Behaviour Research and Therapy 175 (2024) 104498

Contents lists available at ScienceDirect

Behaviour Research and Therapy

journal homepage: www.elsevier.com/locate/brat

Daily micropractice can augment single-session interventions: A randomized controlled trial of self-compassionate touch and examining their associations with habit formation in US college students

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ARTICLE INFO

Keywords:
Self-compassion
Mindfulness
Psychopathology
Habit formation
Single-session

ABSTRACT

In this pre-registered study, we evaluated the effects of a single-session, self-guided intervention, leveraging daily micropractice (≤20 seconds/day practice) of self-compassionate touch to enhance self-compassion. We randomly assigned undergraduates (N = 135) to one of two conditions: a single-session intervention in which they were taught self-compassionate touch or a finger-tapping active control. Then, we instructed them to practice for 20 seconds/day for one month. At baseline (T1) and one-month follow-up (T2), participants completed assessments of self-compassion, growth mindset, positive affect, stress, psychopathology, habit formation, and more. In confirmatory, intention-to-treat analyses ($N = 135$), we found no significant effects on these outcomes. However, in confirmatory, per-protocol analyses (comparing the subsets from each condition who practiced>28 times, $N = 45$), self-compassionate touch, relative to active control, predicted T1-to-T2 increases in self-compassion ($\beta = 0.71$, $p = .025$), and reductions in stress ($\beta = -0.62$, $p = .047$) and psychopathology ($\beta = -0.61$, $p = .046$). In exploratory intention-to-treat analyses (N = 135), we found the same pattern of effects as in the per-protocol analyses among those who practiced self-compassionate touch more frequently relative to active control. We discuss factors associated with habit formation of daily practice. Daily micropractices have the potential for augmenting single-session interventions and for offering help when more time-intensive approaches may be less accessible.

Clinical trial registration number: NCT05199779.

Accumulating evidence indicates that high self-compassion is associated with a variety of positive outcomes, including increased growth mindset, authenticity, and positive affect, and reduced stress and psychopathology (Breines & Chen, 2012; Ferrari et al., 2019; Neff et al., 2007; Zhang et al., 2019). In addition, increased self-compassion may at least partially explain the effect of certain interventions (e.g., social support and mindfulness-based stress reduction) on psychological outcomes (Evans et al., 2018; Maheux & Price, 2016). Furthermore, randomized-controlled trials suggest that self-compassion is modifiable (Ferrari et al., 2019). Neff and Germer (2017) write that "self--compassion is simply compassion directed inward" (p. 371). The key components of self-compassion include recognizing suffering, understanding suffering is part of being human, emotionally connecting with the suffering, being able to sit with uncomfortable feelings, and acting to alleviate one's suffering (Dodson & Heng, 2022; Gu et al., 2020; Muris et al., 2022; Muris & Otgaar, 2020; Strauss et al., 2016).

Unfortunately, existing self-compassion interventions (e.g., Mindful Self-Compassion program, compassion-focused therapy, Gilbert, 2014; Neff & Germer, 2013), although effective, can be time-intensive, ranging from 1 to 20 contact hours, plus 2.5–40 practice hours (Ferrari et al., 2019). For many, such longer time commitments are neither feasible nor affordable. Yet, over half of people with psychological disorders or symptoms in the U.S. go without treatment each year—costing the U.S. economy over $300 billion every year due to productivity losses from

Abbreviations: SCT, Self-Compassionate Touch; AC, Active Control; T1, Baseline; T2, one-month follow-up; ITT, Intention-to-Treat (N = 135); PP, Per-protocol (those who practiced>28 times, $N = 45$); SOCS–S, Sussex-Oxford Compassion for the Self Scale; SRBAI, Self-Report Behavioral Automaticity Index; CI, (95%) Confidence Interval; DSM-5, The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition.

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https://doi.org/10.1016/j.brat.2024.104498
Received 10 March 2023; Received in revised form 12 February 2024; Accepted 20 February 2024
Available online 21 February 2024

untreated psychological distress (Gillison & Keller, 2021; Substance Abuse and Mental Health Services Administration, 2020). Even for those able to access treatment, dropout remains high, and the modal number of sessions attended is one (Hoyt et al., 2018). For college students, attitudinal barriers to treatment, such as stigma and preferences to solve problems on one's own, are prevalent (Ebert et al., 2019), yet high self-compassion predicts treatment seeking in college students (Dschaak et al., 2019). In this study, we evaluated whether a brief, single-session, self-guided intervention, leveraging daily micropractice (≤20 s/day personal practice) of self-compassionate touch would reduce psychological distress and boost self-compassion and other positive outcomes in college students.

Investigators have called for leveraging new technologies to increase the reach and access of interventions through "disruptive innovation": to redesign them based on their most potent elements to meet the needs of more people in less time at a lower cost (Dimidjian & Segal, 2015; Rotheram-Borus et al., 2012). One such innovation could be micropractices. Micropractices consist of small units of training that are parsimoniously based on the most potent elements of therapeutic practices and can be accessed with minimal burden. This not only lessens the barrier to entry but also the time and commitment needed for meaningful benefits (Baumel et al., 2020). Compared to longer practices (e.g., sitting meditation), some evidence suggests briefer contemplative practices (e.g., micropractices) might exhibit stronger reductions in stress and comparable decreases in psychopathology among novice practitioners (Manigault et al., 2021; Strohmaier et al., 2021), as well as fewer adverse effects (e.g., traumatic re-experiencing, difficulty sleeping; Goldberg et al., 2021), suggesting micropractices could serve as an accessible first-line intervention. Self-compassionate touch is one promising micropractice that has been shown to reduce salivary cortisol and speed return to baseline following a stress induction task after performing the exercise just once for 20 seconds (Dreisoerner et al., 2021). We elected to examine self-compassionate touch in the study herein because, to the best of our knowledge, we were unaware of a briefer empirically supported practice that aimed to increase self-compassion. Self-compassionate touch typically involves placing one's hands over the heart and belly for 20 s while contemplating warmth (Dreisoerner et al., 2021) and/or self-compassionate thoughts (Bluth et al., 2016). It can also involve other forms of touch such as stroking the upper arms or hugging oneself—what is important is the method of touch supports the practitioner in feeling kindness and warmth toward themselves (Neff, 2015).

