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Acceptance and Commitment Therapy and Subjective Wellbeing: A Systematic Review and Meta-analyses of Randomised Controlled Trials in Adults

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Introduction

Developing interventions that aim to promote mental health has increasingly been recognised as a global priority (World Health Organisation, 2015). In the UK and internationally, this agenda has been reflected in the burgeoning number of public policy, legislation, programmes and interventions which aim to enhance the mental health of individuals and their communities (e.g. Department of Health, 2014, New Economics Foundation, 2011; Office for National Statistics, 2019).

Conceptually, mental health promotion broadens the focus of researchers' and clinicians' attention towards improving indicators of well-being and health, in addition to more narrowly focused efforts to alleviate psychological distress or 'illness'. The 'dual-factor model of mental health' (Westerhof & Keyes, 2010) proposes that mental health and mental illness exist on distinct, yet related, dimensions. A growing body of research evidence attests to the possibility that positive mental health (i.e. elevated subjective wellbeing; SWB) 'buffers' against mental and physical illness (Grant, Guille, & Sen, 2013; Keyes, Dhingra, & Simoes, 2010; Steptoe, Docray & Wardle, 2009). As such, SWB has been highlighted as an important outcome for clinicians and researchers involved in delivery and evaluating psychological interventions respectively (Diener, Diener, & Tamir, 2004; Trompetter, De Kleine, &Bohlmeijer, 2017; White, Imperiale, & Perera, 2016).

SWB has been defined broadly as "a person's cognitive and affective evaluations of his or her life" (Diener, Oishi, & Lucas, 2002, pp.63), and has been proposed to consist of hedonic and eudaimonic aspects (Keyes, Scmotkin & Ryff, 2002; Waterman, 1993). Hedonia relates to satisfaction with life, and an emotional equilibrium between positive affect (e.g. happiness) and negative affect (Diener, Emmons, Larsen, & Griffin, 1985; Deiner, Suh, Lucas, & Smith, 1999; Larsen & Prizmic, 2008). Eudaimonia concerns optimal, psychological functioning and fulfilment of one's own potential (i.e. "self-acceptance", "environmental mastery", "positive social relationships", and "purpose in life") (Ryff & Keyes, 1995, pp.720).

There exists a wealth of validated, self-report wellbeing measures for which underlying conceptualizations may be divided into hedonic and eudemonic traditions (*for a comprehensive review of measures see* Cooke, Melchert, & Connor, 2016). Increasingly, measures have been developed to capture both of these aspects of wellbeing. For example, Keyes (2002) argues that emotional (i.e. hedonic), psychological and social (both eudemonic) components constitute the core aspects of wellbeing. Furthermore, it is suggested that individuals may be classified as "flourishing", "languishing", or in "moderate mental health" depending on their levels of SWB as assessed by the Mental Health Continuum (MHC-Short-Form/Long Form; Keyes, 2002). This theoretical understanding of wellbeing aligns closely with the World Health Organisation's (WHO) definition of mental health: "a state of wellbeing in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (2001, p.1).

Acceptance and commitment therapy (ACT) is a transdiagnostic intervention, which focuses on personal growth, and the cultivation of wellbeing through enhanced value-based living (Harris, 2011; Hayes, 2004). Underpinned by *functional contextualism*, ACT moves away from reductionist approaches to therapy that aim to correct the *content* of "dysfunctional" or "pathological" cognitions and behaviours; instead focusing on the *context* in which psychological and behavioural events occur. In ACT, psychological suffering is considered to be caused by a lack of "psychological flexibility", defined as "the ability to fully contact the present moment and the thoughts and feelings it

contains without defence, and, persisting in or changing behaviour in the pursuit of goals and values" (Bond et al., 2011, pp. 678). In order to enhance psychological flexibility, ACT draws on six therapeutic processes: *acceptance* (embracing internal experiences without altering their form or frequency); *cognitive defusion* (achieving psychological distance from internal experiences); *being present (*ongoing, non-judgemental contact with psychological and environmental events as they occur); *self-as-context* (observing or noticing ones' inner/ outer world, and flexible perspective taking); *values* (choosing valued life directions); and *committed action* (acting in service of one's chosen values).

Whilst ACT does not view symptom reduction itself as a primary goal, this can be a fortuitous by-product of enhanced psychological flexibility. Further, ACT takes a non-pathologising stance towards human distress, emphasising instead that distress is an inherent aspect of the 'human condition' (Ramsey & Wade, 2015).

Reflecting an evidence-based practice focus on measuring the efficacy of interventions in terms of symptom reduction, a large proportion of ACT studies have focused on "disorders" and condition-specific outcomes (e.g. Beilby, Bymes, & Yaruss, 2012; Bohlmeijer, Fledderus, & Rokx, 2011; Lappalainen et al., 2014). A number of systematic reviews and meta-analysis have been conducted (Powers, Vording, & Emmelkamp, 2009; Swain, Hancock, Hainsworth, & Bowman, 2013; A-Tjak et al., 2015). Research has demonstrated ACT's efficacy in relation to anxiety and depression (e.g. Forman, Herbert, Moitra, Yeomans, Geller, 2007) and a range of mental health difficulties (e.g. Gratz & Gunderson, 2006; Hayes, 2004) and physical health conditions (e.g. Dahl, Wilson, & Nilsson, 2004). Yet there have been recent calls for research efforts to focus on transdiagnostic outcomes such as SWB (Fledderus, Bohlmeijer, Smit & Westerhof, 2010; French, Golijani-Moghaddam, & Schröder, 2017; Trompetter, Bohlmeijer, Lamers, & Schreurs, 2016).

In the current review, the authors sought to address an important gap within the literature base, by synthesising and critically appraising the research findings of randomised controlled trials (RCTs) of face-to-face and guided ACT interventions (i.e. an ACT intervention where the participant had at least minimal contact with a practitioner linked to the intervention) that have assessed SWB in adults. Face-to-face and guided interventions were chosen as the focus of this review, as they have been shown to be superior to unguided interventions within the literature (Anderson & Titov, 2014; French et al., 2017; Richards & Richardson, 2012).The current study aimed to evaluate the methodological rigor of RCTs of ACT interventions; the ranges of standardised SWB measures being used; and the reported efficacy of ACT (versus control groups) for bringing about changes in SWB. Specifically, the current review, and meta-analysis aimed to address the following questions:

1. What is the range of SWB measures used as outcome measures in ACT RCT intervention studies?

2. What is the efficacy of ACT interventions (compared to control groups) for bringing about changes in subjective well-being?

3. What risks of bias are inherent in the relevant studies?

Method

Pre-registration of the systematic review protocol

The protocol for this review was registered with the International Prospective Register of Systematic Reviews (PROSPERO) number CRD42018097352.

Search strategy

Following initial scoping searches, four electronic databases (Medline, PsycINFO, Scopus and Web of Science) were searched for relevant literature from inception to July 2018. Search terms were adapted from a previous, published review exploring SWB in a clinical sample (Schrank et al., 2013). An information specialist with expertise in bibliographic databases was consulted, and helped in devising the final search strategy. As ACT is a transdiagnostic approach, and in keeping with the exclusion criteria for this review, no 'disorder' or condition-specific keywords were included. The following search terms were used:

("well-being'" OR "wellbeing" OR "wellness" OR "happiness" OR "happy" OR "thriv*" OR "flourish*"O R "pleasure" OR "joy" OR "life ADJ2 satisfaction" OR "satisfaction ADJ2 with life" OR "strength*"OR "blessing*" OR "virtue*" OR "good ADJ2 life" OR "fulfilment" OR "eudaimonia" OR "eudaemonia" OR "hedonism") AND ("randomi*ed controlled trial" OR "controlled clinical trial" OR "groups" OR "trial" OR "treatment as usual" OR "TAU" OR "control*" OR "randomi*d" OR "waitlist*" OR "placebo") AND ("Acceptance and Commitment Therapy" OR "ACT ADJ3 treatment* OR "ACT ADJ3 intervention*" OR "ACT ADJ3 therap*).

Search terms were adjusted for each database, including the use of MeSH terms and Cochrane filters (Higgins & Green, 2011) as required. English language limiters were applied in three databases (Medline, Scopus, and Web of Science) and in Medline results were restricted to human participants. Appendix A details a full search conducted in Medline.
Additionally, all reference lists of the included studies, as well as recently published, systematic reviews relevant to the review topic were searched (e.g. Brown, Glendenning, Hoon, & John, 2016; French et al., 2017). Finally, experts in the field were contacted by email regarding any additional papers which met the specified inclusion criteria.

Study selection

Studies were included in the current review provided they met the following inclusion criteria: a) were RCTs of interventions described by authors as "Acceptance and Commitment Therapy" or "ACT"; b) were delivered in either group, one-to-one format, or were a guided/supported form of ACT self-help intervention (i.e. an ACT intervention where the participant had at least minimal contact with a practitioner linked to the intervention); c) included a comparative group (i.e. either active comparison interventions, and/or a non-active

control); d) included a standardised measure of SWB[1] (*see* Cooke et al., 2016 and Appendix B) pre- and post-intervention as either a primary or secondary outcome; e) reported data from adult participants (18 years or older); f) were published in a peer-reviewed journal. Reviews, case studies, protocols, discussion articles, and other study designs were excluded. Any reanalysis of data from previously published studies, and papers not published in the English language were also excluded from the review. Lastly, ACT interventions combined with another form of intervention (e.g. ACT plus behavioural activation), or unguided/ unsupported ACT interventions were excluded.

