



Acting with Acceptance, Mindfulness and Compassion to Cope with Test and Exam Anxiety (AcAdeMiC): Preliminary Efficacy From a Pilot Randomized Trial

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Abstract

Objectives Research on structured, manualized psychotherapeutic interventions for high test anxiety (TA) in adolescents remains limited, particularly those integrating acceptance, mindfulness, and compassion-based strategies. These psychological processes have been identified as protective factors for test anxiety, fostering adaptive emotional regulation and resilience. The AcAdeMiC program (Acting with Acceptance, Mindfulness, and Compassion to Cope with Test/Exam Anxiety) was developed to help adolescents manage test anxiety by strengthening these competencies, and its preliminary version demonstrated good feasibility indicators (Pires et al., 2025).

Method This pilot randomized trial assessed the efficacy of a restructured version of AcAdeMiC, which consists of four sequential modules focusing on developing acceptance, mindfulness, and self-compassion as key psychological skills. The study examined efficacy throughout treatment and variance in outcome measures. Thirty-five adolescents ($M_{age} = 15.63$ years, $SD = 0.88$) were randomized to either an experimental group (EG, $n = 17$) or a waitlist control group (CG, $n = 18$), but due to missing data and procedural constraints, effective sample sizes for some repeated-measures analyses included only 15 participants from the experimental group.

Results The retention rate was 85.71%, with no baseline differences between groups. Self-reported ($p < 0.001$; $\eta_p^2 = 0.57$) and clinician-rated ($p < 0.001$; $\eta_p^2 = 0.66$) test anxiety severity decreased over treatment, with notable improvements between modules. Significant group $\times$ time effects were observed for test anxiety and self-compassion ($d = 0.40$).

Conclusions These findings offer preliminary evidence supporting the efficacy of the AcAdeMiC program in reducing test anxiety and increasing self-compassion, contributing to a biopsychosocial and contextual framework for intervention. They also provide a foundation for a larger-scale randomized controlled trial to further validate the program's efficacy.

Preregistration

This trial was registered at ClinicalTrials.gov (Identifier: NCT04861116).

Keywords Test anxiety · Adolescents · Pilot RCT · Cognitive-contextual intervention · Self-compassion · Acceptance · Mindfulness

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Test anxiety is “the set of phenomenological, physiological, and behavioural responses that accompany concern about possible negative consequences or failure on an exam or similar evaluative situation” (Zeidner, 1998, p. 17), including cognitive (e.g., worry) and affective-physiological (e.g., tension, bodily symptoms) components. Adolescence, a developmental period marked by heightened brain plasticity, makes individuals highly receptive to environmental influences (Dow-Edwards et al., 2019). During this stage, academic pressures – such as preparing for tests and exams and the high stakes tied to academic achievement – are significant stressors (Banks & Smyth, 2015; Núñez-Regueiro et al., 2022). For secondary school students, particularly in contexts like Portugal where grades determine university eligibility, formal assessments are perceived as highly consequential (Banks & Smyth, 2015). These pressures, coupled with the increasing importance of academic performance for self-worth and future opportunities (Putwain & Daly, 2014), contribute to the emergence or intensification of test anxiety during this critical life stage.

Test anxiety affects a substantial proportion of secondary school students, with studies using validated self-report measures estimating prevalence rates between 16.4% and 34% (Pires et al., 2025; Putwain & Daly, 2014). However, up to 55% of students report feeling highly anxious before a test, and up to 69% in the Portuguese context (Organisation for Economic Co-operation and Development, OECD, 2017). This widespread prevalence is concerning, as test anxiety is associated with a range of adverse outcomes, including increased stress (Akinsola & Nwajei, 2013; Putwain et al., 2021a, 2021b; Wuthrich et al., 2021) and reduced life satisfaction and well-being (Putwain et al., 2021a, 2021b; Steinmayr et al., 2016; World Health Organization, 2016). Emotional well-being – characterized by happiness, satisfaction, and interest in life – and social and psychological well-being – related to self-realization and a meaningful purpose in life (Keyes, 2002) – are crucial for complete mental health (Greenspoon & Saklofske, 2001). Test anxiety undermines these dimensions, leaving students struggling not only academically but also in terms of their overall mental health.

Students with high test anxiety often experience additional challenges, such as sleep disruptions, intense guilt for not studying, and feelings of being overwhelmed during revisions (Chamberlain et al., 2011). These difficulties further exacerbate the negative impact of test anxiety, creating a cycle of stress and impaired functioning. Research also indicates that test anxiety symptoms can vary throughout adolescence, suggesting that developmental stage plays a role in shaping both its intensity and impact (Torrano et al., 2020). Younger adolescents struggle more with the emotional regulation of anxiety due to their ongoing cognitive and emotional maturation, while older adolescents face heightened test anxiety due to

increased academic pressures, such as university entrance exams (Torrano et al., 2020). Given the profound consequences of test anxiety on adolescents’ academic performance, mental health, and well-being, there is a pressing need for targeted interventions during this developmental phase.

Recent scientific advancements, grounded in contextual cognitive-behavioural therapies, aim to promote meaningful therapeutic change by focusing on modifying the function of psychological experiences – such as thoughts and emotions – rather than their content, form, or frequency (S. C. Gilbert, 2010; Hayes & Hofmann, 2021). These approaches integrate compassion-, acceptance-, and mindfulness-based techniques to foster valued commitment, enhance well-being, and cultivate a more caring relationship with oneself (Gilbert, 2010, 2022b; S. C. Hayes et al., 1999). When considering test anxiety, research highlights the importance of cultivating competencies such as acceptance, mindfulness, and self-compassion to help teens cope effectively (Cunha & Paiva, 2012; O’Driscoll & McAleese, 2022b). Therefore, rather than viewing test anxiety as a barrier to achievement-related behaviors and outcomes, a contextual intervention for test anxiety would seek to develop strategies that reappraise these behaviors as meaningful and valued, while fostering a supportive and caring attitude towards oneself. While symptom reduction may occur, the focus should not be solely on changing what one feels or thinks (Doyle et al., 2023) – as this is not the aim of contextual interventions – since such an approach can paradoxically reinforce and perpetuate the experience of anxiety (S. C. Hayes, 2016).

Acceptance refers to the willingness to experience thoughts, emotions, and physical sensations as they are, without resistance or attempts to change them (Harris, 2019). This encompasses both emotional acceptance and situational acceptance, which involve embracing the internal experience and challenging situations without avoidance, to serve valued ends. This is particularly relevant for adolescents with test anxiety, who often engage in cognitive and behavioural avoidance (e.g., procrastination, suppression of test-related thoughts) to cope with distress (Skinner & Saxton, 2019; Stöber, 2004). Acceptance is embedded in the Acceptance and Commitment Therapy (ACT) model (S. C. Hayes et al., 1999) as one of the pillars of psychological flexibility, namely the ability to act according to valued ends while in the presence of unpleasant thoughts, emotions, or physical sensations (S. C. Hayes, 2016). Acceptance has been shown to reduce the severity of test anxiety over time (Pires et al., 2025), and acceptance and ACT-based interventions have demonstrated efficacy in reducing test anxiety among secondary school students (Abdali et al., 2018; Aydın & Aydın, 2020; Habibollahi et al., 2019).

Compassion refers to a motivation that is oriented toward “... a sensitivity to suffering in self [self-compassion] and

others with a commitment to try to alleviate and prevent it” (Gilbert & Choden, 2014, p. 98). It is particularly beneficial in addressing difficulties rooted in shame (a powerful self-conscious emotion referring to a perception of existing negatively in the minds of others – *external shame* – or in one’s own mind – *internal shame*) (Gilbert, 1998, 2010; Kaufman, 1996) and self-criticism (a self-to-self hostile relationship). Compassion postulates and forms the basis of interventions such as Compassion Focused Therapy (CFT) (Gilbert, 2010). Shame and self-criticism have been positively associated with test anxiety in adolescents (Cunha & Paiva, 2012; Pires et al., 2020). In turn, self-compassion has been noted as a protective factor against test anxiety (O’Driscoll & McAleese, 2022b), and compassion and CFT-based interventions have shown promising results in enhancing compassion and reducing test anxiety (O’Driscoll & McAleese, 2022a). Indeed, compassion-focused strategies are particularly relevant for addressing the shame and self-criticism often linked to test anxiety, as adolescents are especially vulnerable to these experiences due to heightened self-consciousness, social comparison, and public scrutiny of academic performance in secondary school (Arslan, 2018; Dan et al., 2014).