Growing evidence supports the promise of single-session, self-guided interventions. A 2017 meta-analysis found that self-guided, single-session interventions (e.g., teaching behavioral activation or growth mindset; Schleider et al., 2022) reduce or prevent a range of mental health problems in youth (Schleider & Weisz, 2017). Although the mean effect size (Hedge's $g = 0.29$) of single-session interventions is smaller than multi-session self-compassion therapies (anxiety symptoms: $g = 0.46$, 95% CIs [0.25, 0.66]); depressive symptoms: $g = 0.40$, 95% CIs [0.23, 0.57]; Wilson et al., 2019), or psychotherapy (standardized mean difference = 0.50; 95% CI, 0.41–0.59; Huhn et al., 2014), their convenience raises potential for broader reach. Critically, it's possible that daily micropractice could further enhance single-session interventions.

We sought to address three unanswered questions regarding self-compassionate touch. First, although self-compassionate touch is often part of self-compassion interventions (Bluth et al., 2016), it's unclear if this boosts self-compassion or what the standalone effects are. Second, although one study found no effect of one 20-second self-compassionate touch on self-reported stress (Dreisoerner et al., 2021), the effects of daily practice are unknown. Third, an important open question is whether daily self-compassion practices lead to practice- and self-compassion habits. Unlike intentional behaviors, which are enacted by conscious control, habits are characterized by automaticity and are thought to emerge via repeated practice in the same context until the context alone can unconsciously cue the behavior (Gardner et al., 2012). The present study seeks to evaluate the habit formation (i.e., automaticity) of two different behaviors: practice and self-compassion. Whereas practice automaticity indexes the extent to which one initiates practice [e.g., of self-compassionate touch] in daily life with minimal deliberation, self-compassion automaticity indexes the extent to which one is compassionate to oneself in daily life with minimal deliberation (described further in Method). Automaticity is crucial to the study herein because when habits and intentions conflict, most of the time, habits win (Gardner et al., 2012). For example, if someone failed an exam or made a mistake that made them feel like they were unworthy, unloved, or "not enough"—if they have a strong habit of practicing self-compassionate touch (i.e., practice automaticity), they might be more likely to practice it—and experience self-compassion (i.e., self-compassion automaticity)—even in these tough moments when they may not necessarily feel like doing so. Therefore, forming habits could boost the utilization of self-compassionate touch (i.e., practice automaticity) and the habit of being compassionate to oneself in daily life (i.e., self-compassion automaticity). Uncovering what changes in outcomes are associated with increases in practice- and self-compassion automaticity could inform future studies that aim to test possible mechanisms of habit formation (White, 2022).

To address these questions, we compared self-compassionate touch (SCT) to an active control (AC). We randomly assigned participants to watch a video of the SCT or AC micropractice and asked them to practice it daily for one month. Assessments were at two timepoints: T1 was the single-session intervention, and T2 was one month later. According to Schleider and Weisz (2017), "interventions are defined as 'single--session' if they involved just one visit or encounter with a clinic, school, or program (p. 108)." Participants had one intervention encounter from which we tested all hypotheses except those involving two secondary outcome measures (see Method). Thus, SCT and AC are considered single-session.

We began our evaluation of these questions with an undergraduate sample for a few reasons. First, psychopathology has sharply increased in this population in recent years (Elharake et al., 2022). Indeed, more than 60% of college students meet criteria for at least one mental health problem (Lipson et al., 2022). Second, based on prior evidence showing that self-compassion predicts mental health among college students (Kroshus et al., 2021), leveraging SCT to reduce stress and psychopathology through increasing self-compassion could be an effective approach for this population. Finally, as noted earlier, stigma and preferences to "go it alone" keep many students from seeking treatment (Ebert et al., 2019). Thus, having access to a micropractice that can be done alone may be particularly helpful for this group.

We report on pre-registered analyses for two confirmatory aims hypothesizing SCT would be superior to AC, and three exploratory aims. Aim 1 was to determine whether SCT, relative to AC, showed greater T1-to-T2 increases in self-compassion, growth mindset, authenticity, positive affect, reductions in stress and psychopathology, as well as higher T1 self-compassion reactivity, which is defined as post-video changes in state self-compassion and aims to index the extent to which one occasion of SCT or AC micropractice induces state-level changes in self-compassion (described as "increases at week [X] in state self-compassion after the self-touch exercise video relative to before" in the pre-registration; osf.io/5hr32; see Supplementary Methods). We included these outcomes to evaluate the range and specificity of SCT effects on self-compassion-related outcomes established in prior research (Breines & Chen, 2012; Ferrari et al., 2019; Neff et al., 2007; Zhang et al., 2019). Aim 2 was to evaluate if SCT, compared to AC, showed greater increases in practice- and self-compassion automaticity from T1 to T2. Our exploratory aims probed: (1) if SCT, relative to AC, showed differences in self-compassion reactivity at T2 and at T2 compared to T1; (2) if across interventions, T1-to-T2 changes in practice- and self-compassion automaticity will be associated with T1-to-T2 changes in self-compassion, growth mindset, authenticity, positive affect, stress, and psychopathology, as well as with self-compassion

reactivity at T1, T2 and T1-to-T2. (3a) If there were conditional effects of practice frequency, and (3b) self-compassion, self-compassion reactivity, experience with contemplative practices, and experience with self-compassion practices on the predicted effects of SCT, relative to AC in Aims 1–2. Exploratory aims 1 and 3b are reported in the supplement.

