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Co-producing an interdisciplinary, preventative mental health intervention: development of the building resilience through socioemotional training (ReSET) programme

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ABSTRACT

Objective: Adolescence is a developmental period of increased susceptibility to mental health problems. In response to rising rates of psychopathology in this age group, there have been calls to develop new or more effective preventative interventions that might avert the onset or worsening of mental health problems. In this paper, we detail the development process of a new indicated, transdiagnostic intervention for adolescents: Building resilience through socioemotional training (ReSET).

Method: The intervention was co-produced with adolescents and included a pilot study. We highlight how feedback from young people and school mental health practitioners significantly altered the structure of the intervention to maximise the programme's acceptability to adolescents. Further, we highlight unique challenges that arose through integrating the distinct disciplines of psychotherapy and cognitive neuroscience.

Results: After outlining the development process, we summarise the resulting intervention that targets transdiagnostic mechanisms implicated in a range of psychopathologies. The intervention involves a unique combination of techniques derived from psychotherapy and cognitive-emotional training adopted from cognitive neuroscience.

Discussion: We discuss how ReSET has a unique opportunity to prevent mental health problems in adolescence and outline the full-scale randomised controlled trial, now underway.

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Introduction

Adolescence is a developmental period during which most mental health problems emerge (McGrath et al., 2023; Solmi et al., 2022). Worryingly, the global rate of mental health problems during adolescence has increased in recent years, a trend that appears to be continuing (Dykxhoorn et al., 2023). In response, there has been increased focus from policymakers, academics, and practitioners on the need for interventions to reduce the burden of psychopathology in this age group (Campisi et al., 2022; World Health Organization, 2021). The present paper will outline the development of a novel preventative intervention for adolescents: Building resilience through socioemotional training (the ReSET programme). ReSET was designed to include a unique combination of techniques from existing evidence-based psychotherapies and established training techniques from cognitive neuroscience. Developing a novel 'hybrid' intervention like this presents interesting challenges, because it relies on techniques from very different disciplines. Furthermore, developing a novel intervention to be delivered in schools also requires careful consultation with and direct involvement of young people and school staff, such as teachers. This paper outlines the ReSET

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intervention and describes the steps taken to ensure it is cohesive, acceptable, meaningful and helpful for young people.

The need for preventative, indicated mental health interventions

The increasing rates of mental health problems in adolescence, and the impact and costs of mental health problems once they have arisen, make a strong case for *prevention* (Fusar-Poli et al., 2021). Preventative interventions aim to stop the onset *or* worsening of mental health problems (Viding et al., 2024). However, compared to interventions that address diagnosed mental health problems, preventative interventions pose unique challenges, including: 'How to predict which young people will go on to experience which mental health problems, and which symptoms therefore to target?'

In this context, transdiagnostic approaches to mental health may have unique advantages. Compared to approaches that focus on specific mental health conditions, transdiagnostic approaches take a continuous approach to mental health problems, quantifying the individual's experience of symptoms across diagnostic boundaries (Eaton et al., 2023) and focusing on processes that are common to multiple disorders or indeed that underpin general liability to psychopathology. In other words, they target mechanisms thought to be implicated in a range of mental health problems (Dalgleish et al., 2020), and avoid the problem of requiring different interventions for different (usually not yet identified) diagnoses.

Two transdiagnostic mechanisms that have been identified in a range of mental health problems in adolescence are social relationships and emotion processing. Social relationships are particularly important for adolescents, as the views of peers become increasingly salient at this age (Andrews et al., 2021). There is evidence that the association between peer relationships and mental health is likely bidirectional, such that positive peer relationships predict positive mental health outcomes and vice versa, whereas negative peer relationships predict negative mental health outcomes and vice versa (Mitic et al., 2021; Schwartz-Mette et al., 2020; Wu et al., 2025). Such bidirectional associations have been evidenced across a range of mental health problems including anxiety (Pickering et al., 2020), depression (Beeson et al., 2020) and conduct problems (Schoeps et al., 2020), suggesting social relationships are a transdiagnostic risk factor for mental health problems in adolescence. The quality of adolescents' relationships with parents and/or caregivers are equally associated with a range of mental health outcomes (Scully et al., 2020), suggesting adolescents' relationships are a general risk factor for mental health problems at this developmental stage (Viding et al., 2024).

Adolescence is also an important period for cognitive-emotional development (Crone & Dahl, 2012), which play a role in well-being and a range of psychological disorders. Specifically, emotion processing abilities, such as the ability to control or regulate one's emotional responses, respond appropriately to the emotions of others, and identify internal physiological states associated with emotion (known as interoception) all undergo significant development during this period (Murphy et al., 2017; Schweizer et al., 2020; Silvers, 2022). Importantly, these abilities have been associated with mental health problems at this point in the lifespan (see Murphy et al., 2017; Penton-Voak et al., 2012, 2017; Royuela-Colomer et al., 2021). Together, social relationships and emotion processing abilities (specifically emotion regulation, emotion perception and interoception) offer candidate transdiagnostic mechanisms that, if targeted, have the potential to improve mental health outcomes across a range of diagnostic categories. They are also likely intrinsically linked and mutually influence each other. Developing strategies to promote them both in a holistic fashion in a single preventative intervention would therefore seem a promising approach. However, we currently lack clear frameworks for how such a hybrid intervention should be delivered or how these elements can be combined in a meaningful way within a preventative intervention.

To address the challenges of combining previously distinct techniques implicated in mental health outcomes into a coherent intervention, it is important to collaborate with young people during the intervention development processes. Collaborating with individuals from the population of study is known as co-production (Bell et al., 2023; Lloyd, Wu, et al., 2024), and is an effective methodology to improve the acceptability of mental health interventions through integrating the views of individuals with lived experience relevant to the topic of study into the research process (e.g. Pinfold et al., 2015). To establish whether Patient and Public Involvement meets the criteria to be considered co-production, it is important to evaluate whether the involvement of experts by experience meets guidelines for this approach, such as those

defined by the NIHR (NIHR, 2024), or by expert consensus (Perowne et al., 2024). This guidance states that co-production should involve active collaboration with young people (Perowne et al., 2024) and should incorporate key principles such as sharing of power, including all perspectives and skills, respecting and valuing the knowledge of all those working together on the research, reciprocity, and building and maintaining relationships (NIHR, 2024). We adopted a co-production approach in the development of ReSET to identify features of existing interventions that adolescents found engaging, as well as how these could be improved to increase their relevance to the target population, ultimately aiming to improve the efficacy of the intervention. Below, we provide a brief review of evidence for common mental health interventions targeting social relationships and emotion processing and highlight how we adapted these existing approaches in ReSET.