Mindfulness is often regarded as a transversal concept, namely to CFT and ACT, and has been widely studied as a way to learn to pay attention with flexibility, openness, and curiosity, consciously connecting with and engaging in whatever is happening in the present moment (internally and/or externally) to facilitate wise choices of action (Harris, 2019; Kabat-Zinn, 2005). Apart from its clinical applications, mindfulness is fundamentally rooted in contemplative traditions, where it is understood as a deliberate practice of training the mind to cultivate awareness and human flourishing (Dahl & Davidson, 2019). As such, mindfulness practices extend beyond the treatment of psychopathology and alleviation of suffering, encompassing both structured meditation exercises and informal integration into daily life activities (Hofmann et al., 2010). Mindfulness-based interventions teach individuals to approach internal experiences – such as emotions, sensations, and thoughts – as transient phenomena in the present moment, observed from a non-judgmental perspective. This is achieved through practices like concentrative meditation and mindful living (Kabat-Zinn, 1982, 1990; Segal et al., 2002). Therefore, mindfulness may be beneficial to help adolescents with test anxiety, as they often experience intrusive thoughts during evaluative situations, which distract them from the task at hand (Putwain et al., 2009; Sarason, 1987) and disrupt their connection to the present moment. Research has demonstrated the negative association of mindfulness with test anxiety (Cunha & Paiva, 2012), and mindfulness-based interventions for adolescents with test anxiety have been shown to improve emotion regulation (Chen et al., 2024; Jin et al.,

2024; Lindinger-Sternar et al., 2020; Yue et al., 2024). Furthermore, mindfulness principles and practices inform and are integrated into other contemporary therapeutic approaches, such as CFT (Gilbert, 2010) and ACT (S. C. Hayes et al., 1999).

Just as test anxiety evolves across adolescence (Torrano et al., 2020), the effectiveness and accessibility of these psychological processes may also vary by age and developmental stage, though findings remain mixed. Some studies suggest that mindfulness requires sustained attentional control, which continues to develop throughout adolescence (Warren et al., 2020), while self-compassion may be more challenging for younger adolescents due to heightened self-consciousness and social comparison tendencies (Bluth & Blanton, 2013). However, other research has found minimal effects of developmental stage on either mindfulness or self-compassion, suggesting that these processes may be accessible across adolescence (Tavares et al., 2024). Despite these innovations in understanding and intervening in test anxiety by incorporating acceptance, compassion, and mindfulness, to the best of our knowledge, an intervention that is simultaneously structured, manualized, conducted within a psychotherapeutic setting, focusing beyond symptom reduction, while enhancing these three competencies combined, remains a gap in the field.

The *AcAdeMiC: Acting with Acceptance, Mindfulness, and Compassion to Cope with Test/Exam Anxiety* is a recently developed, manualized online psychotherapeutic program rooted in acceptance, mindfulness, and compassion-based strategies for adolescents with high test anxiety. Its first version demonstrated promising feasibility and preliminary efficacy in a small group of adolescents, particularly in reducing test anxiety and psychological inflexibility while increasing self-compassion, acceptance, and psychological well-being (Pires et al., 2025). Recommendations from this feasibility study highlighted the importance of integrating compassion-informed content from the beginning and ensuring a compassionate framework throughout all sessions. A subsequent case study piloting this revised version showed clinical improvement and maintenance of gains over time (Pires et al., 2023). These findings align with existing research on the efficacy of acceptance, mindfulness, and compassion-based interventions for test anxiety in adolescents (e.g., Abdali et al., 2018; Jin et al., 2024; O’Driscoll & McAleese, 2022a).

As mentioned, the *AcAdeMiC* intervention integrates acceptance, mindfulness, and compassion-based strategies, which are grounded in contextual cognitive-behavioural therapies such as ACT and CFT. These approaches were selected for their strong theoretical and empirical support in addressing anxiety-related difficulties by targeting the function of psychological experiences – such as thoughts and emotions – rather than their content or frequency (S.

C. Gilbert, 2010; Hayes & Hofmann, 2021). While other programs, such as Compassionate Mind Training (Gilbert, 2010), Youth DNA-V (L. L. Hayes & Ciarrochi, 2015), and Mindful Self-Compassion (Germer & Neff, 2019), incorporate similar – albeit separate – components, the AcAdeMiC program is distinct in its focus on the unique challenges faced by adolescents with test anxiety. It specifically targets the interplay between test anxiety, academic performance, and adolescent development, addressing both the symptoms of test anxiety and its related processes (e.g., shame, self-criticism).

Given the positive feasibility indicators, a pilot study to further test the efficacy of AcAdeMiC is warranted. Key recommendations for this pilot study included incorporating a control group, implementing randomization procedures (Sundaram et al., 2022), and tracking changes not only from baseline to post-treatment/follow-up but also throughout the course of treatment. Monitoring progress in this way has been shown to improve outcomes (Lambert et al., 2003), enabling the identification of intermediate steps in therapeutic change and specific areas of improvement. Furthermore, in therapeutic approaches such as CFT, change is conceptualized as sequential, with later stages building upon earlier ones (Gilbert, 2010). To the best of our knowledge, no pilot trials have utilized such comprehensive methodologies to evaluate the efficacy of acceptance, mindfulness, and compassion-based strategies for addressing test anxiety in adolescents.

In the absence of such trials, to the best of our knowledge, and in light of recent data on feasibility, preliminary efficacy, and improvement recommendations for this demographic (Pires et al., 2025), this research entailed a pilot intervention that incorporates and implements these advancements. Therefore, this randomized pilot study aimed to test the efficacy of the AcAdeMiC program, seeking to establish the foundation for a larger-scale RCT. Specifically, it intended to (1) explore efficacy data, in the experimental group, concerning the course of test anxiety symptoms and related processes throughout the intervention, with self-reports and clinician reports as outcomes, and (2) assess the variance in the outcome measures in the experimental and control group (test anxiety and specific factors, shame, psychological well-being, self-criticism, psychological inflexibility, acceptance, mindfulness, and self-compassion), with assessments at T1 (baseline), T2 (post-intervention/12 weeks after randomization) and T3 (3-month follow-up/6 months after randomization). It was hypothesized that (1) self-reported and clinician-reported perceptions of change in test anxiety symptoms and related processes would decrease over the course of the intervention, and (2) *group x time* significant effects would be found for test anxiety, acceptance, mindfulness, and self-compassion, from T1 to T3.

Method

Participants

Eligibility criteria to participate in the study were (a) ages 13 to 18 years; (b) written informed consent from legal guardians and written assent from participants; (c) high levels of test anxiety (≥ 1 SD); (d) educational level between 9 and 12th grade; (e) absence of Neurodevelopmental Disorders, except mild Specific Learning Disorders; (f) absence of severe Depressive Disorder; (g) absence of other severe psychiatric conditions (e.g., Obsessive–Compulsive Disorder, Bipolar Disorder, Psychotic Disorders); (h) not currently undergoing any psychological intervention. Criterion (c) was confirmed via self-report and clinical interview, and criteria (e) to (g) via clinical interview. Recruitment took place between April and August 2021, targeting students in grades 9 through 12 for the upcoming academic year (2021/2022), with authorization from their legal guardians. Information was disseminated online, through advertisements and pages on Facebook and Instagram, which included a promotional video portraying realistic scenarios of an adolescent experiencing test anxiety, including preparing for a test, taking the test, and receiving the results. The video aimed to enhance potential participants' understanding of test anxiety and foster a sense of empathy, helping them decide whether to participate in the study. At the end of the video, the project was briefly outlined, and contact details were provided for interested students to reach out to the research team through their legal guardians. Legal guardians of interested adolescents who emailed the team were sent an informed consent form with all study information and phases.

Of the adolescents authorized to participate, some would not be in secondary school in the following year and were therefore excluded from the study. The remaining participants were first screened for eligibility with a test anxiety questionnaire administered through the LimeSurvey® platform (LimeSurvey GmbH, Hamburg, Germany). Those who scored at least one standard deviation above the mean on the Reactions to Tests for Portuguese Adolescents (Pires et al., 2025) were considered to have high test anxiety. Given the absence of an established clinical cutoff for test anxiety, a rule of thumb approach was applied based on the normal distribution, defining high test anxiety as scores one standard deviation above the mean. This method is widely used in psychological research when no predefined threshold exists, providing a statistical benchmark for identifying individuals who score notably above the sample average (e.g., Zhang et al., 2018).