Interventions requiring at least a minimal contact with a person supporting the delivery of the intervention were chosen as previous reviews have focused exclusively on unguided self-help or web-based interventions (e.g. Brown, Glendenning, Hoon, & John, A, 2016). Additionally the studies included in this review focused on adult participants, due to marked differences in how interventions are designed and delivered according to whether those receiving the intervention are children/adolescents versus adults. ACT studies that combined other interventions (e.g. including ACT plus behavioural activation) were excluded. Although there may be some overlap in the rationale for ACT and behavioural activation, there are also some important differences. Indeed, Kanter et al. (2006) stated that 'the two treatments differ dramatically and may in fact present opposing conceptualizations' (P106).

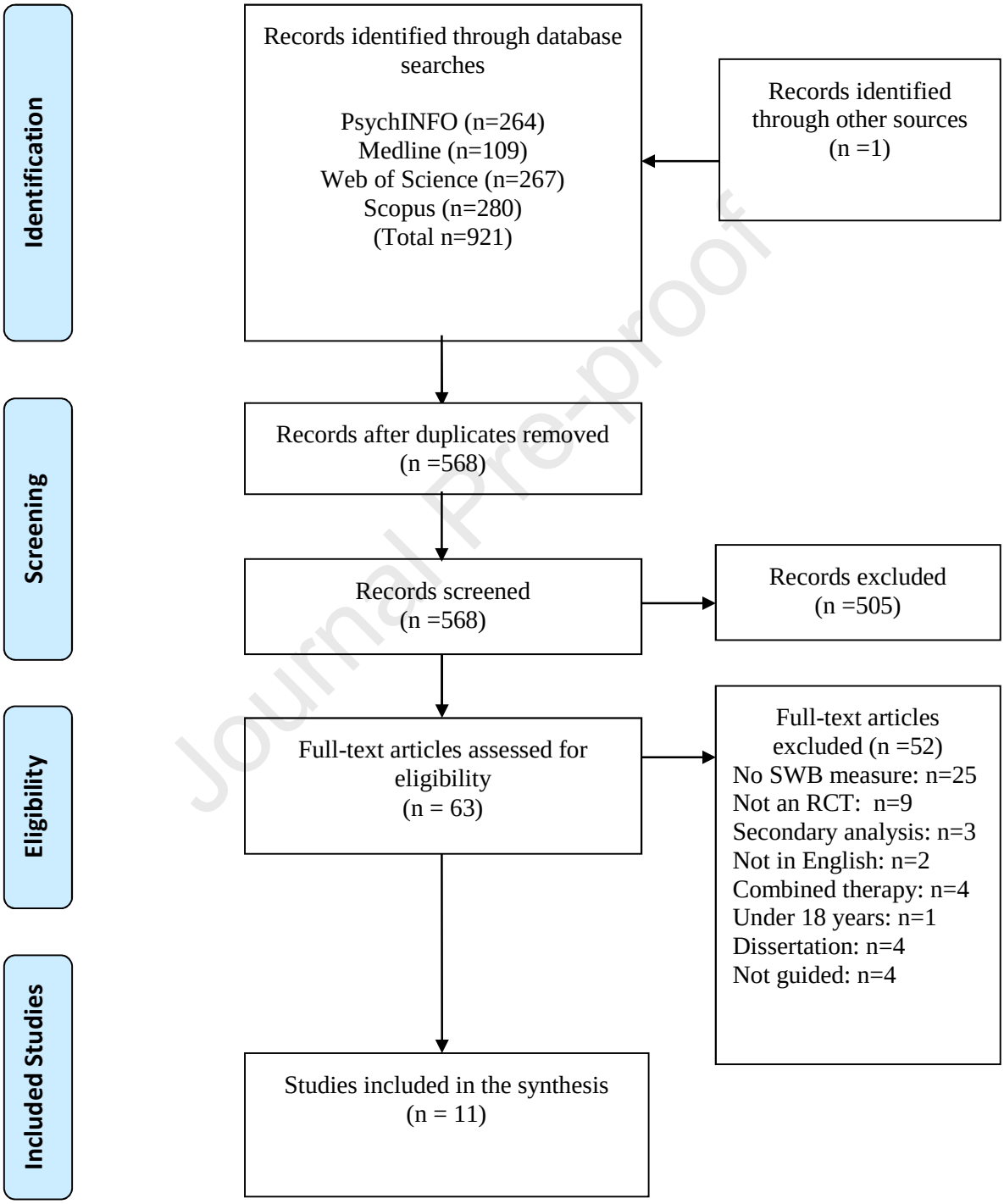
Following the searches, and removal of all duplicate records, titles and abstracts were simultaneously screened to assess their eligibility for inclusion. To ensure systematic article selection, a screening tool was used (Appendix C). Full papers of potentially relevant articles were then assessed. Screening was undertaken at both stages independently by X.X and an assistant psychologist (X.X). Agreement at both stages was high (stage 1: k=.87, stage 2: k=.80). Any differences in judgement were discussed and resolved. A third reviewer was available to resolve any discrepancies; however this was not necessary as consensus was reached in all instances.

Risk of bias

The Cochrane Risk of Bias Tool (RoB; Higgins & Green, 2011) was used to evaluate risk of bias. The use of this tool is endorsed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009), and it is widely used in the evaluation of methodological quality of RCTs. The tool includes six domains: (1) "random sequence generation", (2) "allocation concealment", (3) "blinding of participants and personnel", (4) "blinding of outcome assessment", (5) "incomplete outcome data", (6) and "selective outcome reporting". In line with recommendations by Munder & Barth (2017) when using RoB in the context of psychological intervention research, a seventh domain was also considered (7) deviations from intended interventions. Emphasized in the revised RoB (2.0) presently at the draft stage (Higgins et al., 2016) this domain allowed consideration of treatment adherence, and integrity. Each domain was assessed as being either 'low', 'high' or 'unclear' in terms of risk of bias. Assessments were undertaken by X.X and X.X. Consensus was high and disagreements were resolved though discussion, without the need for arbitration from a third reviewer.

[1] Note: Where a SWB measure was not listed by Cooke, Melchert, & Conner (2016) (Appendix B) the authors considered the measure against criteria set out by Cooke et al. (2016). One study (Grégoire, Lachance, Bouffard, T., & Dionne, 2018) was included in the current review on this basis.

Figure 1: PRISMA flow diagram.



Data extraction and analysis

Sample demographics, study characteristics and outcomes were extracted using a data extraction form devised specifically for this systematic review. This form was checked independently for accuracy and completeness by X.X. Disagreements were again resolved through discussion. Details of all outcome measures utilised in each study were collated yet results were only extracted for measures of SWB in line with the aims of this review (see Table 3). A further supplementary (Table 4) presents further details of the primary outcome findings alongside SWB findings. The Centre for Epidemiologic Studies Depression Scale (CES-D), and the Patient Health Questionnaire-9 (PHQ-9) appeared to be the most commonly used primary outcome measure other than SWB measures. Of the seven studies that included a primary outcome measure (e.g. stress, depression, anxiety, pain interference) other than/ or additional to SWB measures, all reported significant reductions of these symptoms in the ACT group as compared to an active or wait-list comparator.

Heterogeneity in participant characteristics, diversity in intervention formats observed and particularly in the SWB outcome measures used. Therefore, a meta-analysis pooling the SWB outcomes of all included studies was deemed inappropriate. Instead, meta-analyses were conducted separately for each SWB measure post-treatment (MHC-SF score, Psychological Wellbeing (PWB) score, Satisfaction with Life Survey Score (SWLS) score, Well-Being Manifestations Measure Scale (WBMMS) score and Warwick–Edinburgh Mental Well-being Scale (WEMWBS) score).

Two studies reported results for MHC-SF domains (emotional, social and psychological wellbeing) separately and three studies reported results for MHC-SF total score. To facilitate meta-analysis, MHC-SF domain summary scores (i.e. means and standard deviations for intervention and control groups) were combined to provide MHC-SF total summary scores according to the scoring manual of the MHC-SF and guidance for combining means and standard deviations within Chapter 6.5.2.10 of the Cochrane Handbook (Higgins & Deeks, 2019). Other SWB measures were all reported as total score.

One study included two ACT intervention groups (with extensive e-mail support [ACT-E] and with minimal e-mail support [ACT-M]). To allow comparisons for both of the ACT intervention groups to the waiting list control group to be included in meta-analysis without multiple counting of the control group, the number of participants in the control group was divided by two when calculating the mean difference and associated standard error for the comparisons in this study.

To allow for visual comparison of ACT compared to control across the SWB outcome measures, meta-analyses was conducted using the effect measure *standardised mean difference* (SMD) and associated 95% confidence interval (CI) and presented within a single forest plot. The SMD is a standardised measure used in meta-analysis when included studies assess the same outcome but measure it in a variety of ways. The SMD is a similar measure to Cohen's d and can be interpreted as follows: 0.2 represents a small effect, 0.5 a moderate effect and 0.8 a large effect (Cohen, 1988).

Meta-analyses were conducted via the generic inverse variance method of meta-analysis in Stata version 14 statistical software (Deeks, Higgins & Altman, 2019). Due to observed heterogeneity in participant characteristics, intervention formats and control treatments, all meta-analyses were conducted with random-effects. Heterogeneity between

studies was assessed by visual inspection of the meta-analysis forest plot and formally according to the I^2 statistic (the percentage of variability between trials that is due to statistical heterogeneity).

