Universal online self-help ACT interventions for youth: A systematic review

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ABSTRACT

Previous reviews of online self-help have not exclusively focussed on universally delivered Acceptance and Commitment Therapy (ACT). This systematic review aimed to evaluate the effectiveness of universal online self-help ACT interventions for young people.

Relevant databases were searched for studies examining ACT interventions that were delivered universally, online and as self-help (guided and unguided) to young people aged 10 to 25-years-old. Eleven studies met inclusion criteria. These were assessed for quality and findings summarised using a narrative synthesis.

Outcomes on mental health, well-being and ACT processes were reviewed, and results across studies were mixed. Most studies found significant improvements in mental health and well-being outcomes following the ACT intervention; however less than half found improvements in ACT process measures. Subgroups, such as those with elevated mental health symptoms, had better outcomes. There were no changes in measures of psychological inflexibility. However, methodological issues limited the interpretation of findings.

Heterogeneity between studies and methodological issues made it difficult for this review to draw conclusions regarding the effectiveness of universal online self-help ACT interventions for young people. Future research with consistent approaches is needed across these types of interventions to improve methodological rigour to determine whether these interventions are effective.

The prevalence of mental health difficulties in children and young people (CYP) is increasing. Mental health conditions have risen from 1 in 9 in 2017 to 1 in 6 in 2022 in children aged 7 to 16, and from 1 in 10 to 1 in 4 in those aged 17 to 19 in England (Newlove-Delgado et al., 2022). This has led to an increase in CYP seeking mental health support services since March 2021, with approximately 720,000 accessing services in February 2023 (NHS Digital, 2023). The COVID-19 pandemic has worsened CYPs' mental health and well-being, exacerbating previous mental health problems, increasing psychological distress and symptoms of anxiety and depression (Hawke et al., 2020; Panchal et al., 2021).

Despite increased funding and efforts to improve access to mental health services for CYP, approximately 50% of CYP in the UK do not receive the necessary support (UK Health and Social Care Committee, 2021). While CYP with severe mental health difficulties (e.g., psychosis and eating disorders) may receive quicker access to specialist input, those with less severe issues experience lengthy waits or receive no treatment, which may worsen their mental health (Edbrooke-Childs & Deighton, 2020). The delay in appropriate interventions for mental health concerns can also lead to an increase in problem severity,

resulting in longer and more complex treatments, which places additional demand on services (Care Quality Commission, 2018).

Adolescence, the period of development between 10 and 25 years old, (World Health Organisation (WHO), n.d.; Kinghorn et al., 2018), is a critical period for the onset on mental health difficulties, as half of adults with mental health difficulties display symptoms before age 14 (Kessler et al., 2005). Limited availability of mental health support is concerning, given the implications of adolescence for future success (Black et al., 2017). Therefore, addressing CYP mental health and well-being in a timely manner is essential.

1. Universal interventions

One approach for addressing limited access to specialist support is prevention and early intervention, which the WHO (2002) categorises into three levels: universal, selective, and indicated, depending on the target population and the risk of mental health problems. Universal interventions aim to address the general, non-clinical population and encompass strategies that aim to reduce mental health risk and enhance protective factors (Purtle et al., 2020). Selective interventions target

subgroups at risk of developing mental health difficulties, and indicated interventions are designed for those with high-risk characteristics and emerging mental health symptoms.

Prevention and early intervention can reduce the long-term impact of poor mental health on development, improving social relationships, and future vocational and economic prospects (McGorry, 2019). Early intervention can also reduce healthcare costs and the economic consequences of poor mental health and well-being (Stevens, 2011). A literature review (Colizzi et al., 2020) concluded universal interventions, such as school-based programs or digital platforms, can be effective in preventing the onset of mental health problems in young people.

A systematic review by Salazar de Pablo et al. (2020) evaluated the effectiveness of universal and selective interventions for improving mental health and well-being outcomes in CYP. The review found that universal interventions were as effective as selective interventions for enhancing outcomes and significantly better at improving cognitive skills to resolve problems. These results suggest that universal interventions are not only feasible but also effective in promoting positive mental health in CYP.

Universal interventions can be delivered effectively outside of healthcare, such as in schools. A systematic review and meta-analysis of 90 studies on school-based preventative interventions (Werner-Seidler et al., 2017) found small effect sizes on depression and anxiety symptoms when compared to controls, and comparable outcomes between universal and targeted interventions for mental well-being and symptoms of anxiety. Similarly, a review of school-based universal interventions in the UK (Mackenzie & Williams, 2018) found neutral or small effect sizes for mental health and well-being outcomes across 12 studies. However, both reviews highlighted methodological issues faced by research on universal interventions in schools, including small sample sizes (Werner-Seidler et al., 2017), high attrition and limited longer-term follow-up (Mackenzie & Williams, 2018).

A common format to deliver universal interventions is self-help, and in recent years self-help universal interventions have increasingly been delivered digitally.

1.1. Universal self-help interventions

Self-help interventions involve an individual following a manualised treatment process independently (Cuijpers & Schuurmans, 2007) and can be delivered either unguided or with some therapist involvement (guided; Bekker et al., 2017). Such interventions are a feasible and acceptable alternative to traditional therapist-led support (Kauer et al., 2014) and can increase the likelihood of individuals who value self-reliance to seek professional help in the future, suggesting self-help provides an indirect route to overcoming barriers to support (Ishikawa et al., 2022; Kauer et al., 2014). Moreover, self-help interventions can be delivered online with minimal professional involvement. This can increase privacy and anonymity, lower practical barriers and associated costs such as time off work and travel, and facilitate quicker access to treatment (Pretorius et al., 2019). In addition, CYP may prefer approaches which focus on self-reliance rather than professional support, due to social factors such as perceived stigma around mental health and perception of professionals, as well as systemic and structural barriers such as financial costs, practicalities and logistics (Gulliver et al., 2010; Radez et al., 2021). Given these factors, self-help interventions may be a feasible option.

Self-help interventions have been used for mental health and well-being in CYP, involving cognitive-behavioural therapy (CBT). A review and meta-analysis (Bennett et al., 2019) found both guided and unguided self-help interventions have moderate effect sizes on mental health and well-being measures such as emotional and behavioural symptoms compared to control groups, with guided self-help having higher effect sizes than unguided. Computerised self-help was found to be superior to bibliotherapy. However, self-help interventions were not as effective as face-to-face treatments, although the difference in effect

sizes was small. The authors recommended further research to understand who might benefit from self-help interventions.

1.1.1. Universal digital self-help interventions

Digital technology has revolutionised the delivery of health interventions, with a diverse range of digital methods employed such as websites, apps, computer-assisted games and programmes, digital devices, virtual reality, and instant or text messaging (Liverpool et al., 2020). While the use of digital technology in healthcare systems has previously been recognised, the COVID-19 pandemic necessitated and normalised its use (Budd et al., 2020; Mann et al., 2020). Digital technology offers several advantages for mental health promotion and intervention, including the provision of real-time data to support timely intervention (Hollis et al., 2015) and engagement of evidence-based treatments to CYP who may be less likely to seek help from professionals (Ryan et al., 2010). Rudd and Beidas (2020) also suggested universal, digitally delivered interventions can support the whole population by increasing mental health awareness and mental well-being, but the evidence base for these interventions needs to be further developed.

Nonetheless, Aguilera (2015) cautioned that challenges such as legal and ethical issues, including patient data privacy, confidentiality and sensitivity in communication, need to be addressed in digitally delivered interventions. Despite these challenges, it has been argued that digitalisation of services is inevitable and will lead to improvements in accessing higher quality care (Mitchell & Kan, 2019).

In the UK, policies such as 'Transforming children and young people's mental health provision: a green paper' (Department of Health and Social Care, 2017) advocate the importance of promoting positive mental health for all young people and suggest self-help digital interventions as one approach to achieve this by increasing access to evidence-based support.

The evaluation of digital mental health interventions is essential for their implementation in routine practice (Taylor et al., 2020). Reviews of online interventions have found that computerised CBT interventions are effective in treating anxiety and depression (Ebert et al., 2015; Stasiak et al., 2016), and web-based CBT self-help is the most commonly evaluated modality with positive outcomes (Zhou et al., 2021). Furthermore, a systematic review of universal, digitally delivered self-help interventions. Babbage et al. (2022) found such interventions improved psychological well-being and social functioning in young people.

With the expanding evidence-base in support of digital self-help interventions, and CBT being the most frequently used modality, the National Institute for Health and Care Excellence (NICE, 2023) have recently drafted guidance to recommend the use of digital self-help resources based on CBT for the treatment of mild to moderate anxiety symptoms in CYP.

2. Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT) is a transdiagnostic third-wave CBT that aims to increase psychological flexibility, rather than targeting specific symptoms. ACT conceptualises distress as resulting from attempts to avoid unwanted thoughts, feelings, and experiences (experiential avoidance), which reduces engagement in other meaningful and important activities (Hayes, Strosahl, & Wilson, 1999). ACT promotes psychological flexibility, which is the ability to be present in the moment while acting in accordance with personal values. By increasing psychological flexibility, psychological distress can be alleviated through the reduction of experiential avoidance and the increase in engagement in behaviours that align with an individual's values; the life directions that guide and motivate behaviour and that a person considers important for leading a meaningful life (Hayes et al., 2011; Reilly et al., 2019).