1. Method

1.1. Design

We randomly assigned participants to SCT or AC (described in Procedure). Both groups completed online assessments at T1 and one month later (T2). We instructed participants to practice their assigned intervention daily until T2. The study is reported in accordance with the CONSORT statement for nonpharmacological trials (Boutron et al., 2017). All analyses were preregistered (osf.io/5hr32), and all data, materials, and analysis code are publicly available on the Open Science Framework (osf.io/wq8mf/). We registered the protocol at ClinicalTrials.gov (clinicaltrials.gov/ct2/show/NCT05199779). The Ethics Committee of the University of California, Berkeley approved this study.

1.2. Participants

A racially and socioeconomically diverse sample of 135 undergraduates, ages 18+, participated online for course credit (see Table 1) between February 2022 and April 2022. 121 participants returned to complete the T2 assessment one month later (see CONSORT participant flow diagram, Fig. 2). Inclusion criteria were: (a) 18+ years of age; (b) English language proficiency; and (c) able/willing to give informed consent. Exclusion criteria were: (a) no email address or to email; and (b) unable/unwilling to complete the T1 assessment. Participants self-screened for eligibility and self-enrolled. Power analysis using the *pwr* package in R suggested 120 participants (our target) was sufficient to identify medium effects via a two-sample *t*-test ($d = 0.516$), and 135 participants (the number enrolled) could identify slightly smaller effects ($d = 0.486$), both at 80% power and $p < .05$ significance level.

1.3. Randomization

We randomly assigned participants in a 1:1 parallel group design using the computer-generated randomizer element in Qualtrics without interaction between study personnel and participants. To prevent cross-condition contamination, we required a written commitment from participants to refrain from sharing any materials. Also, participants were blinded and not aware that the study had two conditions—all were told they were receiving the intervention.

1.4. Procedure

To reduce bias in the assessments, we excluded the constructs of interest (e.g., "self-compassion") in the language used to describe the intervention and study. We told participants this study was on "fostering emotional well-being." We delivered all study procedures via Qualtrics. At both the T1 and T2 assessments, participants first completed outcome and other measures in the same order and then were randomized to receive the SCT or AC video intervention. Immediately after the video, participants completed two measures: (1) state self-compassion for a second time so reactivity scores could be computed, and (2) practice automaticity, so participants could reference the micropractice when reflecting on their automaticity of initiating it (see Fig. 1). In other words, all measures were assessed pre-randomization, except for those that were specific to having seen the video and thus could only be accurately assessed post-randomization. A participant could not accurately assess their practice automaticity if they were unaware of their assigned micropractice; their scores may be different depending on SCT or AC. Therefore, both groups viewed their assigned SCT or AC video twice: at T1 and one month later (T2). Participants viewed the SCT video again at T2 to assess self-compassion reactivity at T2 and T1-to-T2 changes in self-compassion reactivity (described in Supplementary Methods, see also Fig. 1). When participants completed the T2 assessment, nearly all outcomes measured at T2, including all primary

Table 1
Demographic information.

Demographics	SCT (ITT; $N = 71$)		AC (ITT; $N = 64$)		SCT (PP; $N = 27$)		AC (PP; $N = 18$)	
	M	SD	M	SD	M	SD	M	SD
Age	21.25	3.18	20.86	2.61	21.74	4.16	20.11	1.18
Estimated Socioeconomic Status (MacArthur SSS Scale, 1–10)	5.79	2.03	6.40	1.96	5.37	1.96	7.00	2.17
People Living in household	3.39	2.58	3.97	3.47	3.74	3.22	3.50	2.66
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Female	49	69.0	43	67.2	22	81.5	14	77.8
Race and Ethnicity								
American Indian or Alaska Native	0	0	0	0	0	0	0	0
Asian	30	42.3	24	37.5	8	29.6	7	38.9
Black/African American	1	1.4	1	1.6	1	3.7	0	0
Hispanic/Latinx	8	11.3	6	9.4	4	14.8	3	16.7
Native Hawaiian or Other Pacific Islander	0	0	0	0	0	0	0	0
White	17	23.9	17	26.6	11	40.7	5	27.8
Multiracial	7	9.9	6	9.4	3	11.1	3	16.7
Not Listed	1	1.4	0	0	0	0	0	0
Missing	7	9.9	10	15.6	0	0	0	0
Relationship Status								
Single	43	60.6	35	54.7	16	59.3	12	66.7
Committed Relationship	19	26.8	20	31.3	11	40.7	6	33.3
Married	2	2.8	0	0	0	0	0	0
Missing	7	9.9	9	14.1	0	0	0	0
Taking Psychiatric Medication	5	7.0	2	3.1	3	11.1	1	5.6
Receiving Psychotherapy Treatment	9	12.7	4	6.3	4	14.8	4	22.2
Naïve to Contemplative Practices	31	43.7	29	45.3	11	40.7	9	50
Naïve to Self-Compassion Practices	55	77.5	49	76.6	22	81.5	15	83.3

Note. Defined PP as those who practiced self-compassionate touch greater than 28 times (about once/day) between the T1 and T2 assessments. T1 refers to the initial intervention; T2 refers to the 1-month follow-up assessment. Individuals who identified as more than one race are reported as "Multiracial" to preserve their confidentiality.