Why and how to combine elements to create a preventative intervention targeting both social and cognitive mechanisms

A well-established intervention used with this age group that addresses social relationships is Interpersonal Therapy for Adolescents (IPT-A; Mufson & Moreau, 1999) and its adaption to a prevention group format: Interpersonal Therapy – Adolescent Skills Training (IPT-AST; Young et al., 2006). IPT-A and its variants address social issues that may precipitate and perpetuate mental health problems. Adolescents are taught communication strategies to assist in expressing their feelings. Their use is rehearsed in roleplays of conversations which aim to resolve current interpersonal issues. Evidence has suggested that IPT-AST is effective at preventing depression in adolescents compared to treatment as usual (Young et al., 2006, 2010; Young, Makover, et al., 2012) and can also improve educational outcomes, such as attendance and academic performance (Young et al., 2016). Although originally developed to prevent depression in adolescents, there is some evidence that IPT-AST can improve symptoms of anxiety (Young, Makover, et al., 2012) and has been adapted for other mental health problems (such as social anxiety; La Greca et al., 2016). Young et al. (2021) identified greater post intervention and long-term symptom reduction when adolescents, rated on interpersonal and cognitive risks factors for depression, were matched to either IPT-AST for those with interpersonal risk factors or a Cognitive Behavioural Therapy (CBT) focused group for those with cognitive risk factors. Notably, improvements were heightened in adolescents who's risk factors matched the intervention compared to adolescents who were allocated to receive an intervention that did not match the risk factors they were presenting with (Young et al., 2021). This differential outcome highlights the value of the integrated cognitive and interpersonal approach being developed, as it can be delivered to adolescents with both interpersonal and cognitive risk factors for psychopathology.

In addition to interventions targeting social relationships, there are well established therapeutic frameworks that target cognitive mechanisms implicated in mental health problems, such as CBT (Shafran et al., 2009). However, incorporating CBT techniques thoroughly within an intervention that also focuses on social relationships, like IPT, is challenging because of the volume of content that would be required. More focused interventions targeting specific cognitive mechanisms have also been developed within the fields of experimental psychology and cognitive neuroscience. Unlike many psychotherapeutic approaches, interventions in experimental psychology and cognitive neuroscience do not require delivery by a highly skilled clinician and can be self-paced or administered with minimal support from researchers. Such interventions target implicit cognitive processes and skills (e.g. emotion regulation abilities) rather than focusing on overt cognitions (as in CBT, for example; Klein et al., 2007). They offer the further advantages of being more precisely defined with respect to their mechanistic targets and require less time than standard CBT. One well-established intervention targeting an implicit cognitive process is Interpretation Bias Training, a protocol developed to shift an individual's bias from viewing faces as hostile to viewing positive emotions (Penton-Voak et al., 2012). The protocol has been used successfully to reduce symptoms of depression, anxiety, and conduct disorder (Ji et al., 2021; LeMoult et al., 2018), consistent with their assumed transdiagnostic nature. In the domain of emotion regulation, similar self-paced interventions have been used to increase the use of adaptive emotion regulation strategies (e.g. reinterpretation and distancing) and reduce reliance on maladaptive strategies (e.g. Feldmann et al., 2023). Moreover, there is emerging evidence that interoceptive abilities can be trained and that improvements in this ability is associated with positive mental health outcomes (Quadt et al., 2021). Emotion regulation, emotion perception, and interoception training

all offer methods of intervening in the transdiagnostic cognitive–affective mechanisms implicated in poor mental health during adolescence.

Whilst these different approaches all show evidence of effectiveness when delivered in isolation, no interventions to date have integrated social and cognitive-emotional training interventions to prevent mental health problems in adolescence, particularly when these approaches cross disciplines (i.e. across interpersonal psychotherapy and cognitive neuroscience). The ReSET programme has a unique focus on targeting social and emotional mechanisms in combination, with the aim of improving mental health outcomes across internalising (e.g. anxiety, depression) and externalising (e.g. conduct problems) domains in adolescence. This paper sets out the development of the ReSET intervention. We developed ReSET through three linked phases: (1) the preliminary development of the cognitive tasks, (2) the integration of these tasks into a group-based intervention based on principles of IPT and IPT-AST; and (3) a pilot study to test the intervention model, and generate learning to help us adapt and refine the programme.

Method

Development process for the ReSET intervention

Initial development process

From the outset, the aim of the ReSET project was to develop a novel transdiagnostic intervention that could be delivered in mainstream secondary schools. We intended the intervention to be preventative, that is working with young people to prevent the onset or worsening of mental health problems. Given the transdiagnostic focus of the project, we targeted social and cognitive mechanisms thought to be implicated in mental health problems across a range of internalising (i.e. mood and anxiety problems) and externalising domains (i.e. conduct and substance misuse problems).

The project team that initially developed the funding application comprised of clinicians, cognitive neuroscientists, a young people representative, parent representative, and school mental health practitioners. This diverse composition provided wide ranging perspectives and skills in the delivery of school-based interventions (e.g. within Mental Health Support Teams), education, mental health, clinical trials, IPT-AST, process evaluation, social networks, the three domains of emotion processing abilities (emotion regulation, emotion perception and interoception). The team also included stakeholder groups, facilitated through the Anna Freud Centre's School in Mind network as well as Mental Health Support Team partnerships facilitated through the Centre's Children Young Peoples Mental Health Workforce Development Training Programmes. This ensured that co-production and sharing of power with young people and school mental health practitioners was embedded throughout the project. Through integrating these perspectives at the inception of the project, consideration was given to potential barriers that might occur and mitigations that could be put in place, such as a lack of cohesive integration of the core ideas underpinning the intervention, barriers to the engagement and implementation of the intervention in schools, or lack of buy-in from young people. For example, school mental health practitioners contributed to an engagement strategy to effectively explain the project and its potential benefits to school senior leadership teams to ensure engagement from the schools, which is essential in the implementation of school-based interventions. Moreover, consideration was given to practical challenges such as ensuring schools would be able to provide a suitable space for the intervention to take place as well as how the work would fit into the school day with minimal disruption.