Increasing psychological flexibility is linked to improved mental

health and well-being (Kashdan & Rottenberg, 2010). Tyndall et al. (2020) identified that higher psychological flexibility was associated with lower depression, anxiety, stress, and negative emotions. Lucas and Moore (2020) found that higher psychological flexibility leads to better mental health, improved social functioning, and greater life satisfaction. Additionally, psychological flexibility mediates the impact of early life traumas on mental health measures (Richardson & Jost, 2019). In summary, psychological flexibility plays a vital role in reducing mental health issues and enhancing well-being, functioning, and life satisfaction.

Over the past twenty years, the evidence base for ACT as an effective treatment for mental health and well-being has grown. A meta-review of ACT interventions for adults (Gloster et al., 2020) found that ACT was significantly better at improving outcomes across a range of mental health difficulties compared to control groups and most active conditions other than CBT. Likewise, ACT has been shown to be an effective intervention for CYP. A meta-analysis by Fang and Ding (2020) found ACT was superior to control conditions and performed similarly to established treatments in reducing mental health symptoms and psychological distress, as well as improving quality of life and well-being.

However, whilst the evidence base for ACT is expanding, there remain certain methodological concerns that require further attention. Swain et al. (2015) highlighted many studies of ACT for CYP had small sample sizes, resulting in underpowered statistics affecting the generalisability of results, used non-randomized study designs which limited internal validity, and a lack of studies comparing ACT to other treatments. Furthermore, Fang and Ding (2020) acknowledged significant variability in the presenting issues across the reviewed ACT studies, as well as inconsistent measures of positive mental health and behavioural symptoms.

3. Digitally delivered universal self-help ACT interventions

ACT is a transdiagnostic approach which can be applied in different formats and intervention levels, including in educational settings. Gillard et al. (2018) outlined how ACT can be applied to support staff well-being, be delivered to young people in individual or group formats to manage mental health difficulties, and be adapted into an emotional health and well-being curriculum to promote well-being and development of life skills. ACT-based school interventions have been found to be effective on outcomes of depression, anxiety, and stress, but significant findings were mostly in studies examining targeted interventions rather than universal (Knight & Samuel, 2022). The review suggested that methodological weaknesses in the included studies, such as inadequate use of validated measures and low sample sizes, could explain this finding. More research with larger samples is required to determine the efficacy of ACT at a universal level.

In terms of the delivery of ACT through digital methods, Klimczak et al. (2023) examined the effectiveness of online self-help ACT interventions across a range of problems and adult populations, consistent with ACT's transdiagnostic approach. The review found that online ACT self-help interventions were effective at improving general mental health and well-being, quality of life and psychological flexibility.

However, for CYP there have not been any reviews of online self-help ACT interventions. Fang and Ding's (2020) review did not comment specifically on whether studies were delivered online, and included a combination of universal and targeted ACT interventions. The authors suggested future research was needed on different delivery formats for ACT interventions for CYP as there is currently a lack of studies compared to adults. More recently, a review of 34 ACT interventions for adolescent mental health (Petersen et al., 2022) included only two studies of digitally delivered ACT, with one being universal self-help and the other being therapist-led online ACT for trichotillomania.

Overall, the mental health needs of CYP are increasing and access to professional psychological support can be challenging and restricted. Self-help and digital delivery of mental health interventions offer an alternative to face-to-face professional support. There is an emerging evidence base for ACT for CYP as an effective approach for reducing psychological distress and improving mental well-being at multiple treatment levels and formats. However previous reviews have not examined self-help or online ACT interventions for children and young people. Therefore, the current review aims to:

a) Systematically review the literature regarding digitally delivered self-help ACT interventions for universal use in young people.
b) Examine the effectiveness of such interventions.
c) Provide a narrative synthesis of the results of identified literature.

4. Method

4.1. Search and screening procedures

Searches of the following online databases were undertaken between September 2022 and March 2023 to identify relevant literature: MEDLINE/PubMed (Ovid); APA PsycINFO (Ovid); Embase (Ovid); Scopus; Web of Science. The Association for Contextual Behaviour Science (ACBS) website was also searched. Grey literature was searched for using the ProQuest Dissertation and Theses Global website. The following search terms were selected to return relevant literature:

"acceptance and commitment therapy" OR acceptance commitment therapy OR iact
    AND
    online OR internet OR web* OR digital* OR mobile OR virtual
    AND
    child* OR adolescen* OR youth* OR young* OR college* OR student* OR teen* OR school*

Using the Ovid website, some search terms were mapped to subject headings within the APA PsychInfo database to retrieve more relevant results. These were:

1. Online* mapped to 'Online Therapy'
2. Internet mapped to internet/or world wide web (www)
3. Web* mapped to websites/or digital mental health resources
4. Digital* mapped to digital interventions/or Digital Mental Health Resources

Retrieved papers were initially screened by title and abstract against the inclusion and exclusion criteria. Full texts of remaining papers were retrieved and compared against the same inclusion and exclusion criteria.

4.2. Inclusion criteria

Empirical studies published in peer reviewed journals, as well as theses and grey literature, were included if studies met the following criteria.

4.2.1. Population

a) Participants were young people/adolescents aged between 10 and 25 years old
    a. Studies where some participants were over 25 years were included if the target sample were students *and* the mean age of the sample was ≤25 years old

4.2.2. Intervention

b) Studies delivering a universal online/digitally delivered ACT
    a. Studies that had a component of in-person contact (e.g., if assessment was conducted in person) were included if the main delivery method of the intervention was online (e.g., web, app, messaging)

c) Studies evaluating intervention targeting more than one area of psychological flexibility: acceptance, cognitive defusion, committed action, mindfulness, self-as-context, and values

d) Studies evaluating a self-help intervention, either guided OR unguided

e) Studies delivering the intervention to an individual OR group

f) Studies using a quantitative or mixed method approach
   Outcome

g) Studies with at least one outcome measure related to mental health and well-being, with measures completed at a minimum of two separate time points

4.3. Exclusion criteria

The exclusion criteria were:

a) Studies with an age range younger than 10 years or older than 25 years

b) Studies which had an inclusion criteria for participants to meet a clinical cut-off, diagnostic criteria, or specific characteristics (e.g., smoker, pain difficulties)

c) Studies evaluating interventions targeting individuals with specific mental health diagnoses (e.g., depression/anxiety) or difficulties (e. g., pain, smoking cessation)

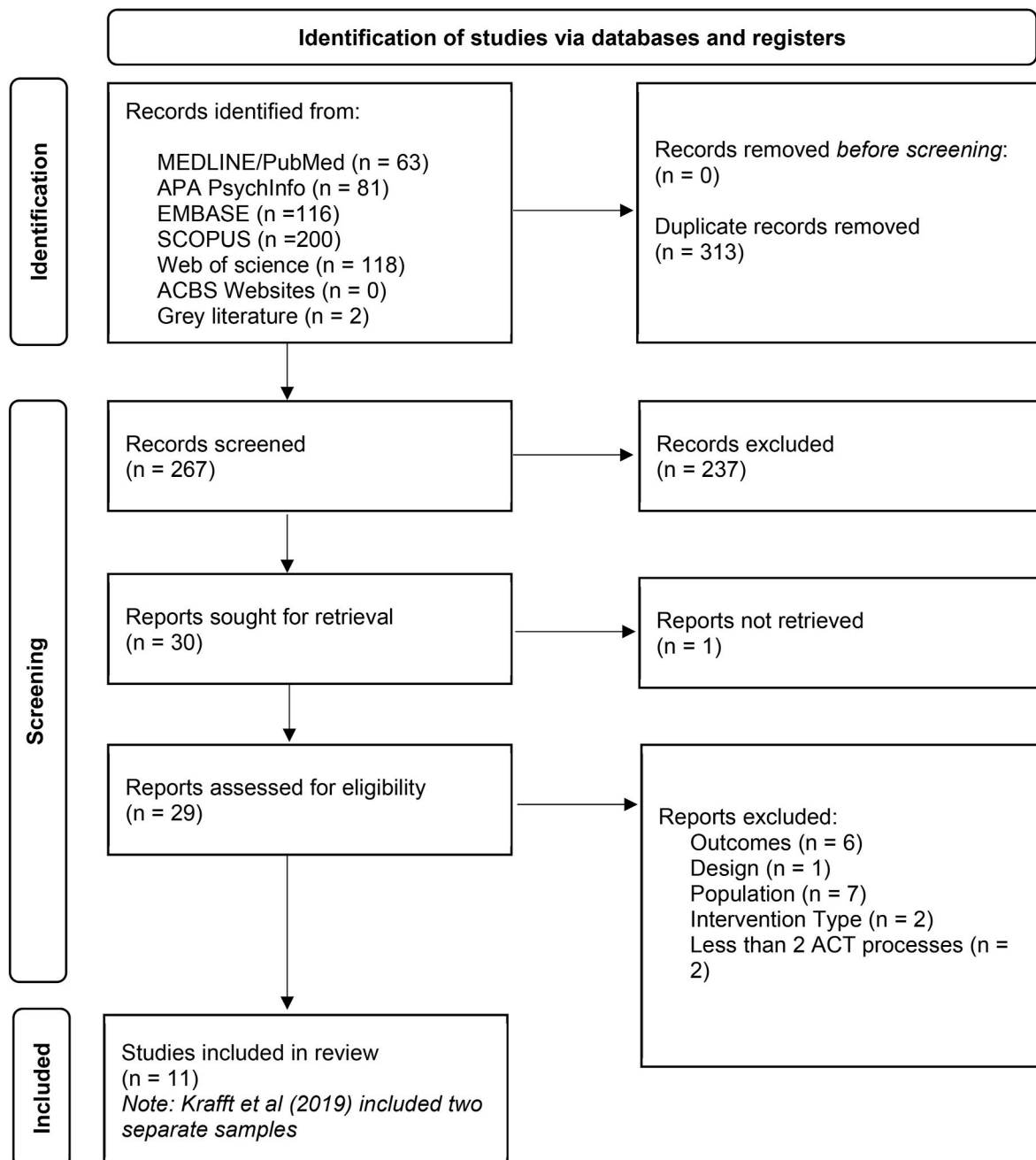d) Studies where the ACT intervention was delivered alongside other psychological approaches