Participants meeting this screening criterion underwent eligibility interviews, consisting of an instrument created by the authors for this project, to obtain a more detailed

description and understanding of test anxiety symptoms in each participant (Comprehensive Test Anxiety Interview; Pires et al., 2025) and the Mini-International Neuropsychiatric Interview for Children and Adolescents (MINI-KID; Sheehan et al., 2010; Portuguese version by Rijo et al., 2016). Adolescents who did not meet eligibility criteria in any phase were, when applicable, recommended to seek mental health services in their local area. Adolescents who fulfilled all eligibility criteria proceeded to baseline assessment.

Procedure

This study was a two-arm parallel pilot randomized trial (pilot-RCT), with participants allocated in a 1:1 ratio to either an experimental group (EG: intervention arm: receiving the AcAdeMiC – 12 sessions), or a waitlist control group (CG), that also received the intervention after the T3 (6 months after randomization) assessment.

Prior to the investigation, approval was obtained from the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra, Portugal, on November 28, 2019. The trial was registered on ClinicalTrials.gov (NCT04861116) and conducted in accordance with the Declaration of Helsinki (1964) and its later amendments. It was reported according to the extension of the Consolidated Standards of Reporting Trials (CONSORT) 2010 checklist for pilot trials (Eldridge et al., 2016), and the Template for Intervention Description and Replication (TIDieR) Checklist (T. C. Hoffmann et al., 2014). Online Resource 1 contains a completed CONSORT 2010 checklist. Parents/legal guardians provided written informed consent prior to the adolescents' participation, and all adolescents assented to participate.

Following eligibility confirmation, participants completed baseline assessment measures (T1). They were then randomly allocated to either the experimental group or the waitlist control group using an online randomization website (<https://www.randomizer.org/>). Outcome measures were administered online at three time points: baseline (T1), post-intervention/12 weeks after randomization (T2), and 3-month follow-up/6 months after randomization (T3), through the LimeSurvey® platform.

Participants in the experimental group received the sessions between November 2021 and February 2022, delivered via Zoom (Version 5.17.11) by one of two therapists with advanced training in compassion, acceptance, and mindfulness-based approaches for anxiety disorders in adolescents. Sessions were scheduled according to each participant's availability to avoid overlap with school hours. Participants were advised to attend sessions in a quiet and

private environment using a laptop, a web camera, a headset (preferably), and a stable internet connection.

In addition, in the experimental group only, weekly measures were collected throughout the intervention to assess participants' self-perceived changes in test anxiety and related variables, as well as therapists' impressions of weekly clinical improvement. These within-treatment measures were not administered to the control group, as no intervention was delivered during this period. Although it would have been technically possible to collect self-report data weekly from control participants, this was intentionally avoided to preserve the neutrality of the waitlist condition and prevent potential reactivity effects or participant frustration in the absence of therapeutic support. Participants in the waitlist control group received the sessions after the last assessment point (T3), from May to July 2022. The detailed study protocol is in Online Resource 2.

The creation of the AcAdeMiC: *Acting with Acceptance, Mindfulness, and Compassion to cope with Test/Exam Anxiety* stemmed from an extensive review of current literature, detailed in the Introduction section, and was led by a team of experts in anxiety disorders, adolescent psychology, Compassion-Focused Therapy (CFT), and/or Acceptance and Commitment Therapy (ACT). Many team members possess clinical expertise in evaluating and treating individuals with test/exam anxiety. The team underwent specialized training in compassion, acceptance, and mindfulness-based approaches, specifically adapted for adolescents with anxiety difficulties.

The AcAdeMiC is a structured online psychotherapeutic program tailored for adolescent students, comprising 12 individual weekly sessions, each lasting 90 min and conducted by a qualified therapist. The primary objectives are to reduce TA levels, enhance psychological well-being, and boost competencies in self-compassion, acceptance and mindfulness. Initially, a manualized draft underwent testing in a preliminary feasibility study (Pires et al., 2025). Insights from both qualitative and quantitative data collected during this testing phase were paramount for a revised version, implemented in this pilot study. In particular, this involved integrating compassion and CFT-informed content from the beginning, ensuring an inclusive compassionate layer throughout all sessions.

Participants were provided with a workbook accompanying the sessions, which includes summaries, exercises, and visual aids illustrating the program's core skills. Additionally, the program incorporated home practices (exercises and audio meditations also conducted during sessions). The structure followed a progressive approach to change, consisting of four modules. These modules covered core components, including: i) Psychoeducation on the nature of the mind in general, as well as anxiety and TA specifically, employing an evolutionary and contextual approach

to human experience and suffering; ii) Psychoeducation on fundamental concepts and skills such as mindfulness, acceptance, cognitive defusion, values, committed action, and self-compassion; iii) Mindfulness exercises aimed at cultivating present moment awareness and a non-judgmental attitude towards one's experiences, particularly concerning TA and academic performance; iv) Encouragement of an adaptive approach to learning, studying, and evaluative situations, emphasizing academic behaviour rooted in values and committed action, rather than solely focusing on performance and outcomes (which would only include correlates from the threat and/or the drive system, and experiential avoidance); v) Acceptance of difficult internal experiences (emotions, bodily sensations), and development of cognitive defusion skills to decrease avoidance patterns; vi) Promotion of a compassionate relationship with oneself, to counteract a relationship based on shame and self-criticism. An overview of the AcAdeMiC's modules, sessions, key messages and exercises/practices is presented in Online Resource 3.

Measures

Detailed information about the assessment instruments and timings is available in the protocol (Online Resource 2). To assess eligibility, the MINI-KID (Sheehan et al., 2010; Portuguese version by Rijo et al., 2016) was used. This structured clinical diagnostic interview evaluates a range of Axis I disorders in children and adolescents according to DSM-5 (American Psychiatric Association, 2022) criteria. It features diagnostic sections with "yes/no" questions, starting with screening questions before additional symptom inquiries.

Two sets of measures were used in this study: (1) within-treatment indicators, collected weekly throughout the 12-week program, and administered only to participants in the experimental group; and (2) outcome measures, collected at baseline (T1), post-intervention (T2), and 3-month follow-up (T3), and administered to both experimental and control groups.

Within-Treatment Measures (experimental group only)

The course of test anxiety symptoms and related processes was measured throughout the intervention using self-reports and clinician reports, adapted from existing measures, described below. Data from both sources were averaged for each intervention module (for an overview of these modules, see Online Resource 3).

Social Anxiety Session Change Index (SASCI; S. A. Hayes et al., 2008; Portuguese version by Figueiredo et al., 2021). This measure was adapted for test anxiety, including

seven items evaluating changes in test anxiety, avoidance, fear of negative evaluation, daily interference, cognitive fusion, mindlessness, and self-criticism, scored on a 7-point scale ranging from 1 (*much less than at the start of treatment*) to 4 (*not different from the start of treatment*) to 7 (*much more than at the start of treatment*), lower scores indicating higher improvement, and presented to participants at the beginning of sessions 2 through 12. At baseline, participants were asked the same items, relating to how they were feeling at that time, in a scale from 1 (*nothing*) to 4 (*moderately*) to 7 (*extremely*). The internal consistency of the SASCI in the original study ranged from 0.84 to 0.94 for each session. In the current sample, these values ranged from 0.85 α for the first intervention module. In the current sample, internal consistency ranged from $\alpha = 0.85$ and McDonald's $\omega = 0.81$ for the first intervention module (seven items¹) and McDonald's $\omega = 0.81$, to 0.97 α for the third intervention module (49 items). And .98 ω .

Clinical Global Impression Scale – Social Anxiety (CGI-SA; Zaidar et al., 2003; Portuguese version by Figueiredo et al., 2021). This measure is completed by clinicians to assess patients' symptoms, with two items: one measures the overall severity of symptoms over the past week, and the other the therapeutic improvement compared to baseline. It was adapted to test anxiety assessment and treatment. At baseline, therapists filled in the severity item and completed the improvement item weekly at the end of sessions 2 through 12. Severity is rated on a 7-point scale from *normal (no excessive symptomatology, no avoidance or interference)* to *very severe (severe avoidance or interference)*, and improvement is rated from *markedly improved* to *markedly worse*, lower scores indicating higher improvement. Reliability values were not computed due to the single-item nature of the measure.