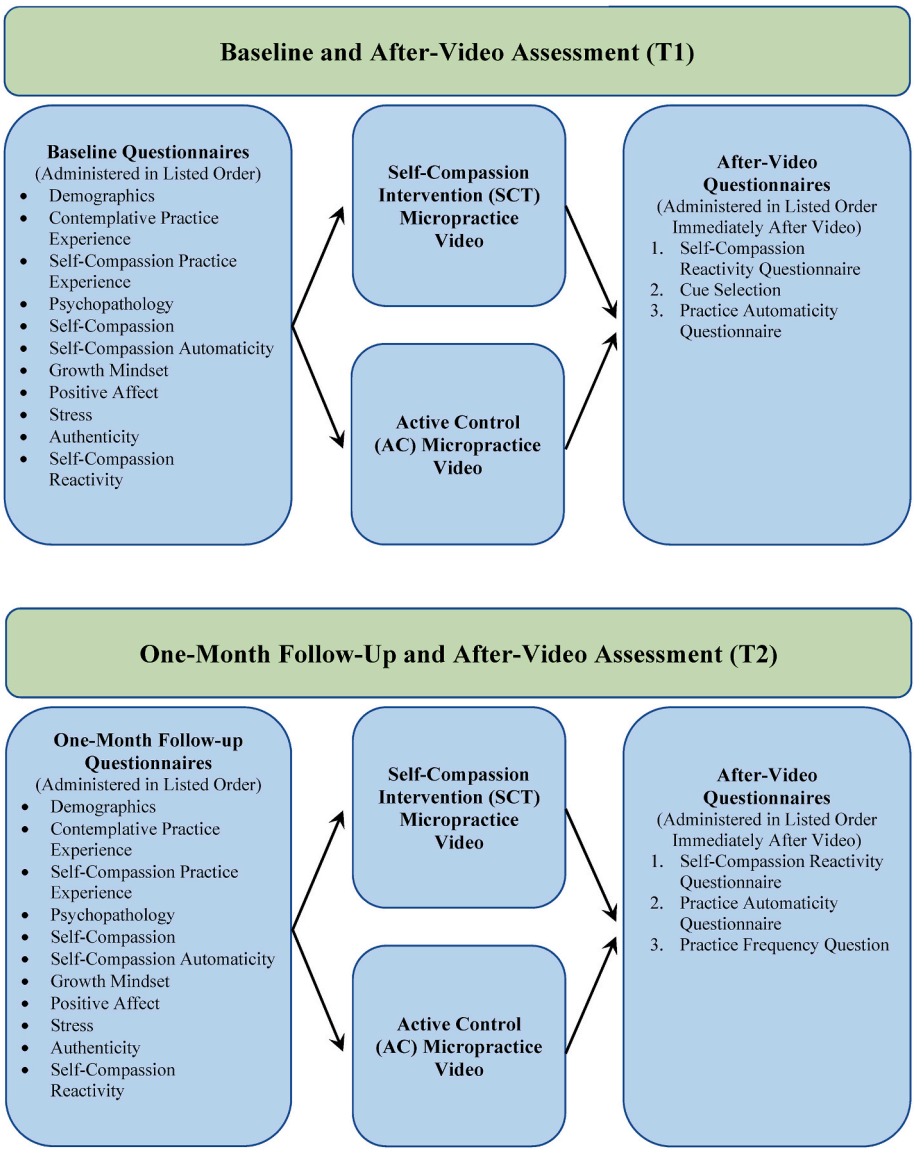

Fig. 1. Outline of study procedure.

outcomes, were assessed prior to the second encounter with the video. Given that the T2 outcomes used to evaluate the efficacy of SCT, relative to AC, occurred when participants only had one encounter with the intervention (including the video) (see Fig. 1), SCT and AC were evaluated as single-session interventions as defined by Schleider and Weisz (2017).

1.5. Intervention

The intervention included three parts. First, participants were guided through a practice of the self-compassionate touch via video recording (see Table S1 for transcript and osf.io/wq8mf/for video). We developed this video based on Dreisoerner et al. (2021) and (Neff, 2015). In Dreisoerner et al. (2021), participants were shown a variety of positions for the self-compassionate touch, the most chosen being right-hand-over-chest, left-hand-over-belly. In the present study, the video depicted left-hand-over-chest, right-hand-over-belly, but participants were encouraged to choose any method of touch that supported them in feeling kindness and warmth towards themselves. Second, participants chose a cue to precede their daily use of SCT. Participants received examples ("When I finish brushing my teeth, this will cue my use of the exercise.") to guide them in selecting their cue. Participants noted their chosen cue in Qualtrics and were emailed a record of their cue, along with the recording and transcript of SCT, that they could reference as desired. Third, participants were encouraged to practice self-compassionate touch at least once per day following their chosen cue for the next month.

1.6. Active Control

The finger-tapping active control participants received the same procedures described above, except they were assigned a different video and instructions (e.g., "you're invited to bring your pointer finger and thumb together to touch. Separate … and bring your middle finger and thumb together. Separate … and bring your ring finger and thumb together. Separate …"). The instructions of AC, based on a psychophysical dexterity test (Bums & Moskowitz, 1977), are in Table S1 (see osf.io/wq8mf/ for video). The SCT and AC videos matched in length, quality, resolution, instructor, and lighting, word count (112 words), and readability level of grade 5 (*Readability Calculator*, 2020).