Fig. 1. PRISMA Flow chart.

e) Studies with a qualitative methodology, and quantitative studies using observational or single case study design

4.4. Eligible studies

The initial search identified 580 articles, which reduced to 267 after duplicate records were removed using Zotero. Thirty articles met the inclusion criteria following a screening of titles and abstracts. A total of 11 studies were included, but one paper had two samples which were analysed independently (Krafft et al., 2019), therefore reported separately in this review (n = 12).

Reasons for exclusion related to the study population age, no mental health or well-being measures, ACT interventions focusing on only one core psychological flexibility process, and intervention type (i.e., not being self-help or targeted for a specific difficulty). See Fig. 1 for the

PRISMA flow chart. At all stages, 50% of papers were peer-reviewed. Any differences in agreement about study inclusion were discussed to reach a consensus.

4.5. Data extraction, synthesis and quality assessment

The following data was extracted from included papers: study date; study location; number of participants; participant demographics (including age, gender and ethnicities where available); study design; groups/conditions; online delivery method (e.g., web, app, phone etc.); category of intervention (e.g., guided self-help, unguided self-help); length of intervention (where applicable); ACT processes included; outcome measures of interest (mental health and/or well-being); study results.

There was considerable heterogeneity between included studies,

Table 1
Overview of study details.

Author, Date, Location	N	Population	Participant Demographics	Study Design and conditions	Intervention type (e.g., delivery format, guided or unguided)	Intervention length	Target ACT processes
Chen et al. (2022) Malaysia	52	Undergraduate students	M = 21.5 (SD = 1.47, Range = 18–23) 86.5% female 51.9% Malay	Pre-post; Intervention only, no control	Web self-help; unguided	2 week; 6 modules; up to 6 h	6; Acceptance, Cognitive Defusion, Committed Action, Mindfulness, Self-as-context, Values
Keinonen et al. (2021) Finland	123 (subsample)	Secondary School Students	Median = 15 (14–16) 57% female	RCT (secondary analysis of Lappalainen et al., 2021)	App self-help; guided	5 weeks; 5 modules; 2.5 h minimum	5; Values; Cognitive Defusion; Acceptance; Mindfulness; Self-as-context
Krafft et al. (2019) - SONA sampleUSA/Canada	63	University Students (SONA credit)	M = 20.24 (3.88) 73% female 96.8% White	RCT; Simple App vs Complex App vs WLC	Mobile App self-help; unguided	4 weeks	3; Acceptance, Mindfulness, Values
Krafft et al. (2019) - helping-seeking sample USA/Canada	35	University Students (Help Seeking)	M = 24.57 (7.86) 65.7% female 94.3% White	RCT; Simple App vs Complex App vs WLC	Mobile App self-help; unguided	4 weeks	3; Acceptance, Mindfulness, Values
Lappalainen et al. (2021) Finland	249	Secondary School Students	M = 15.27 (SD = 0.39, Range = 15–16) 51% Female	RCT; iACTface vs iACT vs control	App self-help; guided	5 weeks; 1 module per week	6; Acceptance, Cognitive Defusion, Committed Action, Mindfulness, Self-as-context, Values
Lappalainen et al. (2023) Finland	348	Secondary School Students	M = 15.01 (SD = 0.14, 14–16 years)	RCT; iACT student + virtual coach vs iACT virtual only vs WLC	Web self-help; guided	5 weeks (with 2 video calls in student coach group)	6; Acceptance, Cognitive Defusion, Committed Action, Mindfulness, Self-as-context, Values
Levin (2013) USA	234	Undergraduate students	M = 21.61, (SD = 5.48, Range = 18–58). 66.7% Female	RCT; ACT-CL vs Active control (Healthy living website)	Web self-help; unguided	3 weeks; 2 lessons	3; Acceptance, Mindfulness, Values
Levin et al. (2017) USA	79	Undergraduate students	M = 20.51 (SD = 2.73, mode = 18) 66% Female 88% White	RCT; ACT vs WLC	Web self-help; unguided	4 weeks; 6 sessions	5; Acceptance, Cognitive Defusion, Committed Action, Mindfulness, Values
Levin et al. (2014) USA	76	First-year university student	M = 18.37 (SD = 0.54, Range = 18–20) 53.9% female; 71.1% White	Feasibility RCT; ACT-CL vs WLC	Web self-help; unguided	3 weeks, 2 lessons	2; Acceptance, Values
Levin et al. (2016) USA	234	Undergraduate students	M = 21.61, (SD = 5.48, range = 18–58, median = 20) 76.9% Female 76.2% White	Feasibility RCT; ACT-CL vs Education website	Web self-help; unguided	3 weeks; 2 sessions	2; Acceptance and values (with secondary mindfulness resources)
Räsänen et al. (2016) Finland	68	University Students	19–32 years old; M = 24.29 (SD = 3.28) 85.3% Female	RCT; iACT vs WLC	Web self-help; guided	7 weeks; 2 in-person, 5 online modules	6; Acceptance, Cognitive Defusion, Committed Action, Mindfulness, Self-as-context, Values
Räsänen et al. (2020) Finland	Secondary analysis of Räsänen et al. (2016)						

Note. RCT = randomized Controlled Trail, WLC = Waitlist Control.

such as the number of ACT process interventions targeted, length of intervention and outcome measures used. A narrative synthesis of the data was deemed appropriate and a meta-analysis was not performed. The quality of studies was appraised using the National Heart, Lung and Blood Institute (NHLBI, n.d.) quality assessment tools for controlled intervention studies (n = 10) or pre-post studies with no control group (n = 1). These tools provide a quality rating of 'Good', 'Fair' and 'Poor'. The NHLBI assessment tools were chosen because they are specifically designed for the two types of studies examined in this review: randomized controlled trials and a pre-post study. Both tools also have the same quality rating categorisation, allowing direct comparison between the two study designs. All papers were quality assessed, five of which were rated by an independent researcher (a trainee clinical psychologist), with discrepancies between quality ratings resolved through discussion.

5. Results

A total of 11 studies were identified which met the inclusion/exclusion criteria. An overview of the studies is provided in Table 1. The included studies involved a total number of 1324 young people across four countries: United States of America (USA), Canada, Finland and Malaysia. Two of the included studies (Keinonen et al., 2021; Räsänen et al., 2020) were secondary analysis of samples from other studies, and therefore not counted as separate participants. Keinonen et al. (2021) is a subsample of participants who had completed a minimum of three intervention sessions from Lappalainen et al. (2021), whilst the sample in Räsänen et al. (2020) is a secondary analysis of the same sample as in Räsänen et al. (2016). Study publication dates ranged from 2013 to 2023.

5.1. Participant demographics and sample characteristics

All studies reported gender as a binary categorisation (i.e., male or female), except for Lappalainen et al. (2023) which also had 'Other/Does not want to tell'. All studies had a majority of their sample identifying as female, although two studies (Lappalainen et al., 2021; Levin et al., 2014) had a closer-to-even gender split. Consistent with the current review's criteria, included studies did not have inclusion criteria for participants to exhibit symptoms of psychological distress or experience mental health concerns. However, five studies reported the prevalence rate of such difficulties. Krafft et al. (2019) had two separate samples: a SONA credit (research credit platform) sample and a help-seeking sample, with 39.7% and 77.1% respectively experiencing at least moderate symptoms on any subscale of the Depression, Anxiety and Stress Scale - 21 Items (DASS-21; Lovibond & Lovibond, 1995). Other studies ranged between 31% and 87% of their sample having elevated scores on primary mental health outcomes measures at baseline assessment (Lappalainen et al., 2021, 2023; Levin et al., 2017; Räsänen et al., 2016).