One of the first challenges to developing the intervention was to communicate how the three components of the intervention (namely, social relationships, emotion processing and mental health) linked to one another. While these three components were decided by the study team *a priori*, based on the current theoretical and empirical literature, young people's understanding of how these concepts linked together was fundamental to the psychoeducation communicated during the intervention. Therefore, it was crucial to communicate this message to young people in simple and accessible language and imagery. To ensure this, several iterative co-production sessions were held with adolescents aged 16–18 to elicit their understanding of these concepts and how the concepts could be effectively conveyed to other adolescents (see Phases 1 and 3, Figure 1). All young people who took part in the co-production sessions had an interest in mental health and a smaller subset of these young people had lived experience of mental health problems

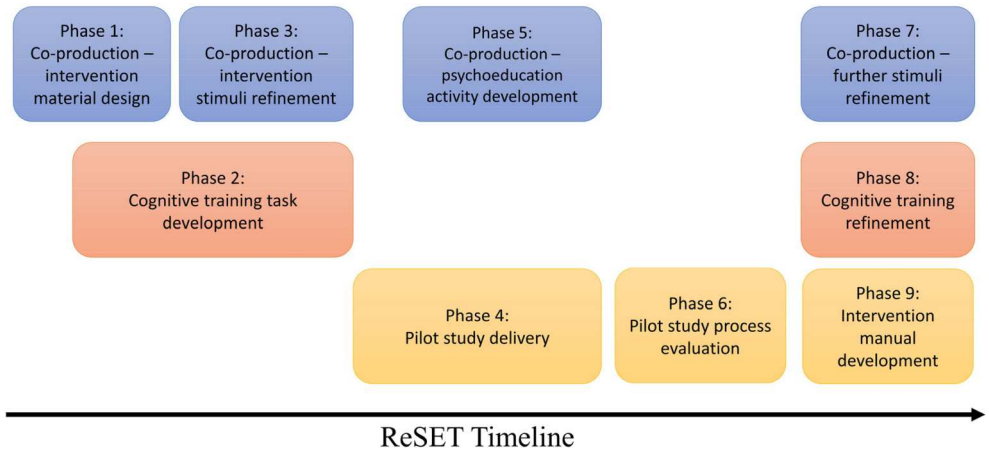

Figure 1. Intervention development timeline for the ReSET programme. Blue indicates development of the intervention materials that shaped the overall structure of the intervention. Orange indicates development of the cognitive training tasks specifically. Yellow indicates the research methods that were used to evaluate the intervention materials and cognitive training tasks. (Author's Work/Source: Authors)

(self-disclosed during participation), though we did not formally record this. During these workshops, led by AL and LL, young people were asked to explain in their own words how they understood the interconnection between emotions, relationships, and mental health. Further, young people were asked to consider how these concepts linked together to promote positive outcomes and where they might lead to negative outcomes. For one example of an output from this session, see Figure 2.

Building on this initial visualisation, a second online co-production session was held with a separate group of young people (aged 16–17), also led by AL and LL. Similar to the first co-production session, all young people had an interest in mental health with a smaller subset having self-disclosed lived experience of mental health problems. Utilising the visualisations developed in the first workshop as a template, young

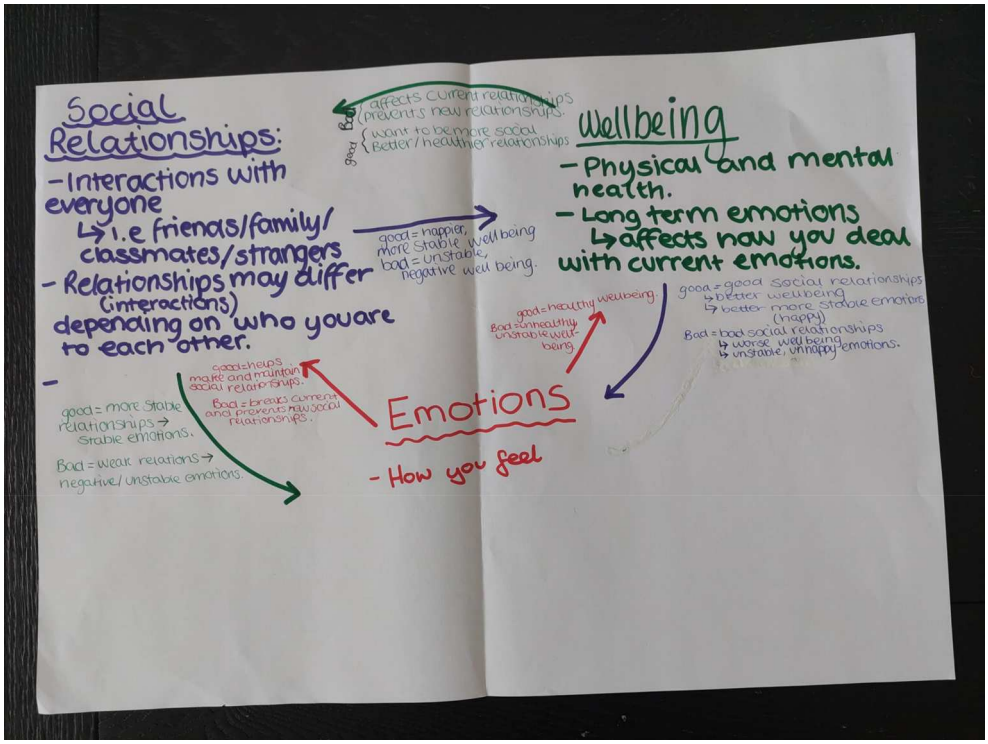

Figure 2. Young people's visualisation of the interlinks between emotions, social relationships and mental/wellbeing. (Author's Work/Source: Authors)

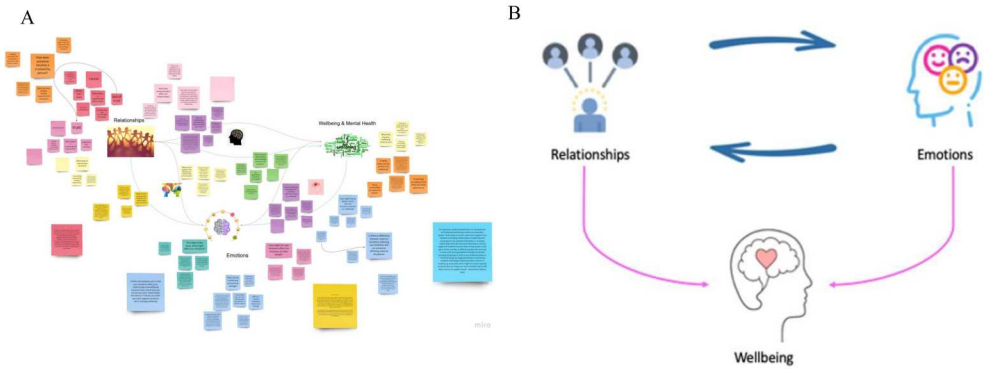

Figure 3. (Panel A) online board populated with young people's definitions of the three components of the intervention and the links between each feature. For closer inspection of the text boxes in Panel A, see Supplementary Materials. (Panel B) An adapted version of the diagram used in the intervention to explain how emotions, relationships and wellbeing are linked. (Author's Work/Source: Authors)