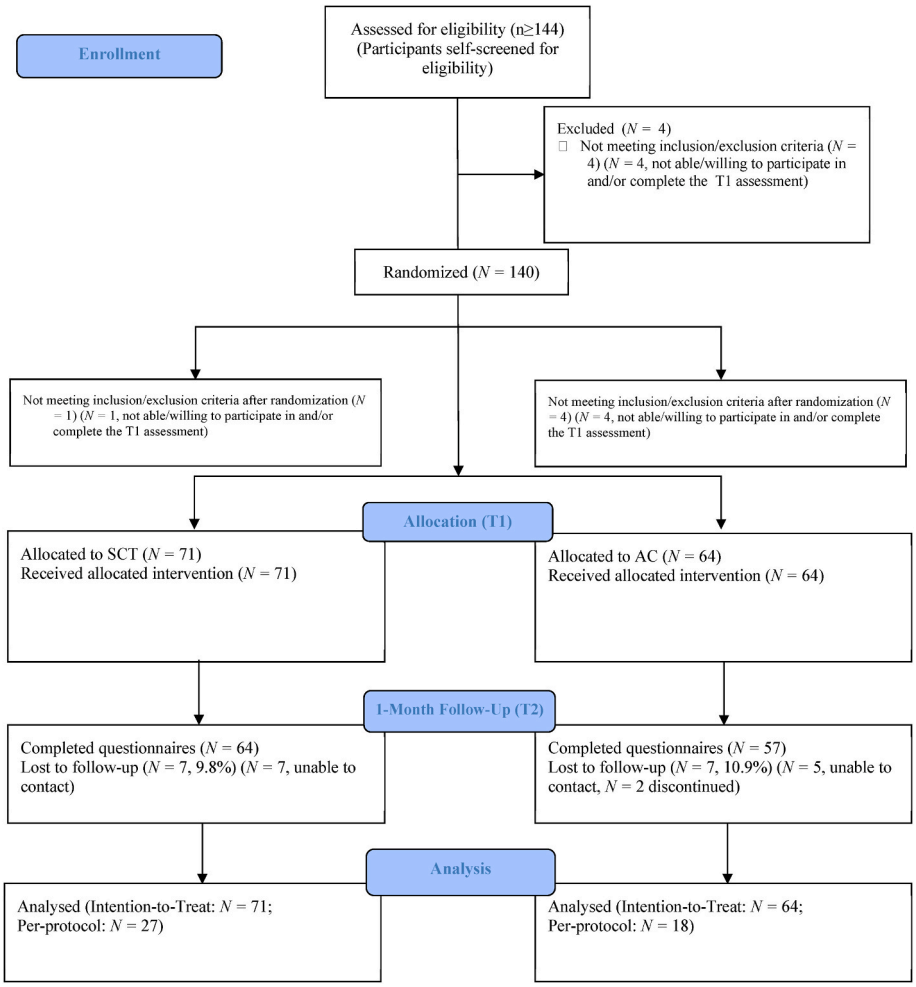

Fig. 2. Participant flow through the study.
Note. We defined per-protocol (PP) as those who practiced self-compassionate touch greater than 28 times (about once/day) between the T1 and T2 assessments.

1.7. Measures

Primary and secondary outcomes and other measures are registered at ClinicalTrials.gov (clinicaltrials.gov/ct2/show/NCT05199779). We selected the primary outcomes for relevance to evaluating the efficacy of SCT relative to AC and included several measures shown to be associated with high self-compassion (Breines & Chen, 2012; Ferrari et al., 2019; Neff et al., 2007). The secondary outcomes were additional measures of interest for evaluating the effects of SCT relative to AC. The other measures were to test the potential conditional and moderator effects of the confirmatory aims. Results and methods on authenticity, contemplative- and self-compassion practice experience, and qualitative data (osf.io/bd9z7) about the participants' experience with SCT and AC are in the supplementary materials.

1.8. Primary outcomes

Self-compassion. We assessed self-compassion using the Sussex-Oxford Compassion for the Self Scale (SOCS–S; Gu et al., 2020). Gu et al. (2020) developed the SOCS–S based on an empirically and theoretically supported conceptualization of (self-)compassion and is considered a significant advancement in the operationalization of self-compassion because it covers all of the elements considered to be relevant to this construct according to various theories and definitions (Dodson & Heng, 2022; Muris et al., 2022; Muris & Otgaar, 2020; Strauss et al., 2016). We also chose the SOCS–S because it has been suggested to be the most appropriate measure of self-compassion for studies examining psychopathology (Muris et al., 2022; Muris & Otgaar, 2020). The SOCS–S has five subscales, four items each, corresponding to the five components of self-compassion described in the introduction (20 items, e.g., "When I'm upset, I do my best to take care of myself", 5-point response scale, Cronbach's α = 0.95; Gu et al., 2020).

Growth mindset. We assessed current growth mindset using the 'Kind of Person' Implicit Theory Scale (8 items, e.g., All people can change even their most basic qualities, 6-point response scale, Cronbach's α = 0.88; Dweck et al., 1995).

Positive affect. We measured Positive Affect in the past week using the positive subscale of the Positive and Negative Affect Schedule (PANAS) (10 items, e.g., "Excited", 6-point response scale, Cronbach's α = 0.92; Watson et al., 1988).

Perceived stress. We measured perceived stress in the past week using the Perceived-Stress Scale (10 items, e.g., "in the last week, how often have you felt nervous and 'stressed'?", 5-point response scale, Cronbach's α = 0.84, Lee, 2012).