5.2. Study design and quality assessment

The present review includes 11 studies investigating the efficacy of different interventions. Eight studies were RCTs (Krafft et al., 2019; P. Lappalainen et al., 2023; R. Lappalainen et al., 2021; Levin, 2013; Levin et al., 2014, 2016, 2017; Rasanen et al., 2016), and two studies reported secondary analyses of previously conducted RCTs (Keinonen et al., 2021; Räsänen et al., 2020). The remaining study by Chen et al. (2022) was a pre-post study without a control condition.

To evaluate the quality and potential biases in the identified studies, the NHLBI quality assessment tools were used. These tools were applied to assess the risk of bias in controlled intervention studies (i.e., RCTs) and before-after (pre-post) studies with no control group, consisting of 14 and 12 items respectively. The assessment items encompass aspects of study design, randomization, blinding, statistical power, sample size,

and appropriateness of outcome measures. The results of the quality assessment are summarised in Table 2.

Most studies (n = 6) had similar group characteristics at baseline, high adherence and acceptable drop-out below 20%, and outcomes were assessed using valid and reliable measures in relation to the study's research question. However, some studies (Krafft J. et al., 2019; Lappalainen et al., 2023; Levin, 2013; Levin et al., 2016, 2017) had high attrition or poor adherence to intervention protocol, limiting the interpretation of the findings. Poorer quality studies were rated as such because of small samples sizes (which resulted in underpowered statistical analysis), high attrition, low adherence to the intervention and access to other interventions not being reported.

5.3. ACT intervention: content, length, delivery format and ACT processes

Six studies delivered the ACT interventions using the web and unguided self-help format, whilst five were guided. Three RCTs used a guided self-help approach, with the intervention being accessed either on the web or through an app (Räsänen et al., 2016; Lappalainen et al., 2021, 2023). One study, Krafft et al. (2019), used a mobile application to provide participants access to the ACT intervention and send notifications to participants mobile phones. The application featured two versions: a simple version that sent 5 daily notifications prompting participants to choose between 'toward move' or 'away move', and a complex version that included the addition of a daily check-in. The check-in required participants to evaluate their progress towards goals in four different areas (work/study, leisure/fun, self-care, and relationships), set goals in each domain, and rate living toward values.

The interventions ranged in length from 2 to 7-weeks long, with varying number of sessions or content to be covered. The shortest intervention (Chen et al., 2022) was conducted over a 2-week period and targeted all six subprocesses of psychological flexibility in six 1-h sessions. Levin et al. (2016) examined a three-week intervention based on acceptance and values, although included some secondary, optional resources to target mindfulness. Two studies targeted three ACT processes; acceptance, values, and mindfulness, over a 3-week (Levin, 2013) and 4-week period (Krafft et al., 2019). Levin et al. (2017) offered a six-session intervention for university students over a 4-week period, covering all ACT processes except self-as-context. Räsänen et al. (2016, 2020) investigated the use of a 7-week online ACT intervention, which included five modules aimed at each ACT process, with two in-person meetings with an ACT coach before accessing the online modules. Supplementary materials, such as multimedia sessions, emails, and online resources, were also used in some of the interventions to be completed with the timeframe (Levin, 2013, 2016).

Three studies delivered an online ACT intervention for adolescents, The Youth Compass (Lappalainen et al., 2021, 2023; Keinonen et al., 2021). The Youth Compass is a 5-week online guided self-help program which targets all six ACT processes. The program is accessed using various devices, including mobile, laptop, tablet or computer. Each module is structured the same; an introduction and three levels, with each level involving a variety of exercises according to the corresponding ACT processes. Exercises included short texts, pictures, comic strips, audio and video clips. Lappalainen et al. (2021) delivered the intervention in two formats: either brief written weekly feedback by ACT coaches via WhatsApp, or weekly written feedback with the addition of two face-to-face meetings with ACT coaches (iACTface), which involved a structured interview at the beginning and a discussion check-in half-way through the intervention. Likewise, Lappalainen et al. (2023) delivered the Youth Compass intervention and one condition had support from both an ACT-trained psychology university student and virtual coach, and the other condition with a virtual coach only (chatbot and SMS coaching). The student coaches had a 45-min video call with the purpose of assessing and understanding the situation of each participant, and a further 45-min video call two weeks later to encourage engagement, discuss values, values-based action and

Table 2
Quality Assessment summary, ranging from 'Good' to 'Poor'.

Authors	Q1. Design	Q2. Randomization	Q3. Concealment	Q4. Blinding (participants)	Q5. Blinding (assessors)	Q6. Baseline	Q7. Attrition	Q8. Differential attrition	Q9. Adherence	Q10. Other treatment	Q11. Measure quality	Q12. Power calculation	Q13. Apriori Analysis	Q14. ITT	Quality score	Rating
Krafft et al. (2019) - SONA sample	Yes	NR	Yes	NR	NR	Yes	No	CD	No	CD	Yes	No	Yes	Yes	6/14	Poor
Krafft et al. (2019) - help-seeking sample	Yes	NR	Yes	NR	NR	Yes	No	CD	No	CD	Yes	No	Yes	Yes	6/14	Poor
Levin (2013)	Yes	Yes	Yes	No	NR	Yes	No	Yes	No	CD	Yes	No	Yes	Yes	8/14	Poor
Lappalainen et al. (2023)	Yes	Yes	Yes	Yes	NR	NR	No	Yes	No	NR	Yes	No	Yes	Yes	8/14	Fair
Levin et al. (2014)	Yes	CD	CD	N	NR	Yes	Yes	Yes	Yes	NR	Yes	Yes	Yes	Yes	9/14	Fair
Levin et al. (2016)	Yes	Yes	Yes	Yes	NR	Yes	No	Yes	No	NR	Yes	No	Yes	Yes	9/14	Fair
Levin et al. (2017)	Yes	Yes	Yes	No	CD	Yes	Yes	Yes	No	No	Yes	NR	Yes	Yes	9/14	Fair
Räsänen et al. (2020)	Yes	Yes	Yes	CD	CD	Yes	NR	NR	NR	Yes	Yes	Yes	Yes	Yes	9/14	Fair
Keinonen et al. (2021)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	N/A	Yes	No	Yes	NR	10/14	Good
Lappalainen et al. (2021)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NR	Yes	NR	Yes	Yes	11/14	Good
Räsänen et al. (2016)	Yes	Yes	Yes	CD	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11/14	Good

Authors	Q1. Study question	Q2. Eligibility criteria	Q3.Study participants	Q4. Participant enrolment	Q5. Sample size	Q6. Intervention	Q7. Measurement quality	Q8. Blinding (assessors)	Q9. Follow-up rate	Q10. Statistical analysis	Q11. Multiple measurements	Q12. Group-level interventions	Quality score	Rating
Chen et al. (2022)[a]	Yes	Yes	Yes	Yes	No	CD	Yes	NR	Yes	Yes	No	N/A	7/12	Fair

Note. NR = Not reported; CD = cannot determine. https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.
[a] NHLBI Quality Assessment Tool for Before-After (Pre-Post) Studies With No Control Group.

cognitive defusion.

The ACT intervention studied by Räsänen et al. (2016; 2020) had the option of being adapted to a theme between stress, depression and anxiety, based on information gathered during the initial in-person meeting. However, this was optional and participants had the final decision, meaning the intervention was universal. The intervention was primarily text based and consisted of self-help text, ACT metaphors, well-being tasks and practical exercises based on each ACT process.

5.4. Outcome measures

Table 3 outlines the mental health, well-being and ACT process measures utilised by each study. Multiple mental health symptoms (e.g., depression, anxiety, stress) and well-being were measured in all studies except Keinonen et al. (2021), who used an outcome measure based only on depression.

All studies used at least one ACT process measure. Three studies used a single measure of one ACT process; Krafft et al. (2019) utilised the Valuing Questionnaire (VQ) to assess changes in values and value-directed behaviours, whilst two studies (Keinonen et al., 2021; Lappalainen et al., 2021) used the 8-item version of the Avoidance and Fusion Questionnaire for Youth (AFQ-Y8; Greco et al., 2008). The AFQ-Y8 is a self-report measure of psychological inflexibility, with elevated scores indicating higher levels of cognitive fusion and experiential avoidance. In five studies, the Acceptance and Action Questionnaire–II (AAQ-II; Bond et al., 2011) was used as a measure of acceptance, experiential avoidance, and psychological inflexibility, alongside other measures of ACT processes.

When examining the ACT process measures being used, there were five studies which evaluated all processes of interest (Lappalainen et al., 2023; Levin, 2013; Levin et al., 2014, 2016, 2017). In comparison, six studies only measured a subset of the target ACT processes. The Youth Compass (Lappalainen et al., 2021) assessed changes in experiential avoidance and cognitive fusion, rather than all ACT processes (AFQ-Y8). Krafft et al. (2019) focused on acceptance, mindfulness, and values but only tested values, whereas Chen et al. (2022) had intervention modules on all six processes, but only evaluated acceptance, experiential avoidance, and mindfulness.