Outcome Measures (both groups, at T1, T2, and T3)

The following self-report instruments were used to assess the efficacy of the program and were collected at all time points from both the experimental and control groups.

Reactions to Tests (RTT; Sarason, 1984; Portuguese version for adolescents by Pires et al., 2025). This scale assesses test anxiety levels using a 4-point Likert scale from 1 (*not at all typical of me*) to 4 (*very typical of me*), higher scores indicating higher levels of test anxiety. Although the original version comprised four factors (Tension, Worry, Test-Irrelevant Thinking and Bodily Reactions), the version used in this study (Pires, et al., 2025), excluded Irrelevant

¹ Data for the first intervention module considered only session 2, given that the instrument asks participants to report on their symptoms in comparison to before starting treatment.

Thinking, retaining the remaining three in a total of 18 items. The total and factors of the original version presented Cronbach's alphas between 0.68 and 0.81, and the version for Portuguese adolescents between 0.76 and 0.91. In the present study, internal consistency was good, with $\alpha=0.90$ and $\omega=0.89$ for the total scale; $\alpha=0.88$ and $\omega=0.89$ for Tension; $\alpha=0.82$ and $\omega=0.88$ for Worry; and $\alpha=0.71$ and $\omega=0.70$ for Bodily Symptoms.

External and Internal Shame Scale (EISS; Ferreira et al., 2022; Portuguese version for adolescents by Cunha et al., 2021). This measure consists of eight items, answered on a 5-point Likert scale from 0 (*never*) to 4 (*always*) that assess external shame, internal shame, and a global sense of shame. In this study, only the total score was used, and higher scores indicated greater shame. In the original version, Cronbach's alpha was $\alpha=0.89$; in the adolescent version, $\alpha=0.85$; and in the present sample, $\alpha=0.91$ and $\omega=0.91$. The temporal stability of the original version was $r=0.81$ ($p<0.001$).

Mental Health Continuum-Short Form (MHC-SF; Keyes, 2002; Portuguese version for adolescents by A. P. Matos et al., 2010). This scale measures general well-being in 14 items that assess the frequency with which one has experienced each symptom of positive mental health within the past month, rated on a 6-point Likert scale from 0 (*never*) to 5 (*everyday*). It includes three subscales: Emotional Well-Being, Social Well-Being, and Psychological Well-Being. Given the clinical focus of this study, only the Psychological Well-Being subscale was used. Cronbach's alpha was $\alpha=0.78$ in the original version, $\alpha=0.83$ in the Portuguese adolescent version, and $\alpha=0.82$ in the present study, with McDonald's $\omega=0.83$ in the present sample.

Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FSCRS; Gilbert et al., 2004; Portuguese version for adolescents by Silva & Salvador, 2011). This 22-item scale assesses the way people self-criticize (subscale Inadequate Self), self-attack (subscale Hated Self), or self-reassure (subscale Reassured Self) in the face of failure or setbacks. It is rated on a 5-point Likert scale from 0 (*not at all like me*) to 4 (*extremely like me*), higher scores indicating higher levels of self-criticism or the ability to self-reassure. In the present study, only the subscales Inadequate Self and Hated Self were used, combined into a single variable named self-criticism, as previously done by Gilbert et al. (2006). The original version showed Cronbach's alphas of 0.90 for Inadequate Self and 0.86 for Hated Self. The self-criticism composite score showed Cronbach's alpha of $\alpha=0.91$ in Gilbert et al.'s (2006) version and $\alpha=0.95$ in the present study, with McDonald's $\omega=0.95$ in the present sample.

Avoidance and Fusion Questionnaire for Youth (AFQ-Y; Greco et al., 2008; Portuguese version by Cunha & Santos, 2011). This 17-item scale measures psychological inflexibility, and adolescents answer each item on a 5-point

Likert scale from 0 (*not at all true*) to 4 (*very true*). Higher scores indicate higher levels of psychological inflexibility. Cronbach's alpha was $\alpha=0.90$ in the original version, $\alpha=0.82$ in the adolescent version, and $\alpha=0.88$ in the present study, with McDonald's $\omega=0.95$ in the present sample. The temporal stability of the adolescent version was $r=0.60$ ($p<0.001$).

Test Anxiety – Acceptance and Action Questionnaire for Adolescents (TA-AAQ-A; Pires et al., 2020). This 12-item unifactorial scale assesses psychological flexibility (Acceptance and Action) in test situations. Each item is rated on a 7-point Likert scale from 1 (*never true*) to 7 (*always true*), higher scores indicating higher levels of acceptance of test anxiety symptoms, and higher levels of action in the face of these symptoms. Items are reverse-scored due to their formulation. Cronbach's alpha was $\alpha=0.93$ in the original version and $\alpha=0.94$ in the present study, with McDonald's $\omega=0.94$ in the present sample. The temporal stability of the original version was $r=0.58$ ($p<0.01$).

Children and Adolescent Mindfulness Measure (CAMM; Greco et al., 2011; Portuguese version by Cunha et al., 2013). This is a 10-item scale measuring children and adolescents' awareness of the present moment, and non-judgmental and non-avoidant responses to internal experience. Participants respond on a 5-point Likert scale from 0 (*never*) to 4 (*always*). Items are reverse-scored due to formulation. Higher scores indicate higher mindfulness skills. Cronbach's alpha was $\alpha=0.80$ in both the original and Portuguese versions and $\alpha=0.85$ in the present study, with McDonald's $\omega=0.86$ in the present sample. The temporal stability of the adolescent version was $r=0.46$ ($p<0.001$).

Self-Compassion Scale (SCS; Neff, 2003; Portuguese version for adolescents by Cunha et al., 2016). This scale aims to measure self-compassion, defined as being receptive to one's own suffering, demonstrating care and kindness toward oneself, adopting a nonjudgmental attitude towards one's shortcomings, and acknowledging that one's experiences are part of universal human experience (Neff, 2003). It comprises 26 items in six subscales: Self-kindness, Self-judgement, Common Humanity, Isolation, Mindfulness, and Over-identification. Considering the statement "How I typically act towards myself in difficult times", respondents are asked to answer each item on a 5-point Likert scale from 1 (*almost never*) to 5 (*almost always*). The total score is computed as the sum of Self-kindness, Common Humanity, and Mindfulness subscales with the reverse scores of Self-judgement, Isolation, and Over-identification subscales. Higher scores indicate greater self-compassion. Only the total score was used in the present study. Cronbach's alpha was $\alpha=0.92$ in the original version and in the present study, and $\alpha=0.88$ in the Portuguese adolescent version, with McDonald's $\omega=0.90$ in the present sample.

Data Analysis

Statistical analyses were conducted with the Statistical Package for the Social Sciences (SPSS), version 25 (IBM Corp., 2017), R 4.3.2 (R Core Team, 2023), and the lme4 package (Bates et al., 2015). Descriptive statistics were used and comparison analyses were conducted for baseline data, between experimental and control groups. A total of 18 statistical comparisons were conducted at baseline: Mann–Whitney *U* or Kruskal–Wallis *H* for continuous variables and Fisher’s *Exact Test* (which exclusively reports the *p* value) for categorical variables (Field, 2024). Regarding effect sizes, for continuous variables, *r* was computed by dividing the absolute standardized test statistic *Z* by the square root of the number of observations (*N*) (Rosenthal, 1991). The magnitude of *r* was categorized as small (up to 0.30), intermediate (up to 0.50), and strong (above 0.50). For pairwise comparisons, Cohen’s *d* was used, with effect sizes interpreted as small (*d*=0.20), medium (*d*=0.50), and large (*d*=0.80) based on benchmarks suggested by Cohen (1988). Partial eta squared (η_p^2) was categorized as small (up to 0.06), medium (up to 0.13), and large (above 0.14) (Cohen, 1988). For categorical variables, reference values for Cramer’s *V* varied based on degrees of freedom: a small effect up to 0.29 (1df), 0.20 (2df), or 0.16 (3df); a medium effect up to 0.49 (1df), 0.34 (2df), or 0.28 (3df); and a large effect starting from 0.50 (1df), 0.35 (2df), or 0.29 (3df) (Cohen, 1988). Scale scores were computed as sums rather than means.