people were asked to populate each feature with their own reflections on the definitions of each concept and how they were interlinked (see Figure 3, panel A; for higher resolution images see Supplementary Materials). The aim of this workshop was to develop an understanding of how young people conceptualised the link between the core features of the intervention and provide further guidance on how this should be communicated to young people during the intervention. Feedback from this workshop informed the framing of the intervention and the links between emotions, relationships, and mental health, including a visualisation developed to scaffold young people's understanding of the links between these concepts (see Figure 3, panel B). Guided by the young people, we also prioritised use of accessible language and 'catch-phrases' to help embed the core ideas. Specifically, the various *interpersonal* strategies to promote wellbeing that rely on social relationships were framed as 'We Strategies', whereas *intrapersonal* strategies focusing on cognitive-emotion processes were referred to as 'Me Strategies'. We Strategies are helpful things you can do by reaching out to others (like telling someone how you are feeling, asking for help). Me Strategies are helpful things you can do by 'reaching in' to yourself and focusing on your feelings, thoughts or state of mind (like checking in with your emotions, calming yourself down, or re-evaluating your interpretation of important things going on in your life).

Parallel to the development of the materials for the intervention, several of the project team were involved in the development of cognitive-emotional training tasks designed to improve emotion regulation, emotion perception and interoceptive abilities (see Figure 1, Phase 2). These tasks were delivered via applications on a tablet and were based on established protocols that have been evidenced to improve emotion processing abilities implicated in mental health problems (Feldmann et al., 2023; Penton-Voak et al., 2012). These paradigms had previously been utilised in lab-based environments for individual training. However, to preserve the properties of the tasks, we made minimal adjustment to the administration procedure for the pilot study. Here, we provide a summary of the tasks to contextualise how we developed them for the purposes of the intervention. For further methodological information about the training tasks, see Viding et al. (2024).

To train **emotion regulation**, participants are required to read scenarios designed to elicit a negative emotion and practice either distancing (projecting oneself into the future; e.g. 'How will I feel about this in a year from now?') or reinterpretation (considering other explanations for the event; e.g. 'What else might be going on for that person?'; Feldmann et al., 2023; see Figure 4). **Emotion perception** is trained by determining the participant's individual bias to view faces as friendly or hostile, and then providing feedback to shift their bias towards viewing more faces as friendly (Penton-Voak et al., 2012; see Figure 5). **Interoceptive ability** is trained using an adapted version of the Phase Adjustment Task (PAT; Plans et al., 2021; see Figure 6). In this task, participants must use a dial to adjust a repeating tone such that it becomes synchronous with the young person's heartbeat. In the training task, participants estimate the delay between their heartbeat and the tone. Once they submit this attempt, they are provided with feedback about whether the tone was too far ahead or too far behind their own heartbeat. On each trial, the tone resets

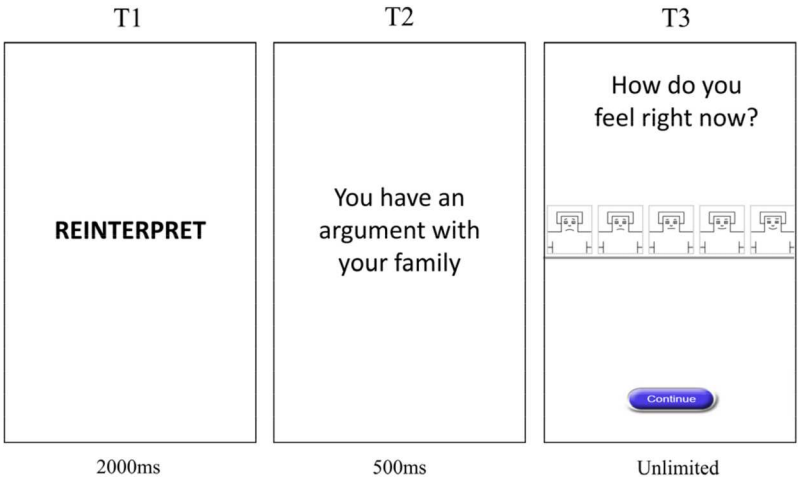

Figure 4. Emotion regulation training task outline. On each trial participants are presented with an emotion regulation strategy to practice (either 'reinterpret' or 'distance'). At T2 they are presented with a scenario to imagine, and asked to practice the strategy in relation to that scenario. At T3 they provide an affect rating using the Self-Assessment Manikin. (Author's Work/Source: Authors)

to a different delay. Although more limited, co-production was used for some elements of the initial task development. For example, the scenarios presented in the emotion regulation training task were generated in the first workshop with young people and rated on the emotion they elicited and how relevant they were by a separate group of young people. Only those scenarios that elicited negative affect and were rated as relevant by the young people were then used in the intervention.

Pilot group

After this initial development process, we delivered an 8-week pilot group with ten students aged 13–14 who had been identified as having low-level concern of socio-emotional difficulties by a counsellor at a partner school with >30% of students qualifying for free school meals, an indicator of socioeconomic diversity. The group was led by a lead facilitator (RL) and a co-facilitator. The aim of the pilot group was to determine the acceptability of delivering tablet-based cognitive-emotional training tasks in a group setting, while preserving the clinical integrity of the IPT-AST-informed processes, such as group role-plays and discussions about managing interpersonal conflict (Young, Makover, et al., 2012). To facilitate flexibility in the delivery