5.5. Study results

The overall findings of the studies included in the analysis on mental health and ACT process measures were mixed (Tables 4 and 5 respectively). Specifically, five studies reported no significant differences in mental health and well-being of participants after the online ACT intervention compared to control conditions (Krafft et al., 2019 (SONA sample); Lappalainen et al., 2021, 2023; Levin et al., 2014, 2016).

Seven studies reported significant improvements in at least one mental health measure (Chen et al., 2022; Keinonen et al., 2021; Krafft et al., 2019; Levin, 2013; Levin et al., 2017; Rasanen et al., 2016; Räsänen et al., 2020). Five of these studies found improvements between pre and post-intervention (Chen et al., 2022; Keinonen et al., 2021; Krafft et al., 2019; Levin et al., 2017; Rasanen et al., 2016). Two studies found significant improvements in favour of the ACT intervention groups (Rasanen et al., 2016; Räsänen et al., 2020). However, two of these studies were rated as poor quality (Krafft et al., 2019; Levin, 2013) due to methodological issues including inadequate sample sizes, high dropout rates, and poor adherence to the intervention, limiting the interpretation of the significant results.

The impact of ACT interventions on process measures was found to be variable in the studies reviewed. With the exception of five studies (Chen et al., 2022; Levin et al., 2014, 2017; Räsänen et al., 2016, 2020), the remaining studies found no significant differences on ACT processes measures between treatment and control groups when examining the whole sample post-treatment. Some studies ($n = 4$) found significant changes in at least one ACT process measure compared to controls in different sub-populations, such as those who adhered to treatment protocol (e.g., completed three of five session; Lappalainen et al., 2023), or those with elevated scores on measures of mental health and/or well-being (Keinonen et al., 2021; Levin et al., 2014, 2017).

5.5.1. Mental health and well-being

Nine studies had at least one significant result within the ACT treatment group for a measure of mental health or well-being (Chen et al., 2022; Keinonen et al., 2021; Krafft et al., 2019; Lappalainen et al., 2016, 2017, 2021; Rasanen et al., 2016, 2020), and significant within-group effect sizes (d) for the ACT intervention conditions ranged from small to large (0.15–1.26).

The RCT comparing a prototype ACT intervention to a healthy living website (Levin, 2013) found no significant differences between the two conditions. In fact, participants in the healthy living condition had significantly lower scores on depression and anxiety ($p = 0.005$, $d = 0.31$) and stress ($p = 0.043$, $d = 0.34$) at three months follow-up compared to the ACT condition. However, this study was rated poor

Table 3

Summary of outcome measures used across studies.

Author	Mental Health/Well-being Outcome Measure(s)	ACT process measure(s)
Chen et al. (2022)	DASS-21; SWEMWBS-7	AAQ-II; MAAS
Keinonen et al. (2021)	DEPS	AFQ-Y8
Krafft et al. (2019) - SONA sample	DASS-21; MHC-SF	VQ
Krafft et al. (2019) - help-seeking sample		
Lappalainen et al. (2021)	DEPS; SWLS	AFQ-Y8
Lappalainen et al. (2023)	STAI; DEPS	CompACT; SCS-SF
Levin (2013)	DASS; MHC-SF	AFQ-Y; PVQ (Relationship; Education Subscales); FFMQ (Acting with Awareness; Non-reactivity subscales)
Levin et al. (2014)	DASS-21	AAQ-II; PVQ
Levin et al. (2016)	DASS; MHC-SF	AFQ-Y; PVQ (Relationship; Education Subscales); FFMQ
Levin et al. (2017)	CCAPS-34; MHC-SF	AAQ-II; CFQ; VQ; PHLMS
Räsänen et al. (2016)	MHC-SF; PSS-10; BDI-II; Finnish Descriptive Visual Rating Scale (Life Satisfaction and self-esteem subscales)	AAQ-II; FFMQ; OLQ-13
Räsänen et al. (2020)	MHC-SF; PSS-10; BDI-II	AAQ-II; FFMQ; ATQ; SOC-13 (Meaningfulness subscale)

Note. AAQ-II = Acceptance and Action Questionnaire–II; AFQ-Y = Avoidance and Fusion Questionnaire for Youth; ATQ = Automatic Thoughts Questionnaire; BDI-II = Beck Depression Inventory-II; CCAPS-34 = Counselling Center Assessment of Psychological Symptoms; CFQ = Cognitive Fusion Questionnaire; CompACT = Comprehensive Assessment of Acceptance and Commitment Therapy processes; DASS/DASS-21 = Depression, Anxiety and Stress Scale; DEPS = Depressive Scale; FFMQ = Five Facet Mindfulness Questionnaire; MAAS = Mindfulness Attention Awareness Scale; MHC-SF = Mental Health Continuum Short Form; OLQ-13 = Orientation to Life Questionnaire; PHLMS = Philadelphia Mindfulness Scale; PSS-10 = Perceived Stress Scale; PVQ = Personal Values Questionnaire; SOC-13 = Sense of Coherence Scale; VQ = Valuing Questionnaire.

Table 4
Summary of mental health and well-being outcomes of studies.

Author and condition	Variable	Measure	P	Effect Sizes
Chen et al. (2022)	Well-being	SWEMWBS-7	0.003	*r* = 0.40
Intervention only	Depression	DASS-21	<0.001	*r* = 0.50
	Anxiety	DASS-21	0.002	*r* = 0.40
	Stress	DASS-21	<0.001	*r* = 0.50
Keinonen et al. (2021)	Depression	DEPS	High <0.001**	ES not reported
High vs stable vs low EA			Stable NS	
			Low <0.001**	
Kraft et al. (2019) - SONA sample	Depression	DASS-21	NS	
Simple app vs complex app vs WL	Anxiety	DASS-21	NS	
	Stress	DASS-21	NS	
	Well-being	MHC-SF	NS	
Kraft et al. (2019) - help-seeking sample	Depression	DASS-21	0.07	
Simple app vs complex app vs WL	Anxiety	DASS-21	0.04**	WG (Complex) *d* = 1.26
	Stress	DASS-21	0.07	
	Well-being	MHC-SF	NS	
Lappalainen et al. (2021) *iACTface vs I iACT vs control*	Depression	DEPS	NS (ITT)	BG iACTface vs control *d* = 0.20
			0.02** (Per-protocol)	BG iACT vs control *d* = 0.20*
				WG pre-post iACTface *d* = 0.15
				WG pre-post iACT *d* = 0.16**
	Life Satisfaction	Satisfaction with Life Scale	NS (ITT)	BG iACTface vs control NS
			0.03* (Per-protocol)	BG iACT vs control *d* = 0.25
				WG pre-post iACTface *d* = 0.19
				WG pre-post iACT *d* = 0.30
Lappalainen et al. (2023) *iACT student + virtual coach vs iACT virtual only vs WL*	Depression	DEPS	NS (ITT)	
			NS (Per-protocol)	
	Anxiety	STAI	NS (ITT)	BG iACT (combined) vs control *d* = 0.30
			0.04* (Per-protocol)	WG iACT (combined) vs control *d* = 0.05
Levin (2013) *iACT vs Active control*	Depression	DASS	NS (BG ITT)	
			NS (BG subgroup)	
	Anxiety	DASS	0.03*(BG ITT)	BG pre-3 month f/u *d* = 0.26
			NS (BG subgroup)	
	Stress	DASS	0.006* (BG ITT)	BG pre-3 month f/u *d* = 0.31
			NS (BG Subgroup)	
	Well-being	MHC-SF	0.006* (BG ITT)	BG pre-post *d* = 0.31
			NS (BG Subgroup)	Pre-1 month f/u *d* = 0.28
Levin et al. (2014) *iACT vs WL*	Depression	DASS	NS (BG ITT)	BG *d* = 0.91
			0.018* (BG subgroup)	WG pre-f/u 0.97
			0.004*	
	Anxiety	DASS	NS (ITT)	BG *d* = 0.81
			0.033* (BG subgroup)	WG pre-f/u 0.97
			0.003*	
	Stress	DASS	NS (ITT)	WG pre-f/u 0.81
			NS (BG subgroup)	
			<0.001**	
Levin et al. (2016) *iACT vs education website*	Depression	DASS	NS	
	Anxiety	DASS	NS	
	Stress	DASS	NS	
	Well-being	MHC-SF	NS	
Levin et al. (2017) *iACT vs WL*	Distress	CCAPS-34	0.013*	BG *d* = 0.66
			0.005*	WG *d* = 0.52
	Social Anxiety	CCAPS-34	0.004*	BG *d* = 0.78
			<0.001**	WG *d* = 0.69
	General Anxiety	CCAPS-34	NS (BG)	WG *d* = 0.39
			0.031*	
	Depression	CCAPS-34	NS (BG)	WG *d* = 0.40
			0.024*	
	Well-being	MHC-SF	0.027*	BG *d* = 0.58
			<0.001**	WG *d* = 0.60
Räsänen et al. (2016) *iACT vs WL*	Depression	DASS-21	0.07 (BG)	WG pre-post *d* = 1.10
			<0.001 **	WG pre-f/u *d* = 0.64
	Anxiety	DASS-21	0.415 (BG)	WG pre-post *d* = 0.42
			0.009 **	WG pre-f/u *d* = 0.60
	Stress	DASS-21	0.416 (BG)	WG pre-post *d* = 0.56
			0.004 **	WG pre-f/u *d* = 0.54
	Depression	BDI-II	0.003 *	BG pre-post *d* = 0.69
			<0.001**	WG pre-post *d* = 1.12
				WG pre-f/u *d* = 0.87
	Stress	PSS-10	0.028*	BG pre-post *d* = 0.54
			<0.001**	WG pre-post *d* = 0.76
				WG pre-f/u *d* = 0.69