Psychopathology. We assessed psychopathology over the past two weeks using the DSM-5 Cross-Cutting Measure (22 items, e.g., "Little interest or pleasure in doing things?", 5-point scale, Cronbach's α = 0.95; Bravo et al., 2018). As Mahoney et al. (2020) suggested and validated, we removed the thoughts of self-harm item (Q11), as participants completed the measure online and we did not monitor responses in real-time—thus, proper follow-up for those who may require immediate intervention was not feasible.

Self-compassion automaticity. We assessed current self-compassion automaticity, which indexes the extent to which one is compassionate to oneself in daily life with minimal deliberation, using the Self-Report Behavioral Automaticity Index (SRBAI; Gardner et al., 2012). The SRBAI is a validated measure that is generally used to assess habit formation by indexing the extent to which a behavior (e.g., being compassionate to oneself) is elicited with minimal deliberation. It contains four items rated on a 1 ("Strongly Disagree") to 9 ("Strongly Agree") scale, where higher scores indicate greater habit formation (e.g., a "5" indicates moderate habit formation): ['Behavior X is something … '] 1) 'I do automatically', 2) 'I do without having to consciously remember', 3) 'I do without thinking', and 4) 'I start doing before I realize I'm doing it') where, following standard procedure, 'Behavior X' refers to the construct of interest (Gardner et al., 2012). For self-compassion automaticity, this measure included five 'Behavior Xs' representing the five components of self-compassion, forming a 20-item SRBAI. For each 'Behavior X' self-compassion component, we selected the item with the highest factor loading from the SOCS–S validation sample (Gu et al., 2020). We made slight grammar alterations to these five SOCS–S items without changing semantic content to make the sentences grammatical in the context of the SRBAI. The five 'Behavior X' question stems were: 1) "Noticing when I'm feeling distressed is something …", 2) "Remembering that everyone experiences suffering at some point in their lives is something …", 3) "When I'm going through a difficult time, feeling kindly towards myself is something …," 4) Connecting with my own suffering without judging myself is something …", and 5) When I'm going through a difficult time, trying to look after myself is something …". The five items employed as 'Behavior X' and their corresponding component of self-compassion are shown in Table S2.

The score for total self-compassion automaticity was the mean of the five items. Given that five items from the SOCS–S were used as "Behavior X″ in the self-compassion automaticity SRBAI, for all analyses examining associations between self-compassion (SOCS–S) and self-compassion automaticity (SRBAI), we conducted pre-registered sensitivity analyses with and without the five SOCS–S items that we used to create the SRBAI (e.g., original 20-item SOCS–S vs. SOCS–S without the five SOCS–S-items used in the SRBAI) (Cronbach's $\alpha = 0.96$).

1.9. Secondary outcomes

Practice automaticity. At T1 and T2, we used the SRBAI to assess the extent to which one initiates their assigned micropractice without deliberation (4 items, "deciding to perform [the assigned micropractice] from the video is something …", 1–9 scale; Gardner et al., 2012). At T1, we instructed participants to select the lowest score (i.e., "1 (Strongly Disagree)") if they had never done their assigned micropractice (SCT or AC) before this study (Cronbach's $\alpha = 0.95$).

1.10. Other measures

Practice Frequency. We assessed practice frequency at T2 by asking participants to report on the "number of times since [their] last session on [date of baseline] (or in about the past month) that [they] performed [their assigned micropractice]".

2. Data analysis

We conducted analyses in R Version 4.1.2. We used linear regression with all outcome variables modeled as continuous. The models included a code for condition (0 = AC, 1 = SCT), and pseudo-coded timepoint (0 = T1, 1 = T2), with T1 as the reference. We used change scores as the dependent variable. Thus, linear regression was sufficient. No multilevel modeling was needed. The residuals of contemplative- and self-compassion practice experience, when used as the outcome variable examining T1 differences across the conditions, were skewed (9.29 and 6.00 in ITT and 5.99 and 5.99 in PP, respectively). Thus, we deviated from the pre-registration by using the log(x+1) of these variables for all analyses (see non-log transformed results in Table S3).

We pre-registered and conducted both intention-to-treat analyses (ITT) and per-protocol analyses (PP). PP is defined as "only those who complete the study and also comply with all its key elements" (Andrade, 2022, p. 416). Thus, PP only included those who practiced SCT or AC greater than 28 times (~once/day as instructed) during the study. Our rationale for pre-registering our confirmatory aims with PP was that people who practiced more frequently would be more likely to benefit from SCT. Confirmatory ITT analyses included all participants regardless of practice frequency to test our hypotheses for Aims 1 and 2 (i.e., that SCT would be superior to AC). Exploratory ITT analyses included all participants regardless of practice frequency. When we used practice frequency as an interacting variable, we did not conduct PP since PP was defined by practice frequency. By doing ITT and PP analyses separately, we were able to ascertain the importance of near-daily practice more clearly. Had we only done ITT, we would not have been able to highlight this. Had we only done PP, we would have justifiably been criticized for not following our pre-registration plan, and we would not have been able to clarify the effects of SCT, relative to AC, on the average college student who received it. We deviate from the pre-registration by not reporting moderation analyses of the PP subsample out of concern over the statistical power of moderation analyses in this subsample.

Given that all tests conducted were for separate, *a priori* hypotheses, we did not correct for multiple comparisons. Also, given the novelty of the study, we did not want to unnecessarily reduce power, increase the probability of a Type II error, or contribute to publication bias (Nakagawa, 2004). Thus, to account for multiple comparisons, our analyses were pre-registered based on existing empirical literature and theory, and we are already being more conservative by using two-sided tests even though the analyses are pre-registered. Additionally, we emphasize interpreting the degree of certainty of the estimates by reporting standardized effect sizes and 95% confidence intervals in all analyses (Nakagawa, 2004). We calculated standardized coefficients by standardizing all continuous variables so the regression coefficients can be interpreted as effect sizes in standard deviation units (Lorah, 2018).