Most of the studies also reported SWB scores at a post-intervention follow-up time in the ACT intervention groups. However, follow-up times were variable, ranging from 4 weeks to 52 weeks and scores were often not reported at follow-up times within the control groups. Therefore, it was deemed that data were too limited and variable for a meaningful meta-analysis of SWB outcomes at follow-up.

For other outcomes, substantial heterogeneity in participant population and outcome definitions prevented meta-analysis from being conducted and a narrative synthesis is presented.

Results

Figure 1 illustrates the PRISMA flow from searches to included articles as recommended by PRISMA guidelines. The searches identified 921 records, of which 11 studies met full criteria and are included in the current review.

Sample Characteristics and Demographics

Overall, 1108 participants took were recruited to the included studies. Of the ten studies that reported gender numbers 34% (n=357 out of 1048 participants) were male. Azkhosh, Farhoudianm, Saadati, Shoaee, and Lashani (2016) did not report information on gender. One study did not report the specific ages of participants (Bayati, Abbasi, Bashiri, Dehghan, & Yazdanbakhsh, 2017). The median for the mean age of participants from the remaining ten studies that did report this information was 44 years (Interquartile range = 27-50). Studies were from a range of countries including: four from the Netherlands (Fledderus et al., 2010; Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012; Pots et al., 2016; Trompetter, Bohlmeijer, Veehof, & Schreurs, 2014); one from the UK (Majundar & Morris, 2018); one from Sweden (Thorsell et al., 2011); one from Canada (Grégoire, Lachance, Bouffard, & Dionne, 2018); two from Iran (Azkhosh et al., 2016; Bayati et al., 2017); one from Finland (Räsänen, Lappalainen, Muotka, Tolvanen, & Lappalainen, 2016); and one from India (Lundgren, Dahl, Yardi, & Melin, 2008). Of the studies that recruited from clinical settings, a range of physical and mental health difficulties were targeted including participants with: an addiction to opiates (Azkhosh et al., 2016); multiple sclerosis (Bayati et al., 2017); chronic pain (Thorsell et al., 2011); a previous history of stroke/s (Majundar & Morris, 2018); drug-refractory epilepsy (Lundgren et al., 2008) and mild-moderate distress (Fledderus et al., 2010). Of those studies that recruited from the general population (non-clinical settings) two studies included participants with symptoms of depression (Fledderus et al., 2012; Pots et al., 2016); one included participants with self-reported distress including anxiety, stress, low mood and/or anxiety (Ransanen et al., 2016); one study included participants with chronic pain (Trompetter et al., 2014) and one study was aimed at mental health promotion (Grégoire et al., 2018). Table 2 illustrates participants' characteristics across the included studies.

Results of risk of bias

A risk of bias graph (Figure 2), as well as the risk of bias assessment is presented (Figure 3). In-line with recommendations from the Centre for Review and Dissemination (CRD, 2009) domain ratings were not summed to provide an overall risk of bias for each

study. Common methodological problems highlighted across the included trials related to allocation concealment, incomplete data, and small sample sizes.

Nine of the included studies reported adequate methods for "random sequence generation" such as computer generated random sequences and drawing of lots (Fledderus et al., 2010; Fledderus et al., 2012; Grégoire et al., 2018; Lundgren et al., 2008; Majundar & Morris, 2018; Pots et al., 2016; Ransanen et al., 2016; Thorsell et al., 2011; Trompetter et al., 2014). These studies were therefore deemed low risk of selection bias. In two studies, the authors presented insufficient information to assess risk of selection bias (Azhosh et al., 2016; Bayati et al., 2017). Only four studies were considered to be at low risk of selection bias ("allocation concealment") as allocation in these RCTs was undertaken by parties external to the research team (Fledderus et al., 2010; Grégoire et al., 2018; Majundar & Morris, 2018; Ransanen et al., 2016). All other studies were deemed an unclear risk.

With regards to "blinding of participants and personnel", a high risk of performance bias was found across all studies. This is reflective of psychotherapy research in general, as blinding of participants and therapists in intervention trials of this nature is unfeasible (Munder & Barth, 2017). As all included studies reported self-report measures, participants were considered to be equivalent to "blind clinical observers" as is common practice in systematic reviews of therapy trials (Munder & Barth, 2017, pp. 6) meaning that detection bias was assessed as 'low risk' in all included studies.

The majority of studies assessed outcomes over three time-points; pre-and-post intervention and follow-up (ranging from 6 weeks to 12 months) (Azhosh et al., 2016; Bayati et al., 2017; Fledderus et al., 2010; Fledderus et al., 2012; Majundar & Morris, 2018; Rasanen et al., 2016; Trompetter et al., 2014). Three studies included four assessment time-points; pre and post intervention and follow-up assessments at 6 and 12 months (Lundgren et al., 2008; Pots et al., 2016; Thorsell et al., 2011). One remaining study included only pre-and-post assessments (Grégoire et al., 2018).

When handling incomplete outcome data, six studies used intention-to-treat analysis, and were deemed low risk of attrition bias (Fledderus et al., 2010; Fledderus et al., 2012; Pots et al., 2016; Ransanen et al., 2016; Thorsell et al., 2011; Trompetter et al., 2014). Of the remaining five studies, one had no attrition and was also classed as low risk (Lundgren et al., 2008); two provided insufficient information on attrition, the reasons for drop-out or how missing data was handled and were therefore deemed as an unclear risk (Azhosh et al., 2016; Bayati et al., 2017); and two studies used inappropriate simple imputation methods (last observation carried forward) when handling missing data and were consequently deemed at 'high risk' of attrition bias (Grégoire et al., 2018; Majundar & Morris., 2018).

Two study protocols were available and located, which reported all pre-specified outcomes in the published paper, and as such were deemed low risk of selection bias (Pots et al., 2016; Trompetter et al., 2014). One study made reference to a protocol, yet on inspection did not report all pre-specified outcomes listed in the final paper. This study was therefore judged as high risk (Bayati et al., 2017). All other included studies did report all expected outcomes that were specified in the aims and hypotheses section of the report, however they did not make reference to a published protocol. These studies were deemed 'unclear risk'.

An additional domain "deviations from intended interventions" was also considered (Higgins, et al., 2016). As highlighted by Munder and Barth (2017) where blinding patients and therapists are not possible (as with all therapeutic trials), low risk of bias in this domain needs to be ensured by providing sufficient information regarding treatment implementation. Of the six studies that included at least one active comparison group, four were judged as low risk. These studies provided detailed descriptions of interventions, of which the majority were manualised. Supervised therapist training and/or checks for therapy fidelity were documented. Treatment dosage (e.g. length, format), and participants' levels of adherence

were also balanced across active groups (Fledderus et al., 2012; Pots et al., 2016; Thorsell et al., 2011; Trompetter et al., 2014).

The remaining two studies were deemed an unclear risk in terms of "deviations from intended interventions" due to insufficient information regarding treatment integrity or participant adherence. Of the five studies with non-active controls (e.g. WLC) three were judged as low risk as detailed descriptions of interventions, therapist training, and fidelity measures were provided. Additionally, participant adherence was high (all participants completing at least 75% of the intervention) (Grégoire et al., 2018; Majundar & Morris, 2018; Rasanen et al., 2016). The remaining two studies with non-active controls, were deemed an unclear risk (Bayati et al., 2017; Fledderus et al., 2010).

Three studies (Pots et al., 2016; Ransanen et al., 2016; & Trompetter et al, 2014) demonstrated comparatively low levels of risk of bias overall; reporting low risk in five or more risk categories.