Table 4 (*continued*)

Author and condition	Variable	Measure	P	Effect Sizes
	Life satisfaction	VRS	<0.001** <0.001**	BG pre-post $d = 0.65$ WG pre-post $d = 0.82$ WG pre-f/u $d = 0.63$
	Self-esteem	VRS	<0.001** <0.001**	BG pre-post $d = 0.63$ WG pre-post $d = 0.72$ WG pre-f/u $d = 0.66$
	Well-being	MHC-SF	0.006* <0.001 **	BG $d = 0.46$ WG pre-post $d = 0.61$ WG pre-f/u $d = 0.65$
Räsänen et al. (2020) *iACT vs WL*	Depression	BDI-II	0.003*	BG $d = 0.69$
	Stress	PSS-10	0.028*	BG $d = 0.54$
	Well-being	MHC-SF	0.008*	BG $d = 0.46$

Note. *p < 0.05; **p < 0.001.

quality as the ACT intervention group had poor adherence to the protocol and high attrition. This meant statistical analysis was underpowered and conclusions are difficult to make. Similarly, in one study (Levin et al., 2016), those in the ACT intervention condition were more likely than the control condition to continue experiencing anxiety and depression symptoms at both post-intervention (p = 0.05) and 3-month follow-up (p = 0.095). Again, low adherence to the ACT intervention may explain these results.

There were three studies that found no significant changes in mental health and/or well-being measures in the intent-to-treat (ITT) samples, but found significant results when examining subsamples. Keinonen et al. (2021) found a significant reduction of depressive symptoms in a subsample of participants who had high experiential avoidance at baseline. Participants who completed a minimum of three sessions of The Youth Compass intervention (Lappalainen et al., 2021) had significant decreases in depression in both ACT groups, with (p = 0.021) and without (p = 0.017) face-to-face contact. There was also a significant positive difference between scores on the 'Satisfaction with Life' measure in the iACT group compared to the controls when analysed per-protocol (p = 0.034). Significant differences in those who adhered to protocol usage was also replicated by Lappalainen et al. (2023), although only anxiety improved (p = 0.042) with a small effective size (d = 0.05) in the intervention group. Changes in depression post-intervention were not significant (p = 0.224, d = 0.10).

Although all studies applied the intervention universally, two studies found differences in outcomes for subsamples who were more distressed compared to those who were not. Levin et al. (2014) reported those at least minimally distressed showed significant improved after the ACT intervention on symptoms of depression (p = 0.018, d = 0.91) and anxiety (p = 0.033, d = 0.81), but not on the stress subscale of the DASS-21. Likewise, when both the help-seeking and SONA credit sample from Krafft et al. (2019) were combined, those scoring above the median on the DASS ("higher distress") had significant improvements in overall distress (p = 0.03), anxiety (p < 0.05) and stress (p = 0.01) in the ACT intervention groups. However, there was no difference between the type of app intervention (simple vs complex).

5.5.2. ACT processes

Significant post-intervention differences in ACT process measures were found in three studies. The ACT intervention used by Chen et al. (2022) led to a significant improvement in the AAQ-II (p = 0.002; r = 0.4) and Mindfulness Attention Awareness Scale (MAAS; p = 0.003; r = 0.4). The secondary analysis of the iACT intervention (Keinonen et al., 2021) concluded the intervention was effective for a subgroup of individuals who had higher levels of experiential avoidance and depressive symptoms at baseline, and the intervention resulted in bigger changes (p < 0.01). Finally, Räsänen et al. (2016) found their 7-week ACT intervention resulted in significant improvements on both pre-post and pre-follow-up for the iACT group on all ACT process measures (p < 0.001), apart from the Orientation to Life Questionnaire (OLQ-13) at 3-month follow-up. Effect sizes were moderate (0.52–0.65).

Across the other studies (n = 8), there was variability in the significance of changes in ACT process measures. Some studies found changes in certain values subscales (Krafft et al., 2019; Levin, 2013; Levin et al., 2017) whilst two had significant changes in mindfulness measures and subscales (Räsänen et al., 2020; Levin et al., 2014). Lappalainen et al. (2023) found the iACT intervention had significant changes in those who adhered to treatment protocol, although this was limited to the valued action subscale of the CompACT (p = 0.02; Francis et al., 2016) and the Self-Compassion Scale–Short Form (p = 0.03, Raes et al., 2011).

Studies with mindfulness as an ACT process outcomes utilised the FFMQ (Räsänen et al., 2016; 2022; Levin et al., 2016) or the MAAS (Chen et al., 2022). The FFMQ and MAAS yielded significant findings in the ACT groups, both in between-group comparisons and within the iACT group at pre-post and pre-follow-up time points. However, examining changes of different subscales of the FFMQ, Räsänen et al. (2016) reported significant improvements post-intervention for the observing and non-reactivity subscales, but not for the describing and acting with awareness subscales.

No studies found significant between-group differences on psychological inflexibility measures (AAQ-II and AFQ-Y/Y-8) post interaction or at follow-up. Two studies found significant within-group changes in the intervention group (Levin, 2013; Räsänen et al., 2016). Levin (2013) found significant reduction in AFQ-Y8 scores at 3-month follow-up in the iACT and control conditions, however the control condition had greater effect sizes. The study was also rated as poor quality.

Although there were no significant changes in ACT processes between pre- and post-measurement in the iACT group, Levin et al. (2014) provided support for the model of Psychological Flexibility. The study found scores on the AFQ-Y correlated both pre-post and pre-follow-up (pre-fu) with significant reduction, and small to moderate effect, in Depression (d = 0.49 (pre-post); d = 0.26 (pre-fu)); Anxiety (d = 0.38; d = 0.18) and Stress (d = 0.56; d = 0.25).

6. Discussion

The objective of this systematic review was to evaluate the effectiveness of digital self-help ACT interventions for universal use in young people without specific mental health difficulties. In total, there were 11 studies which were examined, describing universal ACT interventions of various length and targeting different ACT processes. The data suggests that some digitally delivered ACT self-help interventions were effective in reducing depression symptoms and psychological distress, as evidenced by significant pre-post intervention changes and large effect sizes (Chen et al., 2022; Levin et al., 2017; Räsänen et al., 2016). However, the effectiveness of the interventions on psychological flexibility was more mixed.

There was also evidence that the outcomes on mental health, well-being and psychological flexibility differed depending on adherence to the intervention, contingent on whether the analyses were on intention-to-treat or per-protocol samples, meaning the whole randomized sample or only those who followed the treatment protocol respectively (Shah,

Table 5
Summary of ACT process measures outcomes for studies.