To examine the efficacy of the AcAdeMiC program, when possible, statistical analyses were performed in accordance with the intention-to-treat (ITT) principles following the CONSORT recommendations (Eldridge et al., 2016), i.e., all participants who completed the baseline assessment were included in the analyses regardless of availability of subsequent assessments (dropouts and non-dropouts) or full completion of the program (completers and non-completers). To assess the perception of self-reported and therapist-reported clinical improvement throughout treatment in the experimental group, two repeated measures ANOVAs were conducted, with intervention modules as the within-subject factor with four levels (module 1, module 2, module 3 and module 4). Greenhouse–Geisser correction was applied when the sphericity assumption was not fulfilled according to Mauchly’s Test. Post hoc comparisons were conducted for differences between improvement means across modules (Bonferroni corrected with the statistical significance level accepted at $p < 0.05$).

To analyze intervention effects over time, 11 linear mixed models (LMMs) were performed – one for each outcome variable – using the restricted maximum likelihood method and the compound symmetry covariance structure.

The missing at-random assumption was checked using Little’s test, which has to be non-significant. Participants were included as a random intercept to account for the repeated-measures structure of the data. The time variable was coded as a categorical variable with three assessment points: baseline (T1) coded as 0, post-intervention (12 weeks after randomization; T2) coded as 1, and 3-month follow-up (6 months after randomization; T3) coded as 2, with baseline specified as the reference category. Group was coded as 0 (control) and 1 (intervention). Fixed effects included time, group, and the time $\times$ group interaction. Omnibus Type III tests of fixed effects were used to evaluate whether overall trajectories differed between groups across the assessment period. Within this framework, effects associated with T2 and T3 correspond to baseline-referenced contrasts, indicating whether change from baseline differed between groups at post-intervention and follow-up. To aid interpretation of these baseline-referenced effects, model-based parameter estimates (*b*), standard errors, and 95% confidence intervals were reported for the contrasts post-intervention versus baseline and 3-month follow-up versus baseline. These estimates indicate when changes emerged and whether they were maintained over time, which is relevant in psychotherapy research, where change has often been assumed to be gradual and linear, although other temporal patterns have been described, including trajectories that may accelerate, decelerate, or level off (A. M. Hayes et al., 2007).

To further explore specific differences at each time point, pairwise comparisons were conducted to probe the temporal pattern of change when supported by the mixed-effects framework, determining whether the experimental and control groups differed at post-intervention (T2) and follow-up (T3). These comparisons were used for interpretative purposes and were not intended as independent tests of intervention efficacy.

Post hoc power analyses were conducted for transparency purposes. For the repeated-measures ANOVAs assessing self- and therapist-reported improvement across intervention modules, power was estimated using G*Power 3.1 (Faul et al., 2009), based on the observed effect sizes, average correlations among repeated measures, Greenhouse–Geisser epsilon, and a significance level of $\alpha = 0.05$. The achieved power was > 0.99 for self-reported improvement ($n = 15$) and 0.39 for therapist-reported improvement ($n = 2$). For the linear mixed models evaluating group $\times$ time effects, post hoc power analyses were conducted using GLIMMPSE v3.1.3 (Kreidler et al., 2013), based on observed means, variances, and correlations among repeated measures, using the Hotelling–Lawley Trace test and controlling the Type I error rate at 5%. The estimated power to detect group $\times$ time interaction effects with the available sample ($n = 34$) was 0.81.

Because post hoc power estimates are mathematically dependent on the observed effect sizes and *p*-values, they

should be interpreted with caution and were not used to guide the interpretation of results (Althouse, 2020).

Although the initial sample size consisted of 17 participants in the experimental group and 18 in the control group, repeated measures ANOVAs assessing efficacy throughout treatment included only the experimental group completers ($n=15$) due to missing follow-up data. In contrast, linear mixed models (LMMs) analyses included all randomized participants, under the missing completely at random (MCAR) assumption confirmed by Little's test.

Results

Participant Flow

Figure 1 shows the flow of participants through the study. Initially, the legal guardians of 251 adolescents contacted the team. These adolescents attended schools from all regions across mainland Portugal and the two islands. Of those, 122 were excluded for not being enrolled in secondary school the following year, not returning the consent form, or declining to proceed in the study. Of the 129 screened through the test anxiety measure, only 49 progressed to the next phase, as 60 did not score high on the screening measure, and the remainder did not respond or withdrew. Out of the adolescents who underwent the eligibility interview, 35 proceeded to complete the baseline assessment and were randomly assigned to either the AcAdeMiC intervention ($n=17$) or the waitlist control group ($n=18$). In the experimental group, 15 participants attended all the sessions, and two completed only part of the sessions ($<80\%$ attendance, *non-completers*). At T2 (post-intervention/12 weeks after randomization), two participants did not complete the assessment in the intervention group (the same two non-completers), and one in the control group. At T3 (3-month follow-up/6 months after randomization), two participants did not complete the assessment in the control group. The retention rate was 91.43% at T2, and 85.71% at T3, with no significant differences in losses to follow-up between the two groups, at either time point [EG T2: $n=15$ (T1=17), vs CG T2: $n=17$ (T1=18); *Fisher's Exact Test* $p=0.60$, Cramer's $V=0.11$; EG T3: $n=15$ (T1=17), vs CG T3: $n=15$ (T1=18); *Fisher's Exact Test* $p=1.00$, Cramer's $V=0.07$]. Attrition rate considering participants randomized to both groups ($n=35$) was 14.29% ($n=5$ lost at T3). Regarding reasons for dropping out, the two participants in the intervention group claimed lack of time to continue with the study, and the three participants in the control group did not return contact.

Online Resource 4 shows the participants' sociodemographic, academic and clinical characteristics, and scores in outcome measures, at baseline, with no mean differences found between the experimental group and control

group. Due to the reduced and unequal sample sizes, making meaningful comparisons between completers ($n=15$) and non-completers ($n=2$), between dropouts ($n=5$) and non-dropouts ($n=30$), and between therapists who conducted the sessions ($n=13$ vs $n=4$) was not feasible.

Efficacy Throughout Treatment

The repeated measures ANOVA analyses assessing efficacy throughout treatment were conducted only in the experimental group. Consistent decreases in the mean of severity of symptomatology were observed for both self-reported and therapist-reported improvement (Online Resource 5). Of the initial 17 participants, only 15 completers with complete data were included in the analysis for self-reported improvement due to missing follow-up data. Results revealed a significant change throughout the course of treatment with a large effect size, $F(1,808)=18.27$, $p<0.001$, $\eta_p^2=0.57$, indicating that participants perceived their symptoms were progressively decreasing throughout the program. Post hoc pairwise comparisons revealed significant differences in mean scores between all pairs of modules (with medium to large effect sizes), except for the difference between the third and fourth modules (see Online Resource 5). Regarding therapist-reported improvement, change was also significantly different throughout the course of treatment with a large effect size, $F(1,912)=26.81$, $p<0.001$, $\eta_p^2=0.66$, meaning that therapists perceived that the severity of participants' symptoms was progressively decreasing throughout the program. Post hoc pairwise comparisons revealed significant differences in mean scores between all pairs of modules (with medium to large effect sizes), except for the difference between the first and second modules (see Online Resource 5).

Outcome Measures

Before conducting the Linear Mixed Models analysis, Little's test, $\chi^2=49.33$, $p=0.69$ indicated that the assumption of missing completely at random was plausible. Therefore, all randomized participants were included in these analyses (17 in the experimental group and 18 in the control group). A significant group $\times$ time interaction was observed for test anxiety (total score), reflecting greater reduction from baseline to the 3-month follow-up in the experimental group compared to the control group, $b=-6.37$, 95% CI $[-11.75, -1.00]$, with a small effect size ($d=0.40$). A comparable pattern was observed for the tension ($b=-3.99$, 95% CI $[-6.44, -1.54]$) and worry ($b=-3.41$, 95% CI $[-5.50, -1.32]$) components of test anxiety, both showing medium effect sizes ($d=0.55$). In addition, a significant group $\times$ time interaction was found for self-compassion, indicating greater improvement from baseline to post-intervention in the

