rescored such that higher scores indicate greater PF) PF effect sizes will inversely correlate with anxiety and depression effect sizes. A further meta-correlation (Table 10) was, therefore, conducted across the 10 studies reporting effect sizes for both process (PF) and distress (anxiety and depression) outcomes. For the purposes of these analyses, all PF outcomes were scored such that higher scores indicate greater PF – this entailed

reverse-scoring of some (inflexibility) indices. Spearman rank correlations showed strong, inverse relationships between effect sizes for (1) PF and anxiety ($\rho = -.90$, $p < .001$, $n = 10$) and (2) PF and depression ($\rho = -.70$, $p = .025$, $n = 10$); indicating that (consistent with expectations) larger effects for distress were negatively associated with larger effects for PF. Rank correlations were used to reduce the influence of outlier data (relatively large effect sizes observed in Ritzert et al., 2016).

Table 10.

Correlations of Effect Sizes for Depression, Anxiety, and Psychological Flexibility

| Measure | Psychological Flexibility |
|------------|---------------------------|
| Depression | -.70* |
| Anxiety | -.90*** |

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Discussion

This systematic review considered the impact of ACT self-help on depression, anxiety, and PF. 13 studies were identified that met criteria for inclusion. The findings are discussed alongside alternative explanations in regards to the questions posed by this review.

What is the quality of current research into ACT self-help?

Two studies were found to be at high risk of bias using the amended risk ratings based upon Higgins and Green (2011) criteria. Research indicates that 'high risk' studies tend to have significantly larger effect sizes (Hartling et al., 2009), however, this is not evident within the results as removing such studies did not significantly impact size, significance, or direction of pooled effect sizes. This, however, may just indicate that the review authors were too stringent in the application of the risk assessment. There is also the limitation of using the Higgins and Green (2011) criteria as, whilst a validated tool enabling comparison with other evidence-bases that have been appraised, it may not have comprehensively captured the relevant sources of bias for this review. It was notably difficult to ascertain the risk of bias for some studies (six at 'unclear' risk) and this review highlights domains where future research could improve clarity (e.g., procedures for randomization and concealment of allocation) and undertake additional analyses (e.g., to assess/control for the impact of baseline non-equivalence or incomplete outcome data).

The funnel plots were reasonably symmetrical and there was no indication of reporting bias, however, interpretation was vulnerable to individual opinion (Terrin et al., 2005). Also, only published results were included, therefore, it is difficult to test Fanelli's (2012) claim that there is publication bias. Whilst forest plots show negative effect sizes in some studies, it is worth noting that many of these studies often neglected to sufficiently describe such negative outcomes within their article's narrative. This echoes concerns raised by O'Donohue et al. (2016) that there is bias in how research results are described.

The funnel plots did raise concern over one 'outlier' (Ritzert et al., 2016) that had significantly greater effect sizes. Removing the study reduced pooled effect sizes, but did not alter the significance of effects or reduce heterogeneity levels. Given that this study had greater size/precision than other studies, and was assessed as being at low risk of bias, it is possible that it provides a relatively representative (versus outlying) estimate of the average pooled effect-size.

Despite concerns raised about the methodologies and narrative representations of outcomes, the meta-analytic outcomes of this review did not appear to be impacted upon by these. However, these concerns need to be taken into consideration in future research.

What is the efficacy of ACT self-help on depression, anxiety, and psychological flexibility?

Meta-analysis showed significant small effect sizes favoring intervention for depression ($g=0.34$; 95% CIs [0.07, 0.61]; $Z=2.49$, $p=.01$) and anxiety ($g=0.35$; 95% CIs [0.09, 0.60]; $Z=2.66$, $p=.008$) outcomes, but 'practical significance' (Ferguson, 2009) was not achieved and so such changes may not have been meaningful to the participants involved. However, as ACT does not claim to reduce symptoms but rather increase acceptance of them (Hayes et al., 1999), symptom reduction was not necessarily expected. This highlights a flaw in ACT research as emphasis is still being placed on symptomatology rather than more model-consistent outcomes. Despite this, it is important to note that many other measures (e.g. smoking status, quality of life, pain) used across the studies were not analyzed within this review due to the wide heterogeneity in usage. Whilst this can be considered a limitation of the review itself, it indicated that further studies are needed using these other measures to enable a more homogenous meta-analysis of these other outcomes.