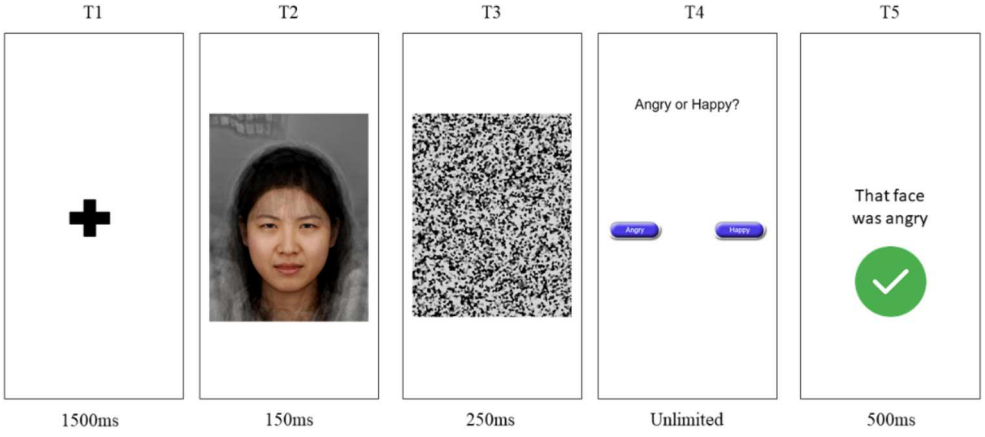

Figure 5. Outline of the emotion perception task. T1 refers to a fixation cross to draw participants' attention. In T2, participates are briefly shown the image of a face, showing a face ranging from unambiguously happy to unambiguously angry. T3 is a visual mask to ensure participants do not have a visual bias following the presentation of the face. In T4, participants guess whether the face presented was happy or angry, followed by feedback in T5. (Author's Work/Source: Authors)

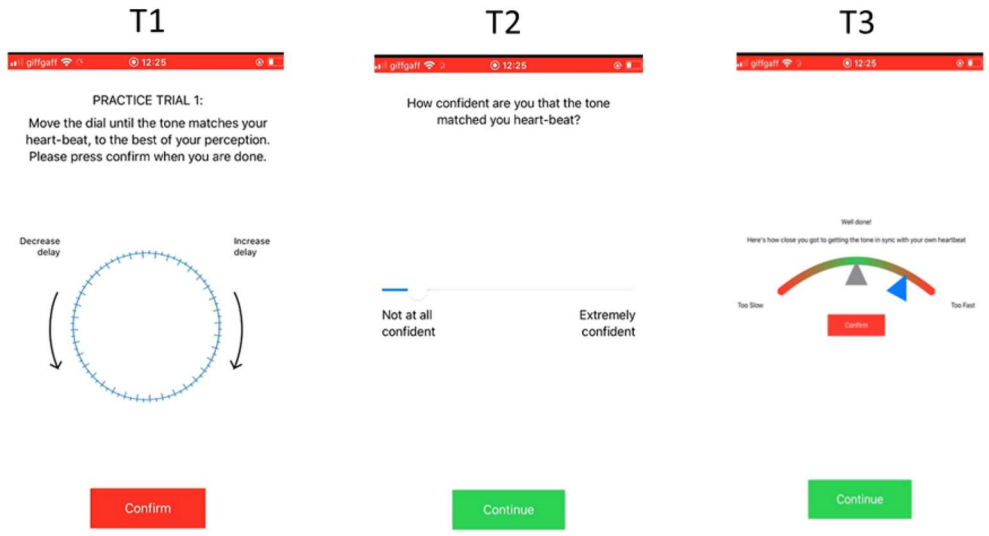

Figure 6. Schematic outline of the Phase Adjustment Training Task. At T1, the participant adjusts the dial until the delay between the beats matches that of their own heart rate. At T2, the participant rates how confident they felt with their score, from not at all confident to extremely confident. T3 is the novel component added in our intervention, where the participant receives feedback based on their accuracy. (Author's Work/Source: Authors)

of the group, we collaborated with the lead clinician on the team (RL) to develop a bullet-point outline of the key activities for each session that had been agreed during the initial development process, such as psychoeducation about how the three cognitive-emotional training tasks could be applied to real-world scenarios. A member of the research team was present as a participant observer to support with the delivery of the tablet-based cognitive-emotional training tasks and recorded notes of the activities used in each session to support the intervention development process.

Throughout the pilot intervention, young people were explicitly informed that they played an important role in the development of the project and were co-researchers who would help shape future iterations of the intervention, though we did not provide specific training for young people. Involving young people as 'co-researchers' aligned with the co-production methodology we adopted and meant that the perspectives of the young people were integrated into the development of the intervention. Ground rules were collectively established to ensure young people felt empowered to state their views. We captured young people's feedback weekly, using feedback questionnaires and informal discussions, as well as a formal focus group once the pilot group had been completed. Drawing on the detailed notes made by the member of the research team who attended the pilot sessions, several observations were made about the delivery of the group that informed the development process. For example, one observation made was that young people struggled to understand the links between the cognitive-emotional training tasks and the group-based component of the session. As one young person put it: '*I didn't get how it links because it felt like two different things and I don't really understand why we did it*'. In the pilot intervention, the cognitive-emotional training tasks were delivered at the start of every session to avoid interrupting the group-based discussions that comprised most of each session. However, reflections from the young people suggested that the separation between the training tasks and group-based activities obscured the relationship between the function of the training and its real-world application, which was a key component of the intervention. These reflections indicated that the timing of the delivery of the cognitive-training tasks in the pilot study was suboptimal to communicate the relevance of the apps to the other elements of the group programme, as well as the wider aims of the intervention.

In addition to the timing of the training tasks, there were specific reflections on the tasks themselves. Notably, the young people found it challenging to engage with the interoception training task, with one reporting '*most of the time even when I was feeling for my heartbeat and changing the dial, I still got it wrong*'. While it is typical for some people to be unable to complete this task, this feedback was reported widely across the group. An additional step was introduced to try to facilitate use of this app, which involved

the group engaging in brief, intense physical activity, such as running on the spot for ten seconds, before attempting the interoception task. Despite this, many group participants continued to find the task difficult and were visibly distracted, often appearing to spin the dial randomly rather than in relation to their heartbeat. It appeared both difficult to tune into their internal experience and to tune out awareness of the other group members, who sat facing each other in a circle while completing the tasks. The difficulty with engaging with the task meant that the young people reported limited benefit from the training, and the pilot group unanimously identified it as the least helpful form of training. One young person appeared to speak for many of their peers when they reported '*I didn't really get anything out of it*'. These comments reflected challenges in comprehension and engagement with the interoception training task which was identified as an area for further optimisation.

Despite some challenges surrounding the delivery of the cognitive-emotional training tasks, the young people shared positive reflections about the pilot group more generally, which we considered encouraging evidence for the acceptability and potential benefits of the intervention. They reported being able to use the interpersonal strategies taught in the group. For example, when describing the strategies discussed in the pilot group, one young person reported: '*I think I could pick up them and use them with other people*'. Despite some issues with the timing of the cognitive-emotional training, these were identified by young people as helpful exercises, and they reported that some of the skills could be applied to their everyday lives. In response to a question about which strategies they have utilised, one young person specifically highlighted '*distance – how you'll feel in a week*', which was a strategy trained using the emotion regulation task. The positive feedback regarding the pilot intervention was corroborated by a school mental health practitioner, who stated '*[there] has been a noticeable kind of increase in their ability to deal with certain situations [which] previously caused a lot of anxiety*'. Together, feedback and observations from the pilot group highlighted some notable benefits along with areas for further development.