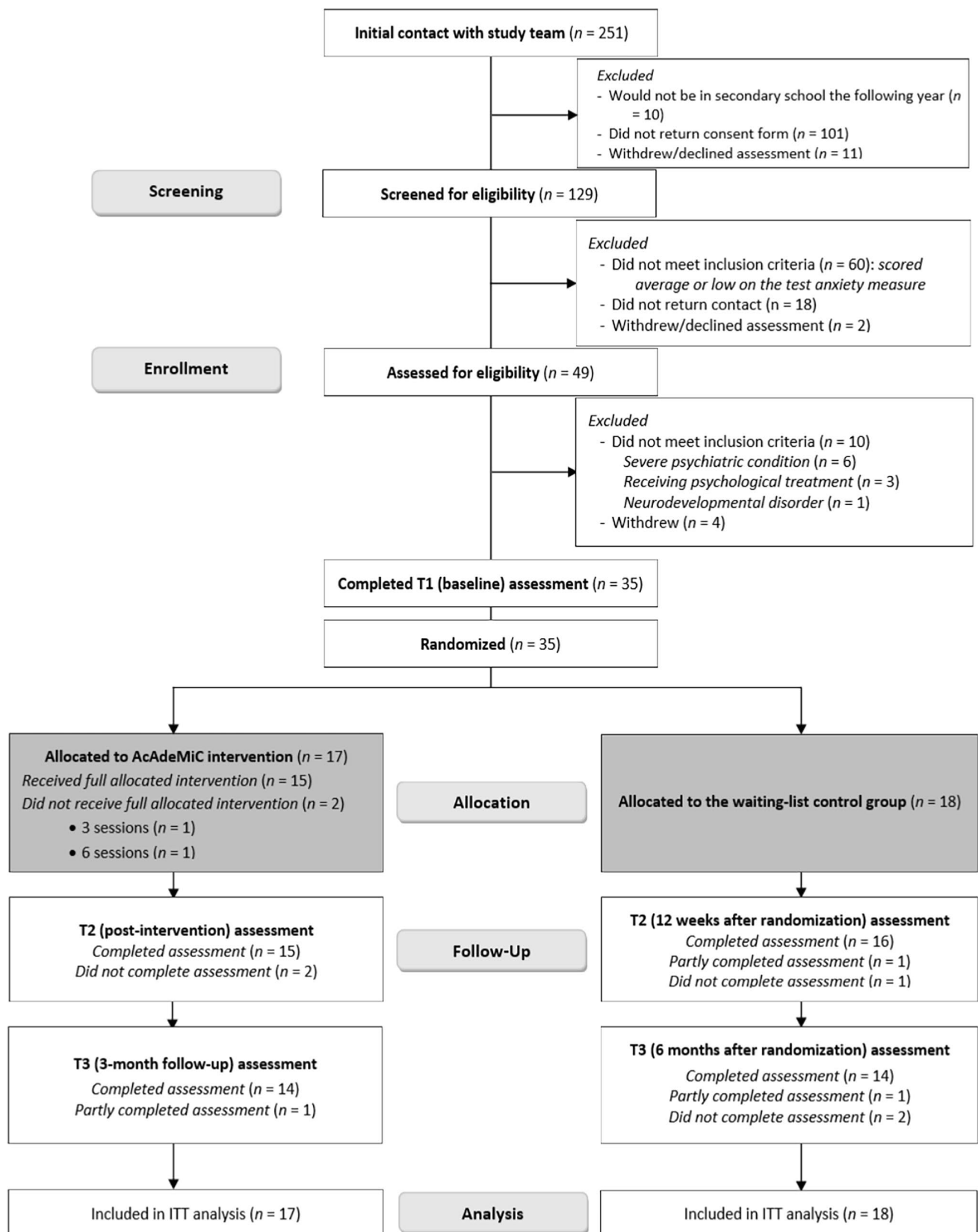


Fig. 1 Participants' flow chart

experimental group relative to the control group, $b = 9.15$, 95% CI [1.21, 17.09], with a small effect size ($d = 0.40$). Further details regarding outcome measures variance are provided in Table 1. No other group $\times$ time interaction effects reached statistical significance across the remaining outcome measures.

Trajectories of test anxiety and self-compassion outcomes, based on the mean estimates and errors derived from Linear Mixed Models (LMMs), are depicted in Fig. 2.

Pairwise comparisons were conducted to examine specific differences between the EG and CG at each time point, providing a more detailed understanding of the intervention's effects over time. These revealed significant differences between the EG and CG (with improvements in the EG) in the tension factor of test anxiety at T3 (*mean difference* = 3.45, $p = 0.045$, $d = 0.37$), with a small effect size, and in self-compassion at T2, with a medium effect size (*mean difference* = 14.79, $p = 0.009$, $d = 0.50$).

Discussion

In light of recent advancements in the feasibility and preliminary effectiveness of the AcAdeMiC program, this pilot randomized trial aimed to assess its efficacy from baseline to the 3-month follow-up (6 months after randomization). Specifically, it aimed to explore improvement over the course of treatment, with self-reports and clinician reports, and to assess the variance of the outcome measures. This study sought to be the foundation for a larger-scale RCT.

Beginning with participant recruitment, it is noteworthy that, due to the online nature of the recruitment process, it was possible to engage participants from all regions of Portugal, including both mainland and island regions. This approach enabled the capture of a geographically diverse sample of the Portuguese adolescent population during the initial phase of the study. This method of recruitment has proven successful in mental health research involving adolescents (Amon et al., 2014; S. H. Hoffmann et al., 2022), while also being cost-effective (Sanchez et al., 2020). However, less than 20% of adolescents who initially contacted the team enrolled in the study, progressing to the interview phase, as the remainder were excluded for not meeting inclusion criteria. This mirrors findings from Moreno et al. (2017), indicating that in-person recruitment, particularly in schools, is more effective and enables the recruitment of a larger number of participants. In fact, the feasibility study conducted by Pires et al. (2025) initially relied on school recruitment but later shifted to online methods due to the COVID-19 pandemic, resulting in a loss of participants during the transition. Therefore, although online recruitment might capture more participants at the beginning, its efficacy in retaining participants for clinical samples, particularly

among adolescents, might be especially challenging, contrasting with the concentrated accessibility afforded by school-based recruitment methodologies.

From the participants who initially contacted the team, 19.52% displayed elevated levels of test anxiety when compared to normative data (Pires et al., 2025). It is important to note that test anxiety currently lacks specific diagnostic criteria (American Psychiatric Association, 2022). Thus, this information adds valuable insights to the prevalence data of test anxiety in adolescents. The attrition rate among participants randomized to both experimental and control groups ($n = 35$), which stood at 14.29%, falls below the reference threshold of 20% identified as posing a risk to internal validity (Marcellus, 2004; Schulz & Grimes, 2002).

In terms of efficacy throughout treatment, both self-reported and clinician-reported perceptions of change in test anxiety symptoms and related processes generally decreased over the course of the intervention, offering preliminary support for hypothesis 1, and suggesting that the program's efficacy may follow a sequential pattern of change, akin to approaches such as Compassion Focused Therapy (Gilbert, 2010). Self-reported improvement was progressively observed, indicating that participants perceived a consistent decrease in their symptoms throughout the program. Noticeable changes occurred between all pairs of modules (with medium to large effect sizes), except between the third and fourth modules. While the fourth module consisted of only one session, and thus offered limited opportunity for further progress, we acknowledge that this may not fully explain the lack of significant change from module 3. A more plausible explanation may be that the short time frame between these two points (i.e., only one session apart) limited the window for participants to experience and report meaningful symptom improvement.

Therapist-reported improvement also revealed a steady decrease in symptoms, suggesting consistent changes in test anxiety symptoms and related processes. That is, therapists perceived that the severity of participants' symptoms progressively decreased throughout the program. Significant changes were noted between all pairs of modules (with medium to large effect sizes), except between the first and second modules. Interestingly, while participants reported significant improvement between modules 1 and 2, therapist-rated change in this same interval did not reach statistical significance. This discrepancy may reflect differences in the nature and focus of each measure: participants reported on internal experiences and perceived emotional shifts, whereas therapists may have based their ratings on observable behavior and clinical benchmarks, which often require more time to emerge. It is also possible that the two informants captured distinct but complementary aspects of therapeutic progress, underscoring the value of using multiple perspectives in clinical assessment.