Comparing the results of this review against previous meta-analyses of face-to-face ACT initially indicates that self-help formats are less efficacious than face-to-face, with Öst's (2014) review showing an overall effect size of $g=0.42$ (95% CIs [0.31, 0.53]; $Z=7.47$, $p<.0001$). However, this reduces to $g=0.28$ when adjusted for publication bias. When limited to psychiatric disorders the effect size was again small ($g=0.27$, 95% CIs [0.17, 0.36]), and Öst's subgroup analyses indicate that self-help may have *greater* efficacy with $g=0.52$ (95% CIs [0.33-0.71]) in comparison to individual ($g=0.33$, 95% CIs [0.21, 0.45]) and group ($g=0.33$, 95% CIs [0.24-0.42]) therapy. When considering these outcomes in light of this review, it could be argued that ACT self-help may have similar efficacy in comparison to ACT delivered face-to-face (based on the overlap of pooled CIs between modalities). However, the studies covered by Öst (2014) may have differing participant populations and/or severity of targeted symptoms, making a direct comparison difficult to achieve.

Meta-analysis of PF outcomes showed a significant small effect size ($g=0.42$; 95% CIs [0.14, 0.70]; $Z=2.93$, $p=.003$) favoring intervention. Whilst these results are positive, concerns have been raised that measures of PF may instead be measuring distress or knowledge of the model (Francis, Dawson, & Golijani-Moghaddam, 2016). If this is the case, then it may be that the witnessed pooled effect size does not truly represent changes in PF, but rather that of distress. There is also the difficulty that this review has pooled together outcomes of a range of measures of 'PF', despite the possibility that there may be variations in the constructs being targeted across the measures.

There may also be alternative explanations for the effect sizes, such as demand characteristics, particularly as the participants within these studies were not 'blinded' to the interventions. However, little research exists to indicate whether demand characteristics have any impact within non-laboratory settings (McCambridge, de Bruin, & Witton, 2012).

Despite these concerns, the results indicate that ACT self-help can increase PF to a level that is meaningful to an individual, and slightly reduce depression and anxiety symptoms.

Does the format of delivery or guidance impact outcomes?

Whilst effect-size trends appeared to favor book-based (versus computer-based) interventions, apparent trends were sensitive to inclusion of an outlier study and did not reach statistical significance in direct comparative testing. Available evidence does not support inferences about differential impact, and this is consistent with previous research indicating minimal differences between self-help formats (Barlow et al., 2002; Lancaster & Stead, 2005; Gellatly et al., 2007).

Regarding the impact of clinician guidance, there is an apparent tendency towards better outcomes for predominantly self-help versus self-administered interventions. This may be due to other factors within the study sub-groups as randomization has been lost; however, it is supported by self-help literature indicating that having any form of clinician guidance can greatly improve depression and anxiety outcomes compared to no guidance at all (Cuijpers et al., 2010; Harai & Clum, 2006). ACT self-help literature also shows face-to-face therapy to be more effective than self-help (Lappalainen et al., 2014), and minimal contact (MC) therapy to have greater impact on PF and depression outcomes (Thorsell et al., 2011). In contrast, Fledderus et al. (2012) found no significant difference between minimal and extensive guidance conditions; however, as both conditions are predominantly self-help, it may be that conditions were not dissimilar enough to show significant difference in outcomes. At present, there is no literature directly comparing self-administered to predominantly self-help interventions within ACT self-help.

These results suggest that the format of intervention is unlikely to impact outcome, but that having some form of guidance can improve examined outcomes within ACT self-help.

Does psychological flexibility mediate depression and anxiety outcomes?

Only four studies investigated the relationships between PF and depression/anxiety outcomes. This may indicate reporting bias; however, studies may have chosen to not investigate such relationships for other reasons. The four articles that did investigate all found PF to be a mediator of depression and anxiety outcomes. Also, when correlating effect-sizes across studies, theoretically-consistent relationships between PF and the depression/anxiety outcomes were found. This indicates initial support for the theory that PF changes mediate changes in depression and anxiety symptoms as shown in previous research in non-self-help populations (Hayes et al., 1999; Levin, Hildebrandt, Lillis, & Hayes, 2012). However, causal inferences are difficult to make because (1) analyses are correlational, (2) only four papers reported on the mediating relationships, and (3) outcomes were not

taken at multiple time points *during* the interventions, such that the temporal sequence of the relationship remains relatively unknown.