3. Results

3.1. Participant characteristics and preliminary analyses

The attrition rate was 10.4% (14 participants) between T1 and T2. Attrition rates did not differ by condition (8.6% in SCT; 12.3% in AC; $\chi^2 = 0.30$, $df = 1$, $p = .585$). Relative to completers, those who dropped out did not differ on biological sex ($\chi^2 = 1.10$, $df = 1$, $p = .294$) or T1 psychopathology ($t = 0.82$, $df = 12.02$, $p = .426$). However, those who dropped out tended to be 1.11 years younger than completers ($t = 2.62$, $df = 36.87$, $p = .013$). The 3.6% of participants who were ineligible due to not completing the baseline questionnaires did not differ by condition ($\chi^2 = 0.953$, $df = 1$, $p = .329$).

Demographic information can be found in Table 1. Descriptive statistics for primary outcomes and other variables are shown in Table 2 (see Table S4 for descriptive statistics on variables discussed in the supplemental materials). We examined whether the ITT and PP samples differed at T1 prior to the intervention. Participants in the two samples did not differ on any T1 variable with one exception: in PP (those who practiced greater than 28 times), the active control condition (AC) had higher T1 self-compassion ($\beta = 0.67$, $p = .031$) relative to the self-compassionate touch condition (SCT) (see Table S5). Both ITT and PP did not differ in practice frequency across treatment conditions (ITT: $\beta = 0.13$, 95% CI [–0.24, 0.50], $p = .477$; PP: $\beta = -0.12$, 95% CI [–0.74, 0.50], $p = .692$). Practice frequency ranged between 0 and 64 times for SCT (Median: 26 [ITT], 45 [PP]) and 0 and 112 times for AC (Median: 24 [ITT], 40 [PP]) (means and standard deviations are reported in Table 2). In pre-registered sensitivity analyses with and without the five similarly

Table 2
Descriptive statistics.

Descriptive Statistics (ITT)	T1				T2			
	SCT (ITT; $N = 71$)		AC (ITT; $N = 64$)		SCT (ITT; $N = 64$)		AC (ITT; $N = 57$)	
	M	SD	M	SD	M	SD	M	SD
Self-Compassion	66.91	12.44	67.54	15.46	68.15	13.15	70.12	15.62
Growth Mindset	30.26	6.73	32.05	8.72	31.49	6.53	30.78	7.06
Positive Affect	32.49	8.26	31.48	9.58	33.13	7.85	33.75	9.27
Perceived Stress	20.74	6.54	20.44	6.88	19.58	5.88	19.29	6.92
Psychopathology	15.41	9.50	15.03	10.29	15.25	9.69	14.95	11.25
Self-Compassion Automaticity	106.37	33.62	100.52	35.99	114.28	31.94	109.93	34.76
Practice Automaticity	8.87	9.01	7.69	7.70	14.56	5.94	13.6	6.11
Practice Frequency					29.75	15.88	27.44	18.99
Descriptive Statistics (PP)	**T1**				**T2**			
	SCT (PP; $N = 27$)		AC (PP; $N = 18$)		SCT (PP; $N = 27$)		AC (PP; $N = 18$)	
	M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Self-Compassion	63.65	12.12	73.12	15.55	70.52	13.44	71.76	17.08
Growth Mindset	30.26	6.32	30.24	8.64	32.07	6.81	29.83	6.00
Positive Affect	32.81	8.70	31.50	10.43	34.33	8.33	36.56	11.18
Perceived Stress	20.56	6.39	20.61	7.09	19.92	6.11	21.41	6.78
Psychopathology	17.26	9.96	14.71	8.73	15.00	10.74	16.94	11.67
Self-Compassion Automaticity	104.56	32.90	112.67	29.95	117.32	31.88	125.00	33.26
Practice Automaticity	7.96	8.70	7.72	8.48	17.08	5.33	13.44	7.71
Practice Frequency					44.85	10.43	46.67	19.99

Note. SCT = Self-Compassion Intervention; AC = Active Control; T1 refers to the initial intervention; T2 refers to the 1-month follow-up assessment. We defined PP as those who practiced self-compassionate touch greater than 28 times (about once/day) between the T1 and T2 assessments. β refers to the standardized coefficient.

worded SOCS–S items (described in the Measures section), there were no differences when removing these five items (see Table S6 and Table S8). Thus, the results reported below will be reported for the original 20-item SOCS–S. Results on primary and secondary outcomes (i.e., Aims 1 and 2) are provided in Table 3. Results on authenticity and self-compassion reactivity can be found in Table S9.

3.2. Aim 1: group differences in primary outcomes

In ITT (i.e., including all participants), SCT did not show superior effects to AC on any primary outcome. By contrast, in PP (i.e., those who practiced more than 28 times), SCT had significant effects on three primary outcomes from T1 to T2. Specifically, participants in SCT, relative to AC, exhibited increased self-compassion ($\beta = 0.71$, $p = .025$), as well as reduced perceived stress ($\beta = -0.62$, $p = .047$), and psychopathology ($\beta = -0.61$, $p = .046$). SCT did not exhibit T1-to-T2 changes in positive affect in either ITT or PP analyses.

In sum, we found partial support for the hypothesis that those in SCT would have better outcomes than those in AC. The average person receiving the SCT did not improve on any primary outcome relative to AC. However, for those who practiced regularly (our PP sample), those receiving SCT showed increases in self-compassion and decreases in stress and psychopathology.

Table 3
Results for primary and secondary outcomes.