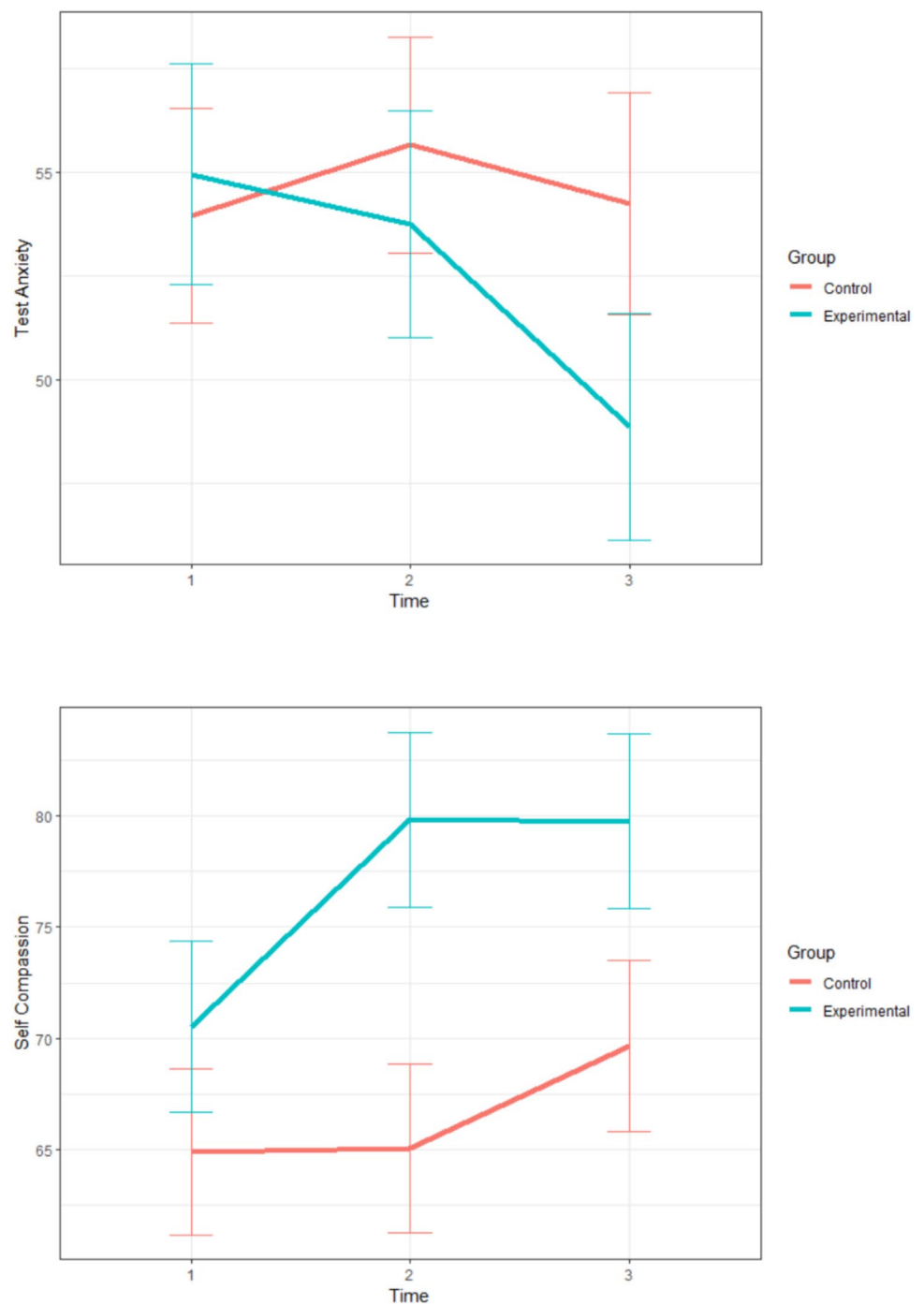
Table 1 Estimated marginal means and fixed effects for outcome measures

Outcome measures	Group	Time 1 <i>M</i> (<i>SE</i>)	Time 2 <i>M</i> (<i>SE</i>)	Time 3 <i>M</i> (<i>SE</i>)	<i>F</i> (<i>p</i>) Time x Group	Estimates of Fixed Effects	<i>b</i> (<i>SE</i>)	Confidence Interval 95%	<i>p</i>	<i>d</i>
Test Anxiety (RTT)	Intervention	54.94 (2.65)	53.73 (2.73)	48.86 (2.73)	2.81 (0.07)	Time 2 × Group	−2.91 (2.63)	[−8.17, 2.35]	0.27	0.19
	Control	53.94 (2.58)	55.64 (2.61)	54.24 (2.67)		Time 3 × Group	−6.37 (2.69)	[−11.75, −1.00]	0.02*	0.40
Tension	Intervention	23.82 (1.17)	22.88 (1.20)	19.68 (1.20)	5.80 (0.005)	Time 2 × Group	−0.84 (1.20)	[−3.24, 1.56]	0.49	0.12
	Control	23.28 (1.13)	23.18 (1.15)	23.13 (1.18)		Time 3 × Group	−3.99 (1.23)	[−6.44, −1.54]	0.002**	0.55
Worry	Intervention	20.71 (0.91)	19.15 (0.94)	17.48 (0.94)	5.38 (0.007)	Time 2 × Group	−1.90 (1.02)	[−3.94, 0.15]	0.07	0.32
	Control	19.83 (0.88)	20.17 (0.89)	20.02 (0.92)		Time 3 × Group	−3.41 (1.05)	[−5.50, −1.32]	0.002**	0.55
Bodily Symptoms	Intervention	10.41 (0.89)	11.68 (0.92)	11.68 (0.92)	0.67 (0.51)	Time 2 × Group	−0.26 (1.04)	[−2.34, 1.82]	0.80	0.04
	Control	10.83 (0.86)	12.36 (0.89)	11.17 (0.90)		Time 3 × Group	0.93 (1.06)	[−1.20, 3.05]	0.39	0.15
Shame (EISS)	Intervention	11.47 (1.80)	9.62 (1.84)	12.26 (1.86)	2.18 (0.12)	Time 2 × Group	−2.79 (1.62)	[−6.03, 0.44]	0.09	0.29
	Control	13.44 (1.75)	14.38 (1.78)	13.84 (1.82)		Time 3 × Group	0.39 (1.68)	[−2.97, 3.75]	0.82	0.04
Psychological Well-Being (MHC-SF)	Intervention	17.47 (1.44)	17.94 (1.50)	17.67 (1.50)	0.83 (0.44)	Time 2 × Group	1.25 (1.82)	[−2.40, 4.89]	0.50	0.12
	Control	16.67 (1.40)	15.89 (1.43)	18.04 (1.48)		Time 3 × Group	−1.17 (1.86)	[−4.89, 2.55]	0.53	0.04
Self-Criticism (FSCRS)	Intervention	22.41 (3.13)	19.08 (3.21)	17.88 (3.24)	0.76 (0.47)	Time 2 × Group	−3.49 (2.83)	[−9.15, 2.18]	0.22	0.21
	Control	30.06 (3.05)	30.22 (3.10)	27.07 (3.13)		Time 3 × Group	−1.54 (2.90)	[−7.35, 4.26]	0.60	0.09
Psychological Inflexibility (AFQ-Y)	Intervention	38.77 (3.26)	28.88 (3.36)	31.24 (3.41)	1.64 (0.20)	Time 2 × Group	−6.23 (3.57)	[−13.39, 0.92]	0.09	0.30
	Control	43.72 (3.16)	41.07 (3.25)	37.61 (3.30)		Time 3 × Group	−1.42 (3.66)	[−8.75, 5.91]	0.70	0.07
Acceptance of Test Anxiety (TA-AAQ-A)	Intervention	33.12 (4.09)	43.25 (4.21)	47.79 (4.21)	2.19 (0.12)	Time 2 × Group	7.12 (4.19)	[−1.27, 15.52]	0.10	0.29
	Control	34.06 (3.98)	37.07 (4.07)	40.72 (4.12)		Time 3 × Group	8.00 (4.24)	[−0.49, 16.50]	0.06	0.33
Mindfulness (CAMM)	Intervention	20.06 (1.81)	22.80 (1.89)	25.09 (1.93)	1.01 (0.37)	Time 2 × Group	0.67 (2.28)	[−3.88, 5.23]	0.77	0.05
	Control	17.11 (1.77)	19.18 (1.83)	18.96 (1.86)		Time 3 × Group	3.19 (2.33)	[−1.48, 7.86]	0.18	0.24
Self-Compassion (SCS)	Intervention	70.53 (3.83)	79.83 (3.95)	79.76 (3.95)	2.66 (0.08)	Time 2 × Group	9.15 (3.97)	[1.21, 17.09]	0.03*	0.40
	Control	64.89 (3.73)	65.04 (3.77)	69.65 (3.87)		Time 3 × Group	4.47 (4.06)	[−3.64, 12.59]	0.27	0.19