Therefore, it is likely that PF does mediate changes in depression and anxiety outcomes within ACT self-help but, without further in-depth analysis, care needs to be taken when drawing such conclusions.

Generalizability of conclusions and limitations of review

The scope of the review was open to a range of client populations, due to restrictions in currently available research, and – as ACT is transdiagnostic – this inclusiveness appears defensible. However, it is this broad scope – and concomitant heterogeneity – that has limited the conclusions that can be drawn. Whilst heterogeneity has been explored through sensitivity analysis, a limitation of this review is that it has been unable to focus in on particular client populations or difficulties. Also, whilst Ferguson's (2009) guidelines to assessing 'practical significance' aid interpretation of effect sizes (against suggested minima/cut-offs for effects that might have real-world importance) it should be acknowledged that there is no consensus agreement about magnitudes necessary for 'meaningful' effects. Effects meeting the applied criterion cut-off for 'practical significance' ($g=.41$) must be interpreted in context (e.g., of study limitations and the real-world meaning of changes in measured responses) and are not necessarily meaningful.

The review's findings can be generalized to other ACT self-help interventions, though only those that are deemed self-administered or predominantly self-help. The findings can also only be applied when considering outcomes in depression, anxiety, and PF. Several studies did include further outcomes; however, for pragmatic reasons, these outcomes were not the focus of the review. This is again a limitation, particularly as ACT does not set out to reduce symptomatology but rather increase acceptance of it.

The findings can also be compared against results of future RCTs investigating ACT self-help, however, comparisons are limited due to the reviews focus on the impact of intervention against mostly *passive* controls (Karlsson & Bergmark, 2015). There is also the difficulty that only published research was analyzed, therefore, conclusions may be skewed due to publication bias (Fanelli, 2012). The review is also limited in that it did not consider the cost-effectiveness of any of the interventions under review.

Implications for practice and future research

This review has, therefore, led to the following recommendations:

- ACT self-help should be actively considered as one possible form of intervention,
- Any service offering ACT self-help should, where possible, provide some form of clinician guidance – irrespective of intervention format

- Any service offering ACT self-help should monitor PF alongside symptom measures
- Further research needs to (1) investigate self-administered versus predominantly self-help interventions within ACT self-help RCTs, (2) investigate changes in PF during ACT self-help through a series of single-case experimental designs, (3) focus more on outcomes that ACT purports to target rather than symptomatology, and (4) follow Cochrane guidelines (Higgins & Green, 2011) to improve research quality

It is hoped that these recommendations will allow greater understanding of ACT self-help processes, and thereby enable more informed/transparent representations of these interventions in public and academic domains: communicating whether, how, and under what conditions they can be effective.

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Appendix A

Search Strategies

Table A1

Search Strategy for following databases: PsychARTICLES (Full Text), PsychINFO (1806 to July week 1 2016), Embase (1974 to 2016 July 13), AMED (1985 to July 2016), OvidMEDLINE(R) (In process and other non-indexed citations and OvidMEDLINE(R)), and the Joanna Briggs Institute (EBP Database current to July 06 2016).

-
- 1 exp "acceptance and commitment therapy"/
 - 2 (acceptance and commitment therapy).mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 3 exp ACT/
 - 4 exp self-help/
 - 5 self help.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 6 exp bibliotherapy/
 - 7 bibliotherapy.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 8 web based.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 9 exp internet based/
 - 10 internet based.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 11 exp application/
 - 12 application.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 13 mobile.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 14 exp internet/
 - 15 internet.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 16 exp computer/
 - 17 computer.mp. [mp=ab, hw, ti, tx, bt, ct, sh, tc, id, ot, tm, cc, sa, tn, dm, mf, dv, kw, nm, kf, px, rx, an, ui]
 - 18 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17
 - 19 1 or 2 or 3
 - 20 18 and 19
 - 21 remove duplicates from 20
-

Table A2

Search Strategy for Cochrane Central Register of Controlled Trials 12, June 2016

- 1 acceptance and commitment therapy
 - 2 ACT
 - 3 self help
 - 4 bibliotherapy
 - 5 web based
 - 6 internet based
 - 7 application
 - 8 mobile
 - 9 internet
 - 10 computer
 - 11 1 OR 2
 - 12 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10
 - 13 11 AND 12
-