Feasibility development

During and after the pilot group, we conducted additional development work based on issues identified through the delivery of the pilot group. As highlighted above, one challenge reported by young people was understanding the links between the cognitive-emotional training tasks and the group-based activities. We therefore sought young people's views on how to better integrate the cognitive-training tasks into the group sessions, with one suggestion being that the tasks were completed during the group session rather than as a separate activity at the start of the session. To develop methods of communicating the relevance of the training tasks to young people and to further refine and make more engaging the group session content, we worked with a performing arts company, Company Three (https://www.companythree.co.uk/). Company Three developed a series of interactive activities around each of the training tasks and conducted a workshop about the difference between normal fluctuations in mood and symptoms of mental health problems. These activities were conducted with two groups of young people who had not taken part in the pilot intervention (see Figure 1, Phase 5) and were used to develop ways to show the link between the tablet-based apps to real world scenarios and developing accessible methods of describing how to identify when an adolescent may be experiencing a mental health problem.

For example, when explaining the concept of interoception in the feasibility group, young people were asked to tap their foot to indicate the rate of their heartbeat in different scenarios (e.g. attending a party where they did not know anyone, preparing for an exam, having an argument with a family member). Changes in the rate of tapping between scenarios, and individual differences between young people, were used to generate discussions about how interoception can provide insight into the physical changes associated with affective states (Khalsa et al., 2018). The language around the interoception intervention was also adapted, highlighting the role of physiological signals as an indication of change, potentially requiring attention or action linked to the skills introduced in the group, rather than as a basis for recognising emotions directly. This incorporated feedback from the pilot group who clearly distinguished recognising emotions and physical changes. These workshops were helped to trial novel activities designed to communicate how the emotion processing abilities (i.e. interoception, emotion perception and emotion regulation) could support positive mental health outcomes. We subsequently incorporated these activities into the intervention to support young people's understanding of the purpose of the app-based training, such as using the physical activities to lead into the more abstract cognitive-emotional training tasks.

To further address the issue of the perceived disconnect between the cognitive-emotional training tasks and the other elements of the group sessions noted by the young people, we restructured the order of sessions to better integrate the training tasks into the main body of the sessions. Specifically, in sessions where there was a focus on psychoeducation about a feature of emotion processing (emotion regulation, emotion perception or interoception), we included the corresponding training task in the main body of the session with an accompanying activity to generate discussion about the task between the young people. The interpersonal skills introduced in each session were also matched to the app-based activities, further emphasising the links between them, e.g. emotional perception was introduced alongside the interpersonal stategy labelled 'cut them some slack' and emotional regulation was discussed in the same session as 'aim for good timing' and 'put yourself in their shoes'. This allowed a thread to carry through each session, encouraging the young people to consider the Me and We skills they could choose from across a range of situations.

A further comment raised by the young people was a lack of engagement with the interoception training task in particular, though young people were able to reflect on the importance of being able to tune into their bodies to notice changes (i.e. they recognised the importance of interoception). We therefore opted to retain the app within the intervention and made further edits to improve the acceptability of the training task (Figure 1, Phase 8). A challenge with integrating the three cognitive-emotional training tasks with the group-based components was to maintain the validity of the tasks (e.g. the number of required trials, response options) while maintaining young people's engagement and avoiding frustration because of a perceived inability to complete the tasks successfully. To attempt to overcome this issue and based on the suggestion of young people, we implemented an in-app reward schedule (visualised as stars) to provide young people with trial-to-trial feedback to (a) provide an intuitive feedback system showing their performance and (b) incentivise them to engage with the training tasks. Several studies have demonstrated that such 'gamification' can improve engagement while preserving the psychometric qualities of a cognitive task (Vermeir et al., 2020). The new reward structure was endorsed by a group of young people who had not taken part in the pilot group. These young people suggested that providing feedback on whether the score was higher or lower than the previous week would be another method of improving engagement with the task, which was then incorporated into the second iteration of the interoception training task.

An additional reflection raised from the pilot group was that the cognitive-emotional training tasks were perceived to be difficult. The training tasks were intentionally designed to be challenging to ensure there was not a ceiling effect on training outcomes but this feedback identified that this feature of the tasks had not been explicitly captured in their description in the pilot study. Therefore, as part of the development process we reframed the cognitive-emotional training tasks around the metaphor of exercise, which was discussed with young people during the pilot study and elicited a positive response. Specifically, we emphasised that the young people should find the activities challenging to feel their benefit. We also drew on this metaphor to promote practice and tenacity, and to reinforce the idea that by completing the tasks, they would improve their skills. As a way of finding common language between clinical practice and the task-based component of the intervention, we used a metaphor to explain the tasks to the young people in the early stages of the intervention. Specifically, young people were asked to identify a person who they admired (e.g. a sports person). This person was then used as an example of how training is often broken down into small steps which can be targeted individually to improve overall performance. For example, a footballer who trains to improve stamina by running on a treadmill in a gym can then maintain performance more consistently in their sport (e.g. running for 90 min of a game). The aim is not to run on a treadmill but to be match fit. Developing metaphors to explain the purposes of the interventions was an important step to finding

Table 1. Summary of the key challenges identified by young people through the pilot study, and subsequent modifications made to the intervention.

	Challenge	Modification
1	Misunderstanding the links between the cognitive-emotional training tasks and the group-based activities	New psychoeducation activities developed to integrate cognitive-emotional training tasks with We Strategies
2	Cognitive-emotional training tasks feeling separate to the main body of the intervention	Sessions restructured to complete relevant training task during the session, rather than beforehand
3	Dislike of interoception training task	Introduction of trial-by-trial feedback to increase motivation and provide method of tracking progress
4	Perceived difficulty of cognitive-emotional training tasks	Development of a metaphor to explain the rationale for completing the training tasks, as well as why they may be difficult at times

a common language between clinical practice and lab-based tasks. The challenges and subsequent modifications of the programme can be found in Table 1.