Figure 2: Risk of Bias Graph

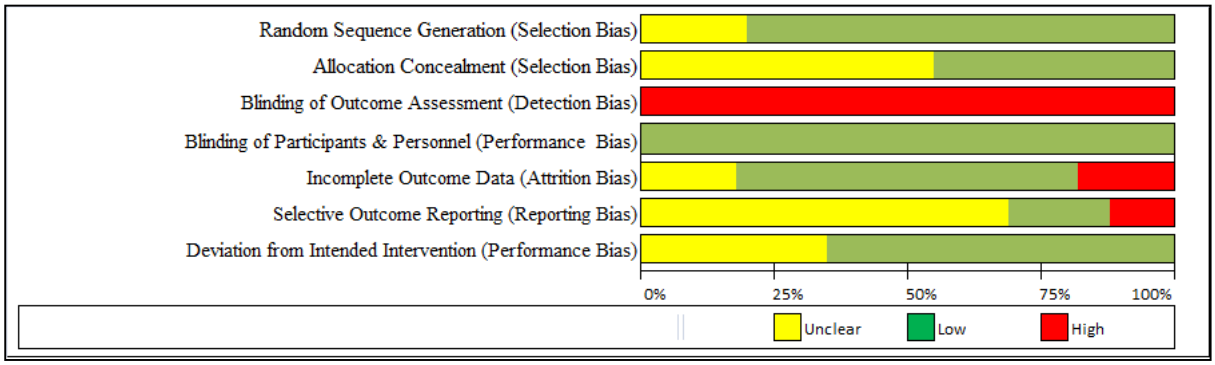
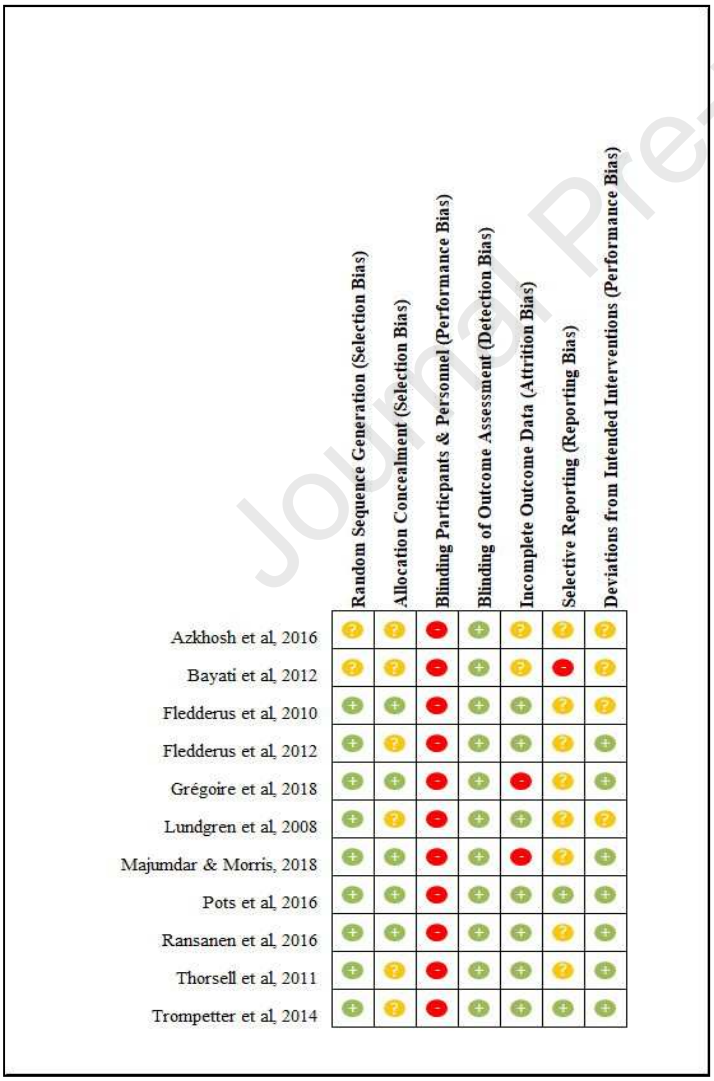


Figure 3: Summary of Assigned Risk of Bias Categories



Study Designs

In-line with criteria of the review all of the studies were RCTs, and included either an active comparison (*n*=2: Lundgren et al., 2008; Thorsell et al., 2011); a non-active control (*n*=5: Bayati et al., 2017; Fledderus et al., 2010; Gregorie et al., 2018; Majumdar & Morris, 2018; Rasanen et al., 2016) or both (*n*=4; Azkhosh et al., 2016; Fledderus et al., 2012; Pots et al., 2016; Trompetter et al., 2014). Table 3 summarises study characteristics, and findings for all included studies.

Intervention characteristics

Five studies investigated interventions delivered in a group format (Azkhosh et al., 2016; Bayati et al., 2017; Fledderus et al., 2010; Gregorie et al., 2018; Majumdar & Morris., 2018). These studies compared ACT group/s to predominantly non-active control groups, with only one study including an active comparison: a Narcotics Anonymous Group (NA; Azkhosh et al., 2016). The majority of interventions were manualised, and included detailed description of the core ACT processes and techniques covered in sessions (n=4). Only one study did not provide details of the ACT intervention (Azkhosh et al., 2016). Group sessions were delivered weekly in all five studies, with each session lasting between 1.5-2.5 hours. The duration of these interventions ranged from four to 12 weeks. Group sizes/and or the number of groups were not specified in the majority of these studies.

In three studies, groups were delivered across multiple sites (Fledderus et al., 2010; Gregorie et al., 2018; Majumdar & Morris, 2018). Additionally one study included a mixed intervention (group and individual sessions) (Lundgren et al., 2008). In this study, a manualised ACT intervention was compared to a Yoga intervention. Over a period of five-weeks, all participants were offered two individual sessions and two group sessions. Booster sessions were also delivered at six and twelve months.

Five studies included guided, self-help interventions; of which three were delivered via an online website (Pots et al., 2016; Rasanen et al., 2016; Trompetter et al., 2014). Two of these studies included an active comparison: an expressive writing (EW) online intervention (Pots et al., 2016; Trompetter et al., 2014). All of these online studies provided detailed descriptions of the core ACT processes and techniques covered in the online modules. The number of modules completed ranged from 5-9 modules, delivered over the duration of 7-12 weeks. Weekly email support and feedback, as well as reminder texts were sent to participants in these online, guided self-help interventions. Lastly, two studies delivered guided, self-help interventions through the provision of self-help books to participants (Fledderus et al., 2012; Thorsell et al., 2011). Fledderus et al. (2012) compared two ACT interventions: a self-help book with minimal guidance (i.e. standardized emails and positive encouragement), to an extensive guidance condition (i.e. personalised email feedback and advice), and a waiting list control (WLC). Thorsell et al. (2011) compared participants given an ACT self-help book, to an applied relaxation (AR) manual. In both interventions, participants received two individual sessions, and weekly telephone guidance and support. The duration of these interventions was between 7-9 weeks.

The majority of interventions were delivered by clinical psychology trainees/ students (n=6), followed by clinical psychologists and other health-care professionals (i.e. care co-ordinators, assistant psychologists) (n=3). In two studies the profession of those that delivered the interventions was not specified by the authors.

Study attrition

Ten out of the 11 included studies included data on attrition. Only one study failed to report this information (Bayati et al., 2017). In these studies, non-active control groups had a mean average of 11% (range=0-42%) attrition at time point 1 (T1; post-intervention), in comparison to intervention groups 23% (range= 0-50%). Of those studies that included follow-ups (FUP) and associated attrition rates (Fledderus et al., 2010; Fledderus et al., 2012; Lundgren et al., 2008; Majumdar & Morris, 2018; Pots et al., 2016; Rasanen et al., 2016; Thorsell et al., 2011; Trompetter et al., 2014) attrition rates at FUP (T2; ranging from 8-52 weeks) were, as could be expected, higher (overall mean in passive control and intervention groups=28%; range=0-56%). Three studies included a second FUP (T3; all at 52 weeks) (Lundgren et al., 2008; Pots et al., 2016; Thorsell et al., 2011). In these studies the mean attrition rate at this time point (across all groups) was 31% (range= 0-73%). Overall, limited information was provided in regards to reasons for attrition in the included studies.

Standardised Wellbeing Measures

The included studies utilised a number of different, validated measures of SWB. Authors did not explicitly state why each measure was chosen. In five of the included studies, the Mental Health Continuum-Short-Form (MHC-SF) was used. Two studies used the Psychological Well-being (PWB) scale. In two studies the Satisfaction with Life Scale (SWLS) was utilised. Finally, one study included the Warwick and Edinburgh Mental Well-being Scale (WEMWBS), and one study used the Well-being Manifestation Scale (WBMMS). As noted previously, the decision was made to include the WBMMS in our review. Although it was not included as a standardised measure of wellbeing in the review by Cooke et al. (2016), it did meet criteria specified their review of SWB measures. Furthermore, there were available details of reliability and validity for this measure (Massé et al., 1998). Table 1 provides a summary of the different SWB measures used in the studies.