Author and condition	Variable	Measure	P	Effect Sizes
Chen et al. (2022)	Psychological Inflexibility	AAQ-II	0.002*	$r = 0.40$
Intervention only	Mindfulness	MAAS	0.003*	$r = 0.40$
Keinonen et al. (2021)	Experiential Avoidance and Fusion	AFQY-8	High <0.001**	ES not reported
High vs stable vs low EA			Stable NS	
			Low NS	
Kraft et al. (2019) - SONA sample	Valued Action	VQ	NS	
Simple vs complex vs WL				
Kraft et al. (2019) - help-seeking sample	Valued Action	VQ	0.03* (Progress subscale; Complex and WL)	ES not reported
Simple vs app vs WL			0.04* (WG; WL)	$d = 0.49$
			NS (WG; Intervention groups)	
Lappalainen et al. (2021) iACTface vs iACT vs control	Experiential Avoidance and Fusion	AFQY-8	NS (ITT)	
			NS (Per-protocol)	
Lappalainen et al. (2023) iACT student + virtual coach vs iACT virtual only vs WL	Psychological Flexibility	CompACT (Total)	NS (BG ITT)	WG iACT (combined) $d = 0.08$
		VA, OE, BA Subscales	NS (BG ITT)	
		CompACT (Total)	NS (Per-protocol)	
		OE and BA Subscales	NS (Per-protocol)	
		VA Subscale	0.02* (Per-protocol)	
	Self-Compassion	SCS-SF	NS (ITT)	WG iACT (combined) $d = 0.12$
			0.03* (Per-protocol)	
Levin (2013) iACT vs Active control	Experiential Avoidance and Fusion	AFQY-8	NS (BG ITT)	pre-3 month f/u (iACT) $d = 0.39$
			<0.001** (WG ITT)	pre-3 month f/u (control) $d = 0.59$
			NS (BG subgroup)	pre-3 month f/u (iACT) $d = 0.55$
			<0.001** (WG subgroup)	pre-3 month f/u (control) $d = 0.58$
	Values	PVQ: Relationship subscale	NS (BG ITT)	Pre-1 month f/u (iACT) $d = -0.29$
		PVQ: Education subscale	NS (BG or WG Subgroup)	
			NS (WG subgroup)	
			NS (BG subgroup)	
			0.039** (Subgroup)	
	Mindfulness	FFMQ: Acting with awareness	NS (BG or WG subgroup)	Pre-post (iACT) $d = 0.37$ pre-1
		FFMQ: Non-reactivity	NS (BG subgroup)	month f/u (iACT) $d = 0.46$
			0.006** (WG Subgroup)	pre-3 month f/u (iACT) $d = 0.37$
			0.001** (WG Subgroup)	
			0.008** (WG Subgroup)	
Levin et al. (2014) iACT vs WL	Psychological Inflexibility	AAQ-II	NS (BG ITT or subgroup)	
			NS (WG)	
	Values	PVQ: Relationship (Success)	NS (BG)	Pre-f/u (iACT) $d = 0.78$
		PVQ: Relationship (Motivation)	0.043*	pre-post (iACT) $d = 0.54$
		PVQ: Education (Success)	NS (BG or WG)	pre- f/u $d = 0.92$
		PVQ: Education (Motivation)	0.024*	pre-post (iACT) $d = 0.51$
			0.033*	
			0.035*	
			NS	
Levin et al. (2016) iACT vs education website	Experiential Avoidance and Fusion	AFQY-8	NS (BG or WG ITT)	
	Values	PVQ: Relationship	NS (BG or WG ITT)	
		PVQ: Education	NS (BG or WG ITT)	
	Mindfulness	FFMQ	NS (BG or WG ITT)	
Levin et al. (2017) iACT vs WL	Psychological Inflexibility	AAQ-II	NS (BG or WG)	
	Cognitive Fusion	CFQ	NS (BG or WG)	
	Values	VQ: Progress	NS (BG)	BG $d = 0.65$
		VQ: Obstruction	0.012*	WG pre-post (iACT) $d = 0.82$
			<0.001**	
	Mindfulness	PHLMS: Acceptance	0.038*	BG $d = 0.53$
		PHLMS: Awareness	<0.001**	WG pre-post (iACT) $d = 0.62$
			NS (BG or WG)	
Räsänen et al. (2016) iACT vs WL	Psychological Inflexibility	AAQ-II	NS (BG)	WG pre-post (iACT) $d = 0.51$
			<0.001**	WG pre-post (control) $d = 0.40$
				WG pre-f/u (iACT) $d = 0.63$
	Mindfulness	FFMQ	0.0075*	BG $d = 0.49$
			<0.001**	WG pre-post (iACT) $d = 0.62$
				WG pre-f/u (iACT) $d = 0.62$
	Sense of coherence	OLQ-13	0.005*	BG $d = 0.53$
			<0.001**	WG pre-post (iACT) $d = 0.52$
Räsänen et al. (2020) iACT vs WL	Psychological Inflexibility	AAQ-II	NS (BG or WG)	
	Mindfulness	FFMQ: Observing	0.00418*	BG $d = 0.27$
		FFMQ: Describing	0.057*	BG $d = 0.23$
		FFMQ: Acting with awareness	NS	BG $d = 0.58$
		FFMQ: Non-judging	NS	
		FFMQ: Non-reactivity	0.027*	

Table 5 (*continued*)

Author and condition	Variable	Measure	P	Effect Sizes
	Automatic Negative Thoughts - Cognitive defusion)	ATQ	NS	
	Sense of Coherence	SOC-13: Meaningfulness	0.012*	BG $d = 0.43$

Note. *p < 0.05; **p < 0.001.

2011).

In terms of quality appraisal of included studies, higher-quality studies tended to report more consistent findings across various outcome measures, whilst lower-quality studies had more mixed or inconclusive results. Levin et al. (2013) was rated 'poor' and found no improvement with the ACT-CL program compared to control in mental health or ACT processes. Similarly, Kraft et al. (2019), also rated 'poor', had inconclusive results. No significant improvements were noted in the SONA credit sample, while only the participants in the help-seeking sample using the complex version of the app showed improvements on measures of mood, anxiety, and stress. The ACT intervention did not have an impact on the values measure in any sample or app condition, however there was a significant improvement in the waitlist condition. In studies rated 'good' (Keinonen et al., 2021; Lappalainen et al., 2021; Räsänen et al., 2020), more positive outcomes were observed for the ACT intervention compared to controls. Keinonen et al. (2021) found decreases in depression and experiential avoidance post-ACT intervention for those with higher depressive symptoms at baseline. Lappalainen et al. (2021) reported small effect sizes for the ACT intervention in reducing depressive symptoms and enhancing life satisfaction, aligning with meta-analysis findings indicating that higher-quality ACT studies may result in lower effect sizes (A-Tjak et al., 2015).

The effectiveness of digitally delivered ACT interventions were evaluated by reviewing the outcomes of ACT process measures across several studies, consistent with ACT theory. The commonly used AAQ/AAQ-II process measure (Chen et al., 2022; Levin et al., 2014, 2017; Rasanen et al., 2016; Räsänen et al., 2020) showed non-significant results for the majority of ACT intervention groups. Similarly, in studies measuring experiential avoidance using the AFQ-Y, the intervention groups did not show significant improvements compared to the control group (Lappalainen et al., 2021; Levin et al., 2016). One study (Lappalainen et al., 2023) utilised the CompACT as an ACT process measure and found no significant results for the intervention group. This may be due to participants in this study being up to 16-years-old, and the CompACT has not been validated in those under 18. These findings suggest that digitally delivered ACT interventions were largely ineffective in improving psychological flexibility and highlight the importance of using valid and reliable measures appropriate for the study population.

The limited significant findings may be attributed to a ceiling effect in some studies, meaning that participants already had high psychological flexibility scores on measures before the ACT intervention. For instance, participants in Lappalainen et al.'s (2021) iACTface and iACT conditions had mean pre-intervention scores on the AFQY-8 (M = 8.83 and M = 9.83 respectively) consistent with those of the validation sample of a similar year group (M = 8.06). Similarly, participants in the ACT intervention condition (Levin et al., 2016) had mean pre-intervention scores on the AFQ-Y within the standard deviation range of the AFQ-Y validation non-clinical sample (Greco et al., 2008). Future research should explore the presence of ceiling effects when evaluating ACT interventions in a universal sample. Additionally, exploring alternative study designs such as longitudinal studies could offer understandings about the long-term preventive impact of these interventions.

The studies reviewed varied considerably in duration; from 2 to 7 weeks. It is difficult to make conclusions about the appropriate length of digitally delivered ACT interventions. For example, Chen et al. (2022)

was a 2-week intervention and found significant improvements in outcomes of depression, anxiety, stress, well-being and increases on psychological flexibility measures. Similarly, the 7-week interventions investigated by Räsänen et al. (2016; 2020) were effective on outcomes of mental health and psychological flexibility. In contrast, there were no significant improvements in mental health and well-being measures in most studies where the intervention length was 3- (Levin et al., 2014, 2016), 4- (Krafft er al., 2019) and 5-weeks (Lappalainen et al., 2021, 2023).

The findings of this review about intervention length differs from some other literature. Harrer et al. (2019) conducted a meta-analysis of online-delivered mental health interventions for students. They found interventions of 4 to 8-weeks had optimal outcomes. However, the review by Harrer et al. (2019) included both universal and selective interventions and grouped CBT and third-wave interventions, making it difficult to compare findings. In contrast, a meta-analysis of online guided self-help interventions for depression in university students (Ma et al., 2021) found no significant difference for length of intervention, although interventions of moderate length (4- to 8-weeks) had the highest effect sizes (g = 0.52) compared to shorter (g = 0.29) and longer (g = 0.25) interventions. Given the variable findings between the current and other reviews, further research is needed to determine the most effective length of digitally delivered interventions, particularly through sub analyses by intervention type and modality.

Since the length of intervention does not appear to be related to the outcome, a more helpful approach might be to examine the content of the ACT interventions and the psychological flexibility processes that were designed to be targeted. Although the ACT program by Chen et al. (2022) was delivered over 2-weeks, the content addressed all six ACT processes. Among the seven ACT interventions that aimed to address at least three processes (excluding studies with poor quality ratings; Levin, 2013; Krafft et al., 2019), a majority found significant outcomes for the ACT conditions on both mental health and well-being, as well as on ACT process measures (Chen et al., 2022; Keinonen et al., 2021; Levin et al., 2017; Rasanen et al., 2016; Räsänen et al., 2020). Therefore, it is possible that ACT interventions which cover a broader range of processes are likely to be more effective than those that target fewer processes, regardless of the intervention length.