To support with the process of formalising the changes being made to the intervention, we began to manualise the complete intervention while concurrently iterating the cognitive tasks and group-based activities (Figure 1, Phase 9). The manual included indicative phrasing for facilitators to frame the cognitive-emotional training tasks and how to explain the links between the training and group-based components of the session, which were key concepts underpinning the intervention. A key feature of the intervention manual was to highlight messages that should be communicated during the group sessions without prescribing a script that facilitators should read. Indeed, while it is important to ensure fidelity to the intervention, facilitators were encouraged to adapt the phrasing to their context, accounting for the young people's cultural context and specific group dynamics. For example, options were provided in the manual for facilitators to engage the group in whole group discussions, or smaller groups, depending on the level of engagement from the group. Developing a manual ensures facilitators maintain fidelity to the intervention and core activities within the sessions, while ensuring they have the opportunity to adapt activities to the needs and dynamics of their group.

Results

The resulting intervention: building resilience through socioemotional training

The resulting ReSET programme combines group-based discussions and role plays to teach interpersonal strategies drawing from IPT-A and tablet-based cognitive-emotional training tasks to target emotion processing abilities, and to apply both these to important issues in young people's lives. The intervention draws on situations relevant to adolescents, which were co-developed with young people as collaborators. We hope that by addressing social and emotional determinants of poor mental health, the ReSET programme will prevent the onset or worsening of mental health problems in adolescence. For a visualisation of our theory of change for the intervention, see Figure 7.

Through the 8-week training programme, participants are provided with an opportunity to learn strategies that can improve wellbeing through managing their own emotions better and approaching their

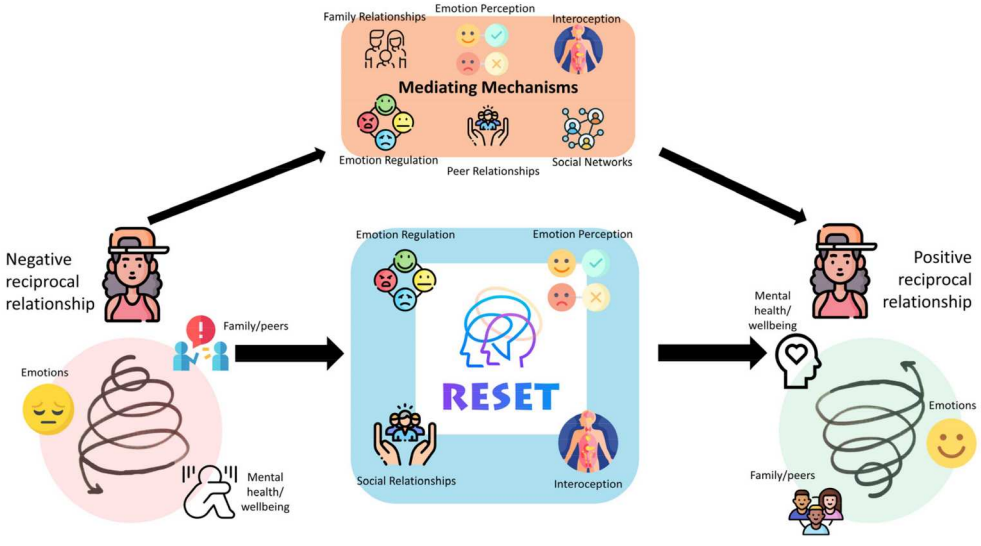

Figure 7. Proposed theory of change for the ReSET project. The leftmost side of the image depicts a young person at elevated risk for mental health problems, which is associated with a negative spiral of interpersonal conflict and negative emotion processing (see also Figure 3, Panel B). The young person enters the ReSET intervention (blue panel) where they develop emotion regulation, emotion perception, interoception and communication abilities. Following the intervention, the young person is on a 'positive spiral' of good relationships, adaptive emotion processing abilities and improved wellbeing. The topmost panel (orange panel) depicts the mediating mechanisms presumed to be implicated in the intervention outcomes that are measure pre- and post-intervention. (Author's Work/Source: Authors)

relationships more effectively. Importantly, the young people are given the opportunity to bring their own examples of situations relevant to them, and roleplay ways to resolve these using the strategies introduced by facilitators, for example, difficulties with their peers. Between sessions, the young people are encouraged to apply the strategies they practiced in the group both at home and at school, and report on how successful this was the following week.

The co-production work we conducted in the early stage of the project informed the structure and delivery of the intervention. Specifically, in the 1:1 pre-group meeting and the first group session, facilitators outline and visually illustrate the aim of the group, including the role of the cognitive-emotional training tasks which are described using the metaphor of exercise, which was based on feedback from the pilot study. The interconnection between relationships, emotions and mental health are explained using examples relevant to adolescents' lived experiences, which were co-produced with young people during the development phase. Participants in the group are encouraged to generate examples of issues that affect adolescents that may be affected by their relationships and emotions and consider how this impact their wellbeing and mental health.

After establishing the fundamental concepts of the intervention, sessions 2–4 focus on introducing each of the emotion processing strategies, using a combination of tablet-based cognitive-emotional training activities to discuss each of the emotion processing skills, and role plays to demonstrate the application of the skills to the young people's interactions. These activities were drawn from the co-production work conducted with Company Three. Emotion processing skills are framed as 'Me Strategies' that the young person can draw on to change their own feelings about a situation. In parallel, the young people are introduced to communication strategies that they can employ in their interactions with others, referred to as 'We Strategies'. These early sessions introduce the emotion processing skills and link them to the group discussions using a series of activities that demonstrate the application of the tablet-based activities to real-life issues. This approach was adopted after feedback from the young people who expressed a disconnect between the cognitive-emotional training tasks and the group-based processes. For example, when learning about emotion perception, young people discuss images that have ambiguous emotions to consider their own bias for positive or negative emotions, followed by discussion to link this app-based activity to the We Strategy 'cut them some slack'.

Sessions 5–8 support the young people to continue using the strategies taught in the earlier sessions, with a focus on the young people bringing their own examples of interpersonal issues to discuss and roleplay. The group are asked to consider methods to resolve the issue using a combination of 'Me' and 'We Strategies', identifying parts of an interaction that may lead to conflict or undesirable consequences and strategies to mitigate these outcomes. The young people are encouraged to flexibly combine the full range of strategies to navigate challenges in their lives using interpersonal and emotional skills and strategies. These later sessions also include discussions about the strategies as 'tools' that may be appropriate in some situations but not others and the young people are encouraged to consider when some strategies may be more appropriate than others.