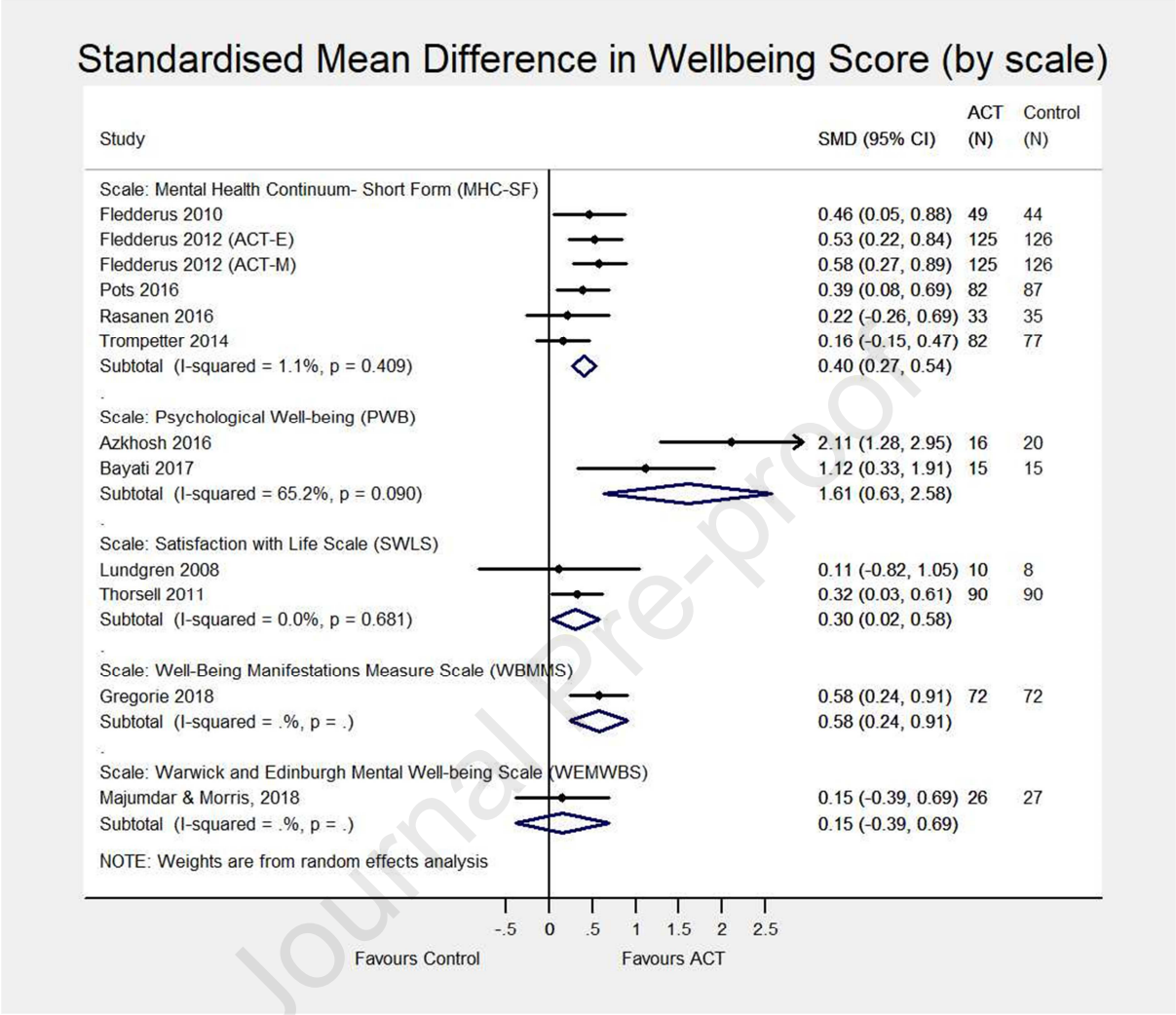
Table1: Summary of SWB Measures Utilised in the Included Studies

Outcome measure	Brief Description	Studies
Mental Health Continuum- Short Form (MHC-SF)	Three domains: emotional well-being (happy, interested in life, satisfied), psychological well-being and social well-being.	n=**5** (Fledderus et al., 2010; Fledderus et al., 2012; Pots et al., 2016; Rasanen et al., 2016; Trompetter et al., 2014)
Psychological Well-being (PWB)	Six domains: autonomy, environmental mastery, personal growth, positive relationships, purpose in life, self-acceptance	n=**2** (Azkhosh et al., 2016; Bayati et al., 2017)
Satisfaction with Life Scale (SWLS)	Uni-dimensional. Five items: designed to measure global cognitive judgments of one's life satisfaction	n=**2** (Lundgren et al., 2008 Thorsell et Al., 2011)
Well-Being Manifestations Measure Scale (WBMMS)	The six factors or subscales of the WBMMS are: control Meaning in Life and Psychological Well-Being of self and events, happiness, social involvement, self-esteem, mental balance, and sociability	n=**1** (Gregorie et al., 2018)
Warwick and Edinburgh Mental Well-being Scale (WEMWBS)	Uni-dimensional. 14 items: designed to measure subjective wellbeing and psychological functioning	n=**1** (Majumdar & Morris, 2018)

Additional Outcome Measures

Table 3 illustrates the range of additional measures (n=24) administered in each of the included studies. The diversity in these measures reflects the heterogeneity of targeted sample populations/characteristics included in the review. The most frequently used measures alongside SWB measures included ACT-related process measures such as psychological flexibility measures (e.g. the Acceptance and Action Questionnaire; AAQ-II; Bond et al., 2011) and measures of clinical symptoms such as anxiety or depression (e.g. Hospital Anxiety and Depression Scale; HADS; Zigmond & Snaith, 1983).

Figure 4: Meta-analysis of Standardised Mean Difference in Wellbeing Scores Post Treatment (by each SWB measure)



SMD=standardised mean difference. can be interpreted as follows: 0.2 represents a small effect, 0.5 a moderate effect ≥ 0.8 a large effect (Cohen, 1988).

Study findings and efficacy of interventions

Results of the meta-analyses

As mentioned previously, meta-analyses were separately for each SWB measure post-treatment (MHC-SF score, PWB score, SWLS score, WBMMS score and WEMWBS score). As previously stated, SMD is a standardised measure used in meta-analysis when included studies assess the same outcome (SWB) but measure it in a variety of ways. As illustrated in Figure 4, results in those studies that measured SWB using the MHC-SF, and SWLS show consistent, significant small-moderate effect sizes in favour of ACT (MHC-SF subtotal; SMD=0.40 (95% CI 0.27 to 0.54); SWLS subtotal; SMD=0.30 (95% CI 0.02 to 0.58)). In

regards to the two studies that utilised the PWB to measure SWB, both showed significant, very large effects favouring ACT (PWB subtotal; SMD=1.6 (0.63 to 2.58)). It is important to note that in regards to these two studies, there is a high level of heterogeneity (I-squared=62%), and that sample sizes in these studies were small. The one study that utilised the WBMMS (Gregorie et al., 2018) reported a moderate, significant effect in favour of ACT (SMD=0.58 (95% CI 0.24 to 0.91). Finally, the one study that measured SWB with the WEMWBS scale (Majumdar & Morris, 2018), showed a small, non-significant effect in favour of ACT (SMD= 0.15 (95% CI -0.39 to 0.69)).

It is important to note that the control groups included in the meta-analyses included wait-list controls, treatment as usual, and active interventions (such as methodone and yoga). As stated earlier in this paper, it must also be acknowledged that a wide variety of populations and clinical conditions have been pooled in the current analysis. Furthermore, while ACT was delivered in a group format in five of the included studies and in an individual format in six of the included studies (Table 3), the results of this meta-analysis do not account for 'group effects'. Whilst one paper included did report an adjusted result for 'group effects' (Fledderus et al, 2010) this was not in a format that could be incorporated into the analysis.

Results of individual studies that conducted follow-up assessments

Whilst data available for meta-analyses precluded analysis of follow-up (FUP), a number of studies included and reported on FUP outcomes. Of the group interventions, Fledderus et al. (2010) reported that gains (favouring ACT) were maintained at 20 weeks. Majumdar & Morris et al. (2018) reported that at 8 weeks, study gains (favouring ACT) were not maintained. Two guided, online interventions included FUPs (T2-3; 26-52 weeks), and gains (in favour of ACT) were maintained at these timepoints (Pots et al., 2016, Rasanen et al., 2016). Finally, two studies reporting guided, interventions with the provision of self-help books and email/individual support included FUP (Fledderus et al., 2012; Thorsell et al., 2011). In these two studies, gains (in favour of ACT) were maintained at FUP (20-26 weeks).

Table 2: Demographic Details of Participants in the Included Studies

		Demographics			Sample Characteristics	
Study	**Country**	**Sample Size**	**Age (Mean, SD/range)**	**Gender (% male)**	**Population**	**Clinical or Non-Clinical/ Recruitment**
Azkhosh et al., 2016	Iran	60	27.5 (n/s)	(n/s)	Individuals with an addiction to opiates, no symptoms of psychosis	Clinical sample, recruited from drug rehabilitation centres
Bayati et al., 2017	Iran	30	n/s (18-55)	0	Females with a diagnosis of multiple-sclerosis, no other physical, or mental health diagnosis	Clinical sample, recruited from the Kermanshah MS Society
Fledderus et al., 2010	Netherlands	93	49 (24-71)	18.3	Individuals with mild to moderate distress	Clinical sample, recruited from mental health institutions
Fledderus et al., 2012	Netherlands	376	42 (18-73)	30	Individuals with mild to moderate depressive symptomology	Non-clinical sample, recruited from the general population
Grégoire et al., 2018	Canada	144	31.7 (SD: 9.22)	26.4	Undergraduate and postgraduate university students	Non-clinical sample, recruited from four participating universities
Lundgren et al., 2008	India	18	23.5 (18-55)	66	Individuals with an epilepsy diagnosis with drug refractory seizures	Clinical sample, recruited from clinics
Majumdar et al., 2018	England	53	62.7 (SD:13.9)	32	Individuals who had experienced a stroke, no degenerative, ABI or cognitive difficulties	Clinical sample, recruited from stroke clinics
Pots et al., 2016	Netherlands	236	46.8 (SD:12.06)	24	Individuals with mild to moderate depressive symptomology	Non-clinical sample, recruited from the general population
Ransanen et al., 2016	Finland	68	24.3 (19-32)	14.7	University students with self-reported distress (stress, low mood and/or anxiety)	Non-clinical sample, recruited from participating university
Thorsell et al., 2011	Sweden	90	46 (12.3)	35.6	Individuals experiencing chronic pain	Clinical sample, Specialty Pain Clinic
Trompetter et al., 2014	Netherlands	238	52.7 (n/s)	24.6	Individuals experiencing chronic pain	Non-clinical sample, recruited from the general population