M = mean; *SE* = standard error; RTT = Reactions to Tests; EISS = External and Internal Shame Scale; MHC-SF = Mental Health Continuum-Short Form; FSCRS = Forms of Self-Criticizing/Attacking and Self-Reassuring Scale; AFQ-Y = Avoidance and Fusion Questionnaire for Youth; TA-AAQ-A = Test Anxiety – Acceptance and Action Questionnaire for Adolescents; CAMM = Children and Adolescent Mindfulness Measure; SCS = Self-Compassion Scale

p* < 0.05, *p* < 0.01

Fig. 2 Intervention and control group trajectories for test anxiety and self-compassion scores from T1 (Baseline) to T3 (3-month follow-up/6 months after randomization) (based on mean estimates and error bars from linear mixed models)



When examining efficacy data from T1 to T3, significant group $\times$ time effects were observed for test anxiety and self-compassion. Specifically, the experimental group showed greater reductions in test anxiety from baseline to follow-up and greater increases in self-compassion from baseline to post-intervention compared to the control group. Although the effect sizes were small, this finding partially supports hypothesis 2 and underscores the efficacy of the AcAdeMiC program in addressing these two variables. This outcome is

not unexpected, as test anxiety represents the primary outcome while self-compassion is a key process emphasized in the program. The observed efficacy is likely influenced by adjustments made to the program structure based on recommendations from the feasibility study (Pires et al., 2025) particularly the inclusion of compassionate content from the outset and the integration of a compassionate approach throughout all sessions. These results also build upon prior interventions demonstrating reductions in test anxiety

and improvements in self-compassion among adolescents (O'Driscoll & McAleese, 2022a). Still, it is important to note that self-compassion was only significant at T2. First, self-compassion is a multi-faceted construct that may require continued practice and reinforcement beyond the intervention period to become fully integrated into an individual's coping strategies (Gilbert, 2010, 2022a; Neff, 2003). Some participants may have experienced initial improvements due to the structured nature of the intervention but required further consolidation over time. Conversely, others may have taken longer to internalize these skills, leading to delayed but more stable effects at follow-up. Second, fluctuations in self-compassion could be influenced by external academic pressures (e.g., exams, school workload), which vary across the academic year and may have differentially impacted participants at post-intervention and follow-up assessments. Although the observed group $\times$ time effects for test anxiety and self-compassion support the potential efficacy of the AcAdeMiC program, these findings should be interpreted with caution due to the small sample size and the exploratory nature of the study.

Limitations and Future Directions

This study has several limitations. Firstly, the relatively small sample size restricts the generalizability of the findings to the broader population. Consistent with the pilot nature of this trial, the present findings should be interpreted as preliminary. Future research should therefore build on these results by conducting adequately powered, larger-scale randomized controlled trials, potentially including additional cohorts, to more robustly estimate effect sizes and evaluate intervention efficacy. Also, although the sample was recruited online during pandemic constraints, school-based recruitment may be a preferable alternative for recruiting adolescents, especially for clinical studies (Moreno et al., 2017). While the online recruitment strategy allowed for broader geographic representation, the sample may not fully reflect the national youth population, particularly in terms of socioeconomic background, educational level, and digital access. This limits the generalizability of findings. Future large-scale RCTs should employ stratified recruitment strategies to ensure a more representative sample and address potential barriers to participation. Another limitation is the use of an arbitrary cutoff for high test anxiety, as no standardized clinical threshold exists. While the one standard deviation rule is commonly employed in psychological research, it remains a statistical rather than clinical criterion, which may limit the generalizability of findings. Future research should explore alternative classification methods, potentially incorporating norm-referenced data or diagnostic validation to establish more precise thresholds for high test

anxiety. However, participant dropout remains a limitation, as some individuals did not complete all assessments.

The absence of participant blinding regarding their assigned condition poses a specific challenge in psychology intervention studies, given participants' typical awareness of their treatment group status (Juul et al., 2021). The introduction of an active control group might help mitigate this challenge, preserving participant blinding and retention in the control group, while improving the study's reliability (Guidi et al., 2018). Moreover, while efforts were made to determine whether dropout was related to the intervention, future studies should implement additional retention strategies and explore potential patterns of missingness to strengthen the validity of findings. Another limitation is the lack of consideration for potential developmental differences in test anxiety, mindfulness, self-compassion, and acceptance across adolescence. Test anxiety itself evolves throughout adolescence, with studies suggesting it may decrease as cognitive and emotional regulation improve or increase due to rising academic pressures (Torrano et al., 2020). Similarly, mindfulness and self-compassion may develop alongside cognitive and emotional maturation (e.g., Bluth & Blanton, 2013; Warren et al., 2020), but findings on their developmental trajectories remain mixed. Future studies should examine whether age moderates the relationships between these mechanisms and test anxiety, helping to determine whether interventions should be adapted to different stages of adolescence for greater effectiveness.

Additionally, the efficacy analyses throughout treatment were conducted solely within the experimental group due to incomplete data in the control group for these measures. Future studies should incorporate similar analyses in both groups to enable more rigorous comparisons and better evaluate the differential efficacy of the intervention. The potential impact of multiple comparisons is another limitation of this study, as analyzing several dependent variables increases the risk of Type I errors. While the use of Linear Mixed Models (LMMs) inherently account for within-subject dependencies, future research should consider applying statistical adjustments to further control for multiple comparisons. Additionally, replication with larger samples will help refine outcome measures and ensure the robustness of the findings. Moreover, significant effects for some variables were observed at different time points (e.g., self-compassion), raising questions about the stability of these changes over time. While improvements were detected, it remains unclear whether these improvements are sustained, decline, or evolve post-intervention. Future research should incorporate longer-term follow-up assessments to better understand the trajectory of these changes and determine the durability of the intervention's effects. Finally, future research should investigate mediation effects to better understand the underlying mechanisms of change driving the intervention's

effects by employing larger samples and rigorous longitudinal mediation analyses, comparing control with experimental groups. This would clarify how key components such as self-compassion, mindfulness, and acceptance contribute to reductions in test anxiety and related outcomes. Due to the small sample size of each group in this study, mediation analyses were not feasible (Fritz & MacKinnon, 2007).

In conclusion, this study demonstrated the efficacy of the AcAdeMiC program in managing test anxiety symptoms and related psychological processes over the course of treatment. Specifically, it was effective in reducing test anxiety while enhancing self-compassion. These findings lay the groundwork for a larger-scale randomized controlled trial, further informing the program's efficacy and refinement.

Beyond its efficacy, the AcAdeMiC program holds significant clinical implications. As a manualized intervention, it can be replicated by researchers and trained therapists in both in-person and online settings and adapted for individual or group use. Unlike interventions that solely focus on reducing anxiety symptoms or improving academic performance, the AcAdeMiC emphasizes adolescent well-being, helping teens develop a healthier relationship with themselves, the learning process, and schoolwork. By integrating acceptance, mindfulness, and self-compassion, the program shifts the focus from performance-driven anxiety reduction to enhancing emotional resilience and self-care in academic contexts. Moreover, these findings suggest that test anxiety interventions should extend beyond individual treatment to influence broader educational practices and policies. Schools, educators, and national education entities might incorporate well-being-centered approaches into their systems, while parents and teachers could adopt more supportive attitudes toward academic pressure. This aligns with research advocating for reducing emotional stress in academic settings by minimizing threat cues in assessments (Segool et al., 2013), promoting growth mindsets (Dweck, 2007), reducing excessive competition (Hughes & Coplan, 2018), and fostering mastery-based learning environments (Putwain et al., 2010). By integrating these strategies, schools and national education systems can create a more supportive, psychologically safe environment that empowers students to manage test anxiety more effectively while promoting their overall mental health and well-being (Casady & Thomas, 2020). This study provided strong evidence for the importance of contextual and biopsychosocial approaches to test anxiety intervention, highlighting the potential of acceptance, mindfulness, and self-compassion as essential psychological tools for adolescent academic and emotional resilience.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12671-026-02816-8>.

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Data Availability The data that support the findings of this study are available on request from the corresponding author, CPP. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Declarations

Ethics Statement This study was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra (CEDI28.11.2019) and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The trial was registered on ClinicalTrials.gov (NCT04861116).

Informed Consent Statement All legal guardians gave their informed written consent, and all adolescent participants gave their written informed assent, before participating in the study.

Use of Artificial Intelligence Artificial intelligence tools were used for language editing and to improve clarity of the manuscript. The authors take full responsibility for the content of this manuscript.

Conflict of interest The authors declare that they have no conflict of interest.

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