Discussion

The next phase of the ReSET project is to test the outcomes of this novel, preventative intervention in a randomised trial (Lloyd, Law, et al., 2025; Viding et al., 2024). We will invite young people with an elevated risk of mental health problems, defined as scores of 15 or more on the Strengths and Difficulties Questionnaire, to take part in the study. A score of 15 or more was selected as this corresponded to the top 25% quartile of psychopathology in young people from this age group (University of Essex, 2022). Randomisation is done at the year-group level, with eligible students in one year group in the school receiving ReSET, while the other year group receives usual care. We predict that young people who receive the intervention will show improvement on measures of general psychopathology compared to their peers who did not receive the intervention. In addition to our primary outcomes of general psychopathology and wellbeing, we also include measures of mechanistic features presumed to be implicated in mental health problems (see Viding et al., 2024). Through our unique combination of group-based psychotherapy and training adopted from cognitive neuroscience, the ReSET programme innovates on existing interventions to target key processes implicated in mental health in an integrated, cross-disciplinary manner. The resulting intervention has the potential to improve mental health outcomes across diagnostic categories and therefore act as a potent transdiagnostic, preventative intervention for adolescents. The development of this intervention generated unique learning opportunities that

we reflect on below, with the aim of providing guidance for other researchers seeking to co-produce interdisciplinary mental health interventions with young people.

Challenges and responses to bringing the fields together

The development process for the intervention was necessary to integrate approaches from cognitive neuroscience and interpersonal psychotherapy. However, this endeavour raised some unique challenges that, to our knowledge, have not been documented elsewhere in the mental health literature. To aid future research that seeks to adopt an interdisciplinary approach to the development of mental health interventions, we outline some of the key challenges in integrating markedly distinct disciplines and how we were able to overcome these barriers, providing guidance for future work in this area.

One challenge experienced during the development of the intervention was a lack of shared language between clinical practice and lab-based tasks that are more commonly used in cognitive neuroscience. The lack of shared language, which could contextualise the activities, likely contributed to the apparent disconnect between the group-based components of the intervention and cognitive-emotional training tasks reported by the young people in the pilot group. To overcome this barrier, conversations were held between the lead clinician (RL) and members of the research team to develop session content and the key bridging messages that could be communicated during the psychoeducation components of the session. In the pilot group, these approaches were then trialled with young people explicitly asked about their understanding of the psychoeducation, and adaptions made dynamically during session to refine the description of the content. This process ensured shared decision-making for the final messaging was shared between the research team and young people. For example, it was agreed that a key feature of the psychoeducation about emotion perception would be that there are scenarios where an individual's emotion could be perceived as friendly or hostile, and the young person's interpretation of that emotion could influence their response to the individual, perpetuating either a positive or negative interaction cycle. During the pilot of this session, young people were encouraged to consider how their reactions would change when perceiving an emotion as more positive. From this discussion with the young people, the term 'positive possibilities' emerged and was noted by the researchers observing the session as helpful framing to communicate the goal of emotion perception training. This phrasing was then adopted in the manual as a key term to explain how training emotion perception could improve social relationships and in turn, mental health outcomes. Developing a shared language that can be used to facilitate intervention components stemming from interpersonal psychotherapy and cognitive neuroscience, in ways that served young people, was one unique challenge encountered that, once resolved, helped improve the coherence of the intervention.

The real-time co-production of this intervention was a simultaneous challenge and opportunity for innovation. Explicitly identifying group members as co-researchers with the power to change the content and delivery of the group was a powerful message that we were involved in reciprocal learning. This approach had the effect of levelling some of the inevitable power imbalance in the group when the young people saw the effect of their feedback in real time and had a sense of not only helping each other but also other young people who would attend groups in the future. This process demanded transparency about what could and could not be changed and why, as well as ensuring the group facilitators and researchers were able to provide accessible and coherent rationales for the group processes. This was replayed in each iteration of the group, conveying changes arising from previous feedback and inviting more on each revised version. This remains part of the group facilitators stance and is reinforced by the opportunity for groups members to talk about their experiences in post group interviews (Viding et al., 2024). However, it is important to recognise that it is difficult to navigate power relations between researchers and young people to achieve true co-production, and this practice requires regular reflection to identify whether decision-making is equitable between those involved in the project.

A further challenge of integrating psychotherapeutic approaches with cognitive neuroscience is the need to retain the validity of the experimental tasks as they have previously been employed while ensuring the needs of the group are met. Specifically, cognitive-emotional training tasks require a set number of trials to target the implicit processes presumed to be implicated in mental health problems (Pezzoli et al., 2023). Yet, several young people in our pilot group reported difficulties maintaining engagement with

these tasks. This posed a challenge as we could not ensure that the young people would experience the benefit of the cognitive-emotional training due to lack of attention. Moreover, this issue was further complicated by the fact that it required the group facilitators to encourage the young people to complete exercises they were not motivated to engage with. Establishing a positive relationship between facilitators and young people is essential to the therapeutic process within the group-based process and is a strong predictor of mental health outcomes (McCabe & Priebe, 2004). Importantly, this relationship should not be established on a foundation of coercion or power imbalances (De Varis, 1994). Directing young people to complete activities they were not motivated to complete might run counter to these therapeutic aims and was therefore a unique challenge to the integration of these two disciplines. One approach we adopted to resolve this challenge was to introduce a familiar model of training to improve performance in a chosen activity. This helped group members accommodate the experience of initial difficulty with new strategies while maintaining a vision of a long-term objective, actively framed in terms of each groups member's own personal goals. Highlighting the positive benefits of completing the apps by relating them to their real-world scenarios and later direct outcomes was used to generate motivation across sessions. Epistemic trust (Fonagy & Allison, 2014) the willingness to accept new information from another person, is enhanced by that person demonstrating the reliability, relevance and usefulness of the ideas shared with the group. When the group facilitator is trusted in this way the group members are more open to what is being suggested. Moreover, we supplemented completing the cognitive-training tasks with a reward (e.g. a sweet) to increase the playfulness of the group and reduce performance anxiety.

Conclusion

We have detailed the development process for the Building Resilience through Socioemotional Training (ReSET) programme. The intervention integrates a unique combination of therapeutic techniques derived from IPT-AST with cognitive-emotional training drawn from cognitive-neuroscience. To ensure these disciplines could be integrated to form a coherent intervention, it was necessary to adopt a co-production perspective and integrate the expertise of young people who advised the research team on ways to communicate core messages, maintain engagement with the intervention, and maximise the benefit to young people within a group-based setting.

Having completed this development work, the next step is to move towards evaluation of efficacy. Our aim through trialling this intervention as part of a randomised controlled trial is to establish whether the programme can prevent the onset or worsening of mental health problems, relative to a control group (Viding et al., 2024). The novel integration of interpersonal psychotherapy and cognitive neuroscience has the potential to target transdiagnostic mechanisms implicated in psychopathology and therefore improve outcomes for adolescence at a time during which susceptibility to mental health problems is heightened.

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Data availability statement

There is no data associated with this manuscript.

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