Table 3: Summary of Included Studies

Study	Intervention/s		Control	Intervention Duration/ number of sessions	Wellbeing measure	Other measures	Attrition Rates %		Findings
	Format	Content/ Delivery (therapists)					Intervention Arm/s	Control Arm	(Reported Effect Sizes)*
Azkhosh et al., 2016	Group	1) Acceptance and Commitment group (ACT; n=20); content n/s; **Delivered by**: the author (1 group). 2) Narcotics Anonymous group (NA; n=20). Contentn/s **Delivered by**: n/s (1 group)	Treatment as usual (TAU)=methadone treatment n=20	1) ACT group=12 weekly x 1.5 hours 2) NA group= n/s	**PWB** Completed at: Baseline (T0) 12 weeks (T1) 18 weeks (T2)	AAQ-R	1) ACT group T0-T1=20% T0-T2=n/s 2) NA group T0-T1=15% T0-T2=n/s	TAU group T0-T1=0% T0-T2=n/s	ACT group showed significantly greater gains in well-being relative to the NA and control group(PWB; Ƞ2= 0.24)
Bayati et al., 2017	Group	ACT group for living with pain (n=15) based on unpublished manual. Sessions covering: limits of control; values; cognitive defusion; committed action; review; moving forward. **Delivered by**: n/s	Control, No inter-vention offered n=15	ACT group= 8 weekly x 1.5 hour sessions	**PWB** Completed at: Baseline (T0) 8 weeks (T1)	N/A	ACT group T0-T1=n/s	Control T0-T1=n/s	From T0-T1 ACT group showed greater gains in wellbeing relative to the control group on well-being (PWB) was significant (Ƞ2=0.41)
Fledderus et al ., 2010	Group	ACT group "living to the full" (n=49) based on manual. Sessions covering: acceptance; cognitive defusion; contact with present moment; self-as-context; values; mindfulness. **Delivered by**: teams of 2 licensed psychologists (7 sites)	Waiting list control (WLC) n=44	ACT group=8 weekly x 2 hour sessions	**MHC-SF** Completed at: Baseline (T0) 8 weeks (T1) 20 weeks (T2)	AAQ-II	ACT group T0-T1=20% T0-T2= no further attrition (20%)	WLC group T0-T1=4% T0-T2=7%	From T0-T1, and T1-T2 those receiving ACT showed significantly greater gains in well-being (MHC-SF; T0-T1 *d* = 0.56; T1-T2 *d* = 0.85

Note: n/s=not specified; *d*=Cohen's d; Ƞ2= eta squared. CI= confidence interval

Study	Intervention/s		Control	Intervention Duration/ number of sessions	Wellbeing measure	Other measures	Attrition Rates %		Findings (Reported Effect Sizes)
	Format	Content/ Delivery (therapists)					Intervention Arm/s	Control Arm	
Gregorie et al., 2018	Group	ACT groups "KORSA" based on manual (n=72). Sessions covering: values; committed action; acceptance; cognitive defusion; mediation; mindfulness. Mediation and observation grid home works. **Delivered by**: two doctoral-level psychology students (4 sites)	Waiting list control (WLC) n=72	ACT group= 4 weekly x 2.5 hours	**WBMMS** Completed at: Baseline (T0) 4 weeks (T1)	PSM-9 GAD-7 PHQ-9 AES FFMQ MEAQ	ACT group T0-T1=20%	WLC group T0-T1=42%	From T0-T1 those receiving ACT showed significantly greater gains in well-being (WBMMS; d = 0.61) compared to WLC
Majumdar & Morris., 2018	Group	ACT groups "ACTivate Your Life after Stroke" (n=26) based on manual. Sessions covering: didactic presentations including ACT activities. **Delivered by**: clinical and assistant psychologists and care co-coordinators (3 sites)	Treatment as usual (TAU) N=27	ACT group=4 weekly x 2 hour sessions	**WEMWBS** Completed at: Baseline(T0) 4 weeks (T1) 8 weeks (T2)	PHQ-9 GAD-7 EQ5D5L AHS	ACT group T0-T1=4% T0-T2=15%	TAU group T0-T1=15% T0-T2=8%	From T0-T1 those receiving ACT showed significantly greater gains in well-being (WEMWBS; Ƞ2 = 0.07) when compared to TAU. At T2 FUP effects were <u>not</u> maintained

Lundgren et al., 2008	Mixed (group and individual)	1) ACT group/ individual sessions for epilepsy (n=10) based on published manual, 'adapted for Indian context'. Sessions covering: values; self-as-context; defusion; acceptance; committed action. ABC home works. **Delivered by:** two clinical psychologists 2) Yoga group/ individual sessions for epilepsy (n=8) based on a manual. Sessions covering: stimulating activity in directions the participants considered meaningful and using yoga technique to decrease the risk of seizures. **Delivered by:** yoga teacher at the clinic	N/A	ACT and Yoga groups=5 weekly sessions: 1 x initial individual session (1.5 hours) 2 x group sessions (3 hours)1 x final individual session (1.5 hours) . 2 x booster sessions at 6 and 12 months (1.5 hours)	**SWLS** Completed at: Baseline (T0) 5 weeks (T1) 26 weeks (T2) 52 weeks (T3)	WHO-QOL BREF	1) ACT group T0-T1=0% T1-T2=0% T3-14=0% 2) Yoga group T0-T1=0% T1-T2=0% T3-T4=0%	N/A	From T0-T4 (effect sizes were calculated using the mean of all post measure points) those receiving Yoga group showed significantly greater gains in well-being (WEMWBS; *d* = 0.58) compared to ACT group

 Note: n/s=not specified; *d*=Cohen's d; η2= eta squared. CI= confidence interval

Study	Intervention/s		Control	Intervention Duration/ number of sessions	Wellbeing measure	Other measures	Attrition Rates %		Findings (Reported Effect Sizes)
	Format	Content/ Delivery (therapists)					Intervention Arm/s	Control Arm	
Pots et al., 2016	Online guided self-help	1) ACT online intervention (n=82) "Living to the full" based on published self-help intervention. Nine online modules covering: cognitive defusion; acceptance; mindfulness; self-as-context; values; committed action. Mindfulness home works. 2) Expressive writing (EW) intervention (n=67) based on published text. 9 online modules covering: EW regarding negative experiences; reflection emotional regulation, reappraisal of emotions); EW of positive experiences. EW home works. **Both delivered by:** 5 psychology students provided email support	Waiting list control (WLC) n=87	ACT and EW group= 9 modules to be completed over 12 weeks Weekly, personalized, email support and standardized text message	**MHC-SF** Baseline (T0) 12 weeks (T1) 26 weeks (T2) ACT and EW only = 52 weeks (T3)	CES-D, MINI, SDS, HADs, FFMQ-SF AAQ-II	1) ACT group T0-T1=13% T0-T2=11% T0-14=13% 2) EW group T0-T1=25% T0-T2=21% T0-T3=30%	Control group T0-T1=10% T0-T2=9% T0-T3=N/A	From T0-T1 and at T2 those receiving ACT intervention showed significantly greater gains in wellbeing when compared to EW and WLC groups. At T1 (MHC-SF; ACT vs EW *d=0.35*, ACT vs WLC *d=0.39*). At T2 and T3 FUP effects were maintained.
Rasanen et al., 2016	Online guided Self-help	ACT online intervention (n=33) "iACT". based on a published protocol and adapted for students based on published self-help intervention. Five modules covering: values; taking action; being present; observer self; awareness; acceptance. Home works (e.g. practicing skills and wellbeing tasks). **Delivered by**: 22 ACT-trained psychology students (third year and above) did individual sessions and provided personalized online feedback	Waiting list control (WLC) n=35	ACT=5 modules completed over 7 weeks: 1 x initial individual session Completed 5 online modules 1 x final individual session Personalized, weekly online feedback, and reminder text/emails.	**MHC-SF** Completed at: Baseline (T0) 7 weeks (T1) ACT group only= 52 weeks (T2)	PSS-10 BDI-II, DASS-21, AAQ-11, FFMQ OLQ-13	ACT group T0-T1=12% T0-T2=22%	WLC group T0-T1=0% T1-T2=N/A	From T0-T1 those receiving ACT showed significantly greater gains in well-being (MHC-SF; *d* = 0.46) when compared to WLC At T2 FUP of those in the ACT condition, gains persisted

Note: n/s=not specified; *d*=Cohen's d; Ƞ2= eta squared. CI= confidence interval

Study	Intervention/s		Control	Intervention Duration/ number of sessions	Wellbeing measure	Other measures	Attrition Rates %		Findings (Reported Effect Sizes)
	Format	Content/ Delivery (therapists)					Intervention Arm/s	Control Arm	
Trompetter et al., 2014	Online guided self-help	1) ACT online intervention (n=82) "Living with pain" based on published self-help programs. Nine online modules covering: cognitive defusion; acceptance; mindfulness; self-as-context; values; committed action. Mindfulness home works. 2) Expressive writing (EW) intervention (n=79) based on published text. 9 online modules covering: psycho-education about emotions and emotion regulation related to the pain experiences, followed by EW. **Both delivered by:** 5 psychology students provided email support	Waiting list control (WLC) n=77	ACT and EW group= 9 modules completed over 12 weeks Weekly, personalized, email support and standardized text messages	**MHC-SF** Baseline (T0) 12 weeks (T1) 26 weeks (T2)	MPI HADS PDI PIPS FFMQ-SF ELS	1) ACT group T0-T1=18% T0-T2=35% 2) EW group T0-T1=35% T0-T2=22%	Control group T0-T1=22% T0-T2=17%	T0-T2 those receiving ACT showed no significantly greater gains in well-being in comparison to WLC or EW.
Fledderus et al., 2012	Guided Self-help	1) ACT extensive support intervention: participants received published self-help book "living to the full" with *extensive email support* (n=125). Nine online modules covering 6 core ACT processes. Mindfulness home works 2) ACT minimal support intervention: participants received published self-help book "living to the full" with *minimal email support* (n=125). Nine online modules covering core ACT processes. Mindfulness home works **Both delivered by:** 5 psychology students (emails, feedback).	Waiting list control (WLC) n=126	ACT extensive support and minimal support groups= 9 modules completed over 9 weeks ACT extensive support=weekly emails personalized feedback/ advice through emails and text. ACT minimal support=weekly standardized emails and positive encouragement	**MHC-SF** Completed at: Baseline (T0) 9 weeks (T1) ACT groups (T2) only= 20 weeks	CED-S, HADS, AAQ, FFMQ, CIS	ACT extensive support group T0-T1=15% T0-T2=21% ACT minimal support group T0-T1=11% T0-T2=16%	WLC group T0-T1=0% T0-T2=N/A	From T0-T1 those receiving ACT extensive and minimal support showed significantly greater gains in well-being compared to WLC (ACT-E; *d*=0.51-0.62 ACT-M; *d* = 0.56-0.79). No significant differences in wellbeing between the two ACT conditions. At T2 FUP ACT groups maintained effects