Other research suggests that the effectiveness of ACT interventions depends on the specific psychological flexibility subprocesses being targeted. An RCT of an online ACT intervention for distressed students found that the full ACT intervention, engaged (values and committed action), and open modules (acceptance, cognitive defusion) had significant moderate to large effects on mental health outcomes, but the open group was less effective compared to the engaged and full group. The engaged and open group had weaker changes on psychological flexibility process measures compared to the full ACT intervention. In another study (Villatte et al., 2016) on ACT modules for adults seeking mental health support, interventions focusing on acceptance and cognitive defusion had greater effects on measures of symptom severity, cognitive defusion, and acceptance. Targeting values showed superior effects on life quality and values-based activation. These findings highlight the variation in mental health and psychological flexibility outcomes based on specific ACT components. The current review supports these findings, suggesting universal self-help interventions targeting at least three psychological flexibility processes are most effective.

To better enable future research to evaluate the effects different ACT components have on outcomes, there is a need for comprehensive measures of ACT. For instance, using measures such as the CompACT (Francis et al., 2016) provides a complete assessment of all ACT processes and allows analysis to explore changes in total psychological flexibility scores, as well as individual subscale scores. The benefit of using a measure which allows for sub-analyses was demonstrated by Lappalainen et al. (2023), who found their intervention was significant for valued action, but not overall psychological flexibility, behavioural awareness (self-as-context, mindfulness) or openness to experience (acceptance, defusion). Being able to distinguish between these sub-processes will be advantageous for future research so that the content of digital ACT interventions can be adapted to address all areas equally.

This review found that some studies did not select appropriate measures to assess the target processes of the intervention, which limited the ability to draw conclusions about intervention effectiveness. Krafft et al. (2019) only used a values measure, despite their intervention targeting acceptance, values, and mindfulness. Keinonen et al. (2021) and Lappalainen et al. (2021) used the AFQ-Y, a measure of experiential avoidance and cognitive fusion, despite their intervention being designed to improve all six subprocesses of psychological flexibility. Similar to the limitations of the measures used by studies in this review, Fang and Ding (2020) noted variability and inconsistency in psychological flexibility measures used when reviewing broader CYP ACT interventions which made comparisons across studies challenging. Without selecting suitable measures related to the intervention's targets, the conclusions of these studies are limited because it is possible the interventions were effective, but not adequately assessed.

Conclusions regarding the effectiveness of universal digital self-help ACT interventions on psychological flexibility may also be influenced by the quality of outcome measures used. Studies with participants over 18 years used the AAQ-II measure, which has been criticised for its poor discriminant validity from measures of distress, and as it may measure psychological inflexibility rather than psychological flexibility (Landi et al., 2021; Wolgast, 2014). The AFQ-Y or AFQ-Y8 measure is more appropriate for adolescents (Livheim et al., 2016) and was used in four studies (Keinonen et al., 2021; Lappalainen et al., 2021; Levin, 2013; Levin et al., 2016). However, these measures are unidimensional and measures psychological inflexibility instead of flexibility. Psychological inflexibility has been defined as rigid patterns of thinking, feeling, and behaving in response to adverse internal experiences, which prevent individuals from adapting to challenging situations and following personal values (Kashdan et al., 2020). In research developing a multidimensional measure of psychological flexibility, Rolffs et al. (2018) concluded psychological flexibility and inflexibility correspond to 12 unique processes which change independently of one another. These findings support the idea flexibility and inflexibility are distinct from one another, and not necessarily opposite.

A theme to emerge from this review was that subsamples, such as those seeking help (Krafft et al., 2019) or with higher levels of distress (Levin et al., 2014), may benefit more from digital ACT self-help interventions than others. However, it's important to note the study by Krafft et al. (2019) had reduced quality due to methodological design, and results should be interpreted with caution. It may be that those actively seeking help are more distressed therefore more likely to engage with the intervention. This is supported by research which suggests individuals experiencing higher levels of distress are more likely to use online interventions compared to those with lower levels of distress (Ryan et al., 2010). The subgroup findings are consistent with other reviews of digital interventions for CYP, which have found them to be effective compared to waitlist controls for individuals with specific mental health needs who seek support (Buttazzoni et al., 2021; Zhou et al., 2021).

Another consideration regarding improved outcomes for those reporting higher levels of distress is that over time, scores on the outcome measures would naturally improve. However, this is unlikely considering Levin et al. (2014) conducted a subgroup analysis on participants with higher distress and found that there was greater reduction in people receiving the treatment than people in the control group. This implies that the ACT intervention led to improvements in outcome measures, rather than just a regression to the mean effect that would have affected both groups equally.

Another finding of this review was that some of the studies had low adherence to the intervention protocol, similar to some other reviews of digital interventions. Clarke et al. (2015) conducted a systematic review of universal online mental health interventions and found adherence to interventions was low in multiple studies, with drop-out rates ranging from 7% to 86%. As adherence rates to online interventions is related to effectiveness (Hamalainen et al., 2022)Hamalainen et al., 2022, it is necessary for studies to consider methods of increasing adherence to interventions to maximise the benefits.

Whether an ACT intervention is guided, and the format of this, can impact adherence and effectiveness. Peer-support coaching has been found to increase adherence and effectiveness in an ACT self-help intervention (Klimczak et al., 2023). In this review, seven studies were guided using virtual (SMS and chatbot) and/or student coaches. The intervention by Lapplainen et al. (2023) included both person and virtual coaching and found the group that had access to both types of coaching had higher adherence outcomes compared to the group who had virtual coaching only. However, the other studies which were guided (Keinonen et al., 2021; Lappalainen et al., 2021; Rasanen et al., 2016; Räsänen et al., 2020) were only compared against waitlist control conditions, and it is therefore difficult to conclude from this review whether guided interventions increased adherence and outcomes compared to unguided.

6.1. Strengths and limitations

A limitation of this review is that there was significant heterogeneity between the reviewed studies in terms of the ACT intervention content, target processes and outcome measures used to evaluate the interventions. This variability makes drawing overall conclusions challenging, as there are multiple factors which differ between studies. In addition, there was variability in outcome measures, the content of the ACT intervention and whether the intervention was guided or unguided. Future research regarding digitally delivered ACT self-help interventions for young people would benefit from having consistency in the measures of psychological flexibility subprocesses to improve methodological quality and enable comparisons across studies.

The scope of this review was also limited by the broad age range of participants; 10 to 25-years-old (consistent with the WHO definition of adolescence). There is currently limited research about how psychological flexibility changes throughout adolescence and into adulthood. This makes it challenging to compare across studies due to the differences in developmental stage of participants and how this may influence psychological flexibility skills and delivery of ACT interventions. For example, there is research to suggest executive functioning skills which develop during adolescence (e.g., self-control, self-regulation) provide the foundation for psychological flexibility (Doorley et al., 2020), and cognitive fusion and experiential avoidance can increase during mid-adolescence, whilst acceptance may decrease (Cobos-Sánchez et al., 2022).

Furthermore, comparison across studies was hindered by the age range as broader measures were used for both young people and adults. Although this review included studies with participants above 10 years old, the youngest age of participants was 15 years old, and only three studies specifically examined digital ACT interventions for adolescents under 18-years-old. The generalisability of conclusions from this review to adolescents therefore needs to be considered cautiously, and further studies in this population are required.

One strength of this study was the quality appraisal tool used. The NHLBI quality appraisal tool allowed for comparisons across RCT and

pre-post studies as the quality rating categories (i.e., 'Good', 'Fair' and 'Poor') were the same on both tools. Whilst it is recognised quality assessment are subjective and introduce a risk of bias (Ma et al., 2020), the NHLBI have detailed guidance to support in standardisation of using the tool. Also, the risk of bias was minimised by having 45% of papers inter-rated for quality by an independent reviewer.

This review is the first, to the authors knowledge, to examine the effectiveness of universal digitally delivered self-help ACT interventions for young people. As mental health services for young people face growing demand (Crenna-Jennings & Hutchinson, 2020), alternative support methods are needed to increase access. It is therefore important that the evidence-base is evaluated to determine whether universal digitally delivered self-help interventions are an effective alternative which could be implemented into routine practice (Taylor et al., 2020). The findings of this review indicate the evidence for the efficacy of universal online self-help ACT interventions for young people is inconclusive, in part due to the methodological limitations of existing studies.

7. Conclusion

The present review aimed to determine the effectiveness of digitally delivered self-help ACT interventions for young people. Digital ACT interventions were found to have inconsistent outcomes for both mental health and psychological flexibility subprocess measures. Conclusions are limited by the quality and comprehensibility of outcome measures adopted. This review also highlighted the variability in the content of digitally delivered ACT interventions. More research is needed to evaluate which components of ACT interventions contribute to changes in overall psychological flexibility, mental health symptoms and overall well-being.

Based on this systematic review, several recommendations emerge for future research on universal ACT interventions for young people. Improving consistency across ACT research through standardised measurement of psychological flexibility processes would enhance understanding of intervention outcomes and facilitate comparisons between studies. Additionally, addressing heterogeneity in universal ACT interventions, including content, duration, and delivery method, is essential for advancing research in this field. Finally, alternative study designs, such as longitudinal studies, should be considered to reduce ceiling effects and allow understanding of the possible preventive or protective effect of universal ACT interventions.

CRediT authorship contribution statement

Alex Morey: Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Victoria Samuel:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Marc Williams:** Writing – review & editing, Writing – original draft, Supervision.

Declaration of competing interest

None

Data availability

Data will be made available on request.

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