Study	Intervention/s		Control	Intervention Duration/ number of sessions	Wellbeing measure	Other measures	Attrition Rates %		Findings (Reported Effect Sizes)
	Format	Content/ Delivery (therapists)					Intervention Arm/s	Control Arm	
Thorsell et al., 2011	Guided self-help	1) ACT intervention: participants received published self-help book "living beyond your pain" (n=61) covering ACT processes: values; committed action; mindfulness; cognitive defusion; acceptance; avoidance 2) Applied relaxation: participants received self-help manual (N=54) covering progressive, cued, differential and rapid relaxation **Both delivered by:** 8 psychology interns	N/A	ACT and AR groups= 8 sessions over 7 weeks 1 x initial individual session (1.5 hours) 6 x telephone sessions 1 x final individual session (1.5 hours) Email support as needed	**SWLS** Baseline (T0) 7 weeks (T1) 26 weeks (T2) 52 weeks (T3)	HADS OMP-OQ CPAQ	1) ACT group T0-T1=46% T0-T2=56% T2-T3=73% 2) AR group T0-T1=50% T0-T2=52% T0-T3=73%	N/A	From T0-T1 those receiving ACT intervention showed significant improvement in wellbeing, (SWLS; *d*=0.75). Gains were maintained at T2 FUP and at T3 FUP. Those in the AR group did not show any significant changes in wellbeing post intervention.

Wellbeing measures: MHC-SF: Mental Health Continuum- Short Form, PWB: Ryffs Psychological Wellbeing Scale, SWLS: Satisfaction with Life Scale, WBMMS: Well-Being Manifestations Measure Scale, WEMWBS: Warwick and Edinburgh Mental Well-being Scale. **Other Measures:** AAQ-II: Acceptance and Action Questionnaire, AES: Academic Engagement Scale: AHS: Adult hope scale: BDI-II: Beck Depression Inventory CED-S: Center for Epidemiologic Studies Depression Scale: CPAQ: Chronic Pain Acceptance Questionnaire, CIS: Checklist Individual Strength, DASS-21: Depression, Anxiety, Stress Scale, ELS: Engaged Living Scale, EQ5D5L: EuroQol five-dimensional questionnaire, FFMQ/-SF: Five Facet Mindfulness Questionnaire/short-form, HADS, Hospital Anxiety and Depression Scale, MEAQ: Multidimensional Experiential Avoidance Questionnaire, MINI: Mini International Neuropsychiatric Interview, MPI: Multidimensional Pain Inventory, OLQ-13: Orientation to Life Questionnaire; OMPQ: Orebro Musculoskeletal Pain Questionnaire, PCS: Pain Catastrophizing Scale, PDI: Pain Disability Index, PIPS: Psychological Inflexibility in Pain Scale, PHQ-9: Patient Health Questionnaire-9, PSS-10: Perceived Stress Scale, SDS: Sheehan Disability Scale , WHO-QOL-BREF: World Health Organization Quality of Life Instrument- Short Version.
Effect sizes: *d*= Cohen's d. (*d*= 0.2 is considered as a small effect; d=0.5 as medium; and d=0.8 as large) (Cohen, 1992).Ƞ2= eta squared(Ƞ2= 0.01 is considered a small effect, Ƞ2= 0.06 is considered a medium effect, Ƞ2=0.14 is considered a large effect) (Cohen, Miles & Shevlin (2001).

Discussion

The aim of the current review was to synthesise and critically appraise the research findings of randomised controlled trials (RCTs) investigating ACT interventions that assessed subjective well-being (SWB) as an outcome. The review sought to evaluate the methodological rigor of these RCTs, the ranges of assessment measures used, and the reported levels of efficacy of ACT in bringing about changes in SWB. Eleven studies were identified as meeting criteria for inclusion.

Methodological quality and rigor

The Cochrane Risk of Bias Tool was utilised to assess risk of bias (Higgins & Green, 2011). The methodological quality of the included studies was variable. In one domain 'blinding of participants/ personnel', a high risk of performance bias was found across all the included studies. This represents an important limitation of therapy research in general, and is not specific to ACT (Munder & Barth, 2018). Three studies (Pots et al., 2016; Ransanen et al., 2016; & Trompetter et al, 2014) demonstrated comparatively low levels of risk of bias overall. These studies clearly documented procedures for sequence generation, handling incomplete data, and provided detailed descriptions of interventions. In contrast, two studies were deemed 'low risk' in less than two domains, with the majority deemed 'high' or 'unclear risk' (Azhosh et al., 2016; Bayati et al., 2017). These studies provided insufficient information on key aspects of the research designs and interventions. Across all studies: 53% of domains were deemed 'low risk, 28% 'unclear risk', and 19% were deemed 'high risk' of bias. This review highlights the need for future researchers to improve clarity and transparency when reporting ACT trials.

Some important methodological difficulties highlighted in this review included inadequate reporting of allocation concealment, and insufficient reporting/ handling of attrition data. Procedures to protect allocation sequence (randomisation) are essential in RCTs (i.e. using external agencies to allocate participants), and such procedures need to be documented to ensure selection bias is not introduced. With regards to attrition, two studies provided insufficient information relating to drop-outs or handling of missing data and a further two studies used simple imputation methods (last observation carried forward) which can lead to bias or misleading results. Future research should endeavour to publish and reference trial protocols as this was undertaken in only a minority of the included studies. This would facilitate a more detailed assessment of internal validity.

In order to overcome some of the inherent bias introduced in therapeutic research, in which neither participants nor personnel can remain blinded, an additional domain 'deviations from intended interventions' was considered (Higgins et al., 2016). This domain allowed the authors of this review to assess treatment implementation and integrity (i.e. therapist/ participant adherence, training etc.) and treatment 'dosage'. Most of the studies were deemed 'low risk' of this type of performance bias. Where risk was deemed 'unclear', this judgement arose due to a failure to report participants' adherence to the interventions. In two studies no details of therapist training, treatment fidelity measures and/or participant adherence were provided (Azhosh et al., 2016; Bayati et al., 2017). Of those studies deemed 'low risk', the majority were manualised, and included details of therapist training and reported high levels of participant adherence (balanced across active groups).

Additional methodological issues highlighted in the included studies included small sample bias, and a lack of active comparators, resulting in a lack of control for non-specific therapeutic factors (n=6). Such limitations echo findings of previous systematic reviews of ACT RCTs (French et al., 2017; Hughes et al., 2017).

Whilst this review sought to appraise and synthesise published RCTs (often considered the 'gold standard' in evidence-based research), it must be acknowledged that this is likely to skew conclusions with regards to 'publication bias'. With regards to this type of selection bias, we cannot determine whether or not there are additional ACT, RCTs that included SWB outcomes, but may not have been published due to non-significant results. Hence the importance of researchers of publishing pre-trial protocols.

Range of wellbeing measures utilised in included studies

A total of five different standardised measures of SWB were used in the included 11 studies. The most commonly used measure was the MHC-SF (Keyes, 2002) which was utilised in five studies, followed by the PWB scale used in two studies, and the SWLS (Diener et al., 1985) used in two studies. In a final two studies the WBMMS (Massé et al., 1998) and WEMWBS (Ruth at el., 2007) were utilised. This range of measures reflects a divergence in how SWB is conceptualised and operationalised within the wider research community (Cooke et al., 2016; Forgeard, Jayawickreme, Kern, & Seligman, 2011)

Whilst there was no general consensus as to how wellbeing should be measured in the included studies, the MHC-SF featured most prominently. In addition to providing a total score, this measure allows individuals to be classed as "flourishing" (highest level of wellbeing), "languishing" (lowest level of wellbeing) or "moderately mentally healthy" (neither "flourishing" nor "languishing") based on scores on individual indices of both hedonic and eudemonic aspects of the SWB construct (Keyes, 2002). This measure has previously demonstrated good internal reliability (α= 0.89) and test-retest reliability (0.65; Lamers, Westerhof, Bohlmeijer, Klooster & Keyes 2011).

Consistent with previous meta-analysis and reviews of ACT the majority of the research focused on symptom outcomes as a primary measure with only five studies specifying SWB outcomes as a primary outcome. As highlighted by previous authors, this represents a fundamental shortcoming in the evidence-base - symptom reduction is not the primary aim of ACT interventions. Notably, the majority of the studies in this review were published within the last two years, and were all group-based or guided self-help. This is likely to reflect the increasing use of SWB measures, and a rise in these formats for therapy that serve to increase access to therapies (Gellatly et al., 2007). Moving forward, greater emphasis should be placed on evaluating the impact of ACT on SWB as a primary outcome.

Reported levels of efficacy for wellbeing outcomes

Meta-analyses were conducted separately for each SWB measure post-treatment (MHC-SF score, PWB score, SWLS score, WBMMS score and WEMWBS score) using standardised mean deviations. Results indicated that all but one study (Majumdar & Morris, 2018) showed significant results in favour of ACT (when compared to controls), with the majority of studies demonstrating moderate effect sizes. As previously highlighted, in those studies utilising PWB to measure SWB (Azkhosh et al, 2016; Bayati et al., 2017), very large effect sizes favouring ACT were evident. It is important to note that there was a high level of heterogeneity between these two studies, and that sample sizes were small. These studies also demonstrated had the least numbers of 'low risk' ratings in the Risk of Bias analyses, suggesting that the design of these studies could have been improved.

The results of this current meta-analysis can be compared with a recently completed complementary meta-analysis that explored ACTs role in wellbeing promotion of undergraduate students specifically (Howell & Passmore, 2019). In contrast to the current review, this research focused solely on non-clinical samples, covering only ACT interventions targeted at university students. The included studies were predominately web-based studies (including non-guided formats). Of the five studies included in this review, ACT interventions were found to have small, positive effect on university students' wellbeing (pooled effect size= *d*=0.29).

Strengths and limitations of the current review

The scope of the current review included a wide variety of populations, and ACT formats (i.e. group, mixed, guided self-help; online or books) and outcome measures of SWB. As ACT is a transdiagnostic intervention, and is increasingly delivered in diverse formats this can be viewed as strength of the current review. Furthermore, the focus of this review on SWB as an outcome, is model-consistent (i.e. an outcome that ACT purports to target). The current study included a meta-analysis of all 11 studies; this was a series of meta-analyses for each post-treatment measure of SWB. It must be highlighted that a wide variety of controls were included in this analysis (e.g. wait list controls, treatment as usual, and active controls such as yoga). It is also important to consider the high number of non-active controls (9 out of the 11 studies) which are likely to maximise the magnitude of the results, and effect sizes in the included meta-analysis. Furthermore, comparisons with non-active controls do not account for non-specific factors. As stated previously, the included analysis did not account for 'group effects', as the data was not available to be incorporated into our analysis.

The current review used a broad search strategy, and was inclusive of all studies incorporating standardized measures of SWB as listed, or against the criteria specified in a recent comprehensive review of SWB measures (Cooke et al., 2016). For the purpose of this review quality of life (a conceptually distinct term to SWB) was purposely excluded from search terms (Cooke et al., 2016; Pinto, Fumincelli, Mazzo,Caldeira, & Martins, 2017).

Subjective wellbeing is often erroneously confused with Quality of Life. Research and theory has sought to highlight the distinctiveness of these concepts. Pinto et al. (2017) noted that in terms of Quality of Life: 'the majority of authors define the concept as the individual's perception of their personal situation in their own life in the physical, social, mental and spiritual dimensions' (P7). Subjective well-being on the other hand is purported to consist of three interrelated components: life satisfaction, pleasant affect, and unpleasant affect. Affect refers to pleasant and unpleasant moods and emotions, whereas life satisfaction refers to a cognitive sense of satisfaction with life' (Diener & Suh, 1997, p. 200). To capture the overlap but distinctiveness of these concepts, Dodge et al. (2002) proposed that quality of life can be considered a dimension of the broader concept of wellbeing.

Recommendations for Future Research

There is an evident need for researchers within the ACT community to use more appropriate model-consistent outcomes such as SWB in future RCTs. Increasing the use of such measures in large RCTs would allow for further meta-analysis of SWB outcomes (i.e.

focused on specific formats of ACT, or measures). Given the vast number of available, standardised measures of SWB is it suggested that authors be explicit about their choice of measure, and underlying conceptualisation of SWB. In the current review, the most commonly utilised measure was the Mental Health Continuum-Short Form (MHC-SF). As stated, this measure captures both hedonic and eudemonic aspects of the SWB, and has demonstrated good internal reliability and test-retest reliability. The use of this existing measure in future RCTs may be allow for consistency in how SWB is measured in ACT, thereby progressing the field and moving away from symptom-focused outcomes. Moving forward, ACT theorists and researchers could play an important role in helping to refine and finesse how SWB is conceptualized and measured informed by the ACT model.

The inclusion of active controls in these designs would further strengthen the evidence base of ACT, and control for non-specific therapeutic factors. In this review half of the studies included had a relatively short FUP, or did not include one. In future, studies with longer FUP are necessary to explore the long-term effects of ACT interventions on SWB. Furthermore, the reporting of reasons for attrition during future RCTs, would allow for a formal meta-analysis of attrition going forward, which may particularly informative to the research community as the literature base grows.

The findings of this review also highlight the need for careful consideration, transparency and clarity when designing and reporting trials (e.g. procedures for allocation concealment, reporting and handling of missing data). In this review, the addition of "deviations from intended interventions" a new RoB category (Higgins et al., 2016) allowed the authors to consider bias in relation to therapy integrity and adherence. It is suggested that future reviewers, and trial investigators utilise these criteria when conducting therapeutic research. There is scope for future research to explore the relationship between SWB and symptom/illness outcomes, given that the majority of published studies have included SWB measures alongside these measures (i.e. depression). Further studies may also wish to explore the active components of ACT interventions (i.e. processes such as cognitive defusion) in improving SWB.

The findings of this review and aforementioned literature indicate that there is an increasing recognition that SWB may be improved in both clinical and non-clinical populations using ACT interventions. Whilst much of the research to date in non-clinical populations has been conducted with students, these interventions may also be applied in a broader range of contexts (e.g. in workplaces, elite level sporting contexts, prisons, community groups etc.) and with a broader range of populations (e.g. older adults) in order to promote and enhance positive mental health. Furthermore, there is now an increasing recognition that ACT may help to elevate the SWB of vulnerable groups (e.g. refuges and those experiencing humanitarian crisis). Finally, the inclusion of booster sessions may help to improve longer-term outcomes and maintain positive outcomes in both research trials and when working clinically with different populations.

Conclusion

The current systematic review sought to synthesise and critically appraise the research findings of RCTs of ACT interventions that have assessed SWB. Whilst caution must be exercised when generalising the findings of this review, the included studies indicate that ACT interventions show evidence of being beneficial in enhancing SWB in clinical and non-

clinical populations. Future RCTs that include standardised measures of SWB are necessary to facilitate further meta-analysis. The methodological limitations highlighted in this review indicate the need for further high-quality studies, with larger sample sizes and active comparators. It is hoped that these recommendations will facilitate an improved understanding of the role of ACT in supporting and enhancing wellbeing, and mental health.

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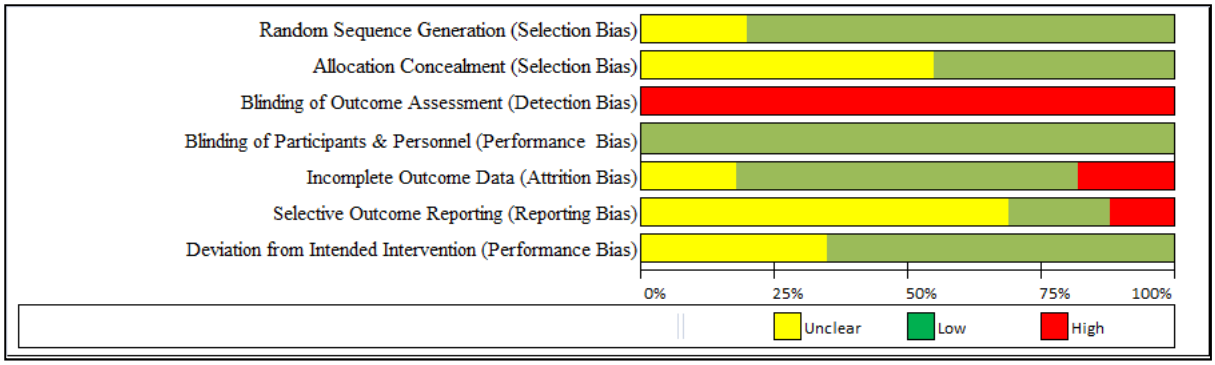
Figure 2 – Risk of Bias Graph



Highlights

- This review investigated the range of subjective wellbeing measures used in ACT research;
- the effectiveness of ACT in enhancing wellbeing, and methodological rigour of these studies.
- 11 randomised controlled trials were included comparing ACT interventions with control groups.
- ACT interventions enhance subjective well-being in clinical and non-clinical samples.

- A range of methodological weaknesses highlighted in this review need to be addressed.

Declaration of Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed.

We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

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Signed and dated by:

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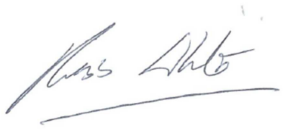
Dr Linda Steadman	L.F. Steadman	14th July 2019
Dr Ross White		16th July 2019