Treatment vs. Control Outcomes	Treatment effect T1-T2 (ITT)			Treatment effect T1-T2 (PP)		
	β	CI	*p*	*β*	CI	*p*
Self-Compassion	−0.05	[–0.43, 0.34]	.792	**0.71**	**[0.09, 1.33]**	**.025**
Growth Mindset	*0.35*	[–0.02, 0.72]	*.066*	0.33	[–0.30, 0.94]	.299
Positive Affect	−0.30	[–0.67, 0.06]	.110	−0.36	[–0.96, 0.25]	.243
Stress	−0.08	[–0.45, 0.30]	.690	**−0.62**	**[–1.22, –0.01]**	**.047**
Psychopathology	0.02	[–0.34, −0.39]	.889	**−0.61**	**[–1.22, –0.01]**	**.046**
Self-Compassion Automaticity	0.08	[–0.29, 0.45]	.657	0.11	[–0.52, 0.75]	.715
Practice Automaticity	0.02	[–0.35, 0.40]	.903	0.43	[–0.18, 1.04]	.168

Note. T1 refers to the initial intervention; T2 refers to the 1-month follow-up assessment. Bolded numbers denote significant ($p < .05$) results. Italicized numbers denote trend-level ($0.05 < p < .10$) results. We defined PP as those who practiced self-compassionate touch greater than 28 times (about once/day) between the T1 and T2 assessments. β refers to the standardized coefficient.

3.3. Aim 2: group differences in automaticity

For our second aim, we did not find significantly greater T1-to-T2 increases in the primary outcome of self-compassion automaticity nor the secondary outcome of practice automaticity in SCT relative to AC in either ITT or PP analyses. In sum, our hypothesis regarding greater automaticity (self-compassion or practice) for those who received SCT compared to AC was not supported.

4. Exploratory aims

Associations Between Changes in Outcomes With Changes in Self-Compassion Automaticity. We examined whether T1-to-T2 changes in outcomes across both conditions were associated with T1-to-T2 changes in self-compassion automaticity (see Table 4 for main results and Table S7 for correlation coefficients). In the ITT sample, greater increases in self-compassion automaticity were associated with greater increases in self-compassion ($\beta = 0.37$, $p < .001$), positive affect ($\beta = 0.32$, $p < .001$), and practice automaticity ($\beta = 0.22$, $p = .022$). In the PP sample (those who practiced more than 28 times), greater increases in self-compassion automaticity were associated with greater increases in practice automaticity ($\beta = 0.38$, $p = .013$).

Associations Between Changes in Outcomes With Changes in Practice Automaticity. We also examined whether T1-to-T2 changes in outcomes across both conditions were associated with T1-to-T2 changes in practice automaticity. In Table 4 (correlations in Table S7), for the ITT sample, greater increases in practice automaticity were associated with greater reductions in psychopathology ($\beta = -0.21$, $p = .024$) and greater increases in positive affect ($\beta = 0.24$, $p = .009$). In the PP sample, greater increases in practice automaticity were associated with greater

Table 4
Associations between changes in outcomes with changes in practice automaticity and self-compassion automaticity across interventions.

Self-Compassion Automaticity	T1-to-T2 (ITT)			T1-to-T2 (PP)		
	β	CI	*p*	*β*	CI	*p*
Self-Compassion	**0.37**	**[0.19, 0.55]**	**<.001**	0.22	[–0.10, 0.55]	.172
Growth Mindset	0.06	[–0.13, 0.25]	.554	0.06	[–0.26, 0.38]	.715
Positive Affect	**0.32**	**[0.14, 0.50]**	**<.001**	0.24	[–0.06, 0.54]	.118
Stress	−0.14	[–0.33, 0.04]	.123	−0.12	[–0.45, 0.20]	.437
Psychopathology	−0.13	[–0.32, 0.06]	.173	−0.11	[–0.42, 0.21]	.508
Practice Automaticity	**0.22**	**[0.03, 0.40]**	**.022**	**0.38**	**[0.08, 0.67]**	**.013**
Practice Automaticity	**T1-T2 (ITT)**			**T1-T2 (PP)**		
	β	CI	*p*	*β*	CI	*p*
Self-Compassion	0.13	[–0.06, 0.33]	.181	0.15	[–0.17, 0.49]	.341
Growth Mindset	−0.04	[–0.23, 0.15]	.665	0.13	[–0.19, 0.44]	.421
Positive Affect	**0.24**	**[0.06, 0.43]**	**.009**	**0.32**	**[0.03, 0.62]**	**.033**
Stress	−0.13	[–0.31, 0.06]	.184	*−0.28*	*[–0.59, 0.03]*	*.071*
Psychopathology	**−0.21**	**[–0.40, –0.03]**	**.024**	**−0.46**	**[–0.74, –0.19]**	**.002**

Note. T1 refers to the initial intervention; T2 refers to the 1-month follow-up assessment. Bolded numbers denote significant ($p < .05$) results. Italicized numbers denote trend-level ($0.05 < p < .10$) results. We defined PP as those who practiced self-compassionate touch greater than 28 times (about once/day) between the T1 and T2 assessments. β refers to the standardized coefficient.

reductions in psychopathology ($\beta = -0.46$, $p = .002$) and greater increases in positive affect ($\beta = 0.32$, $p = .033$).

4.1. Conditional and moderating effects

The conditional effect of practice frequency (the number of times participants performed their micropractice) on the effects of SCT, relative to AC, can be found in Table 5. In ITT, among those who practiced more often, participants in SCT, relative to AC, exhibited greater T1-to-T2 reductions in perceived stress ($\beta = -0.51$, $p = .008$) and psychopathology ($\beta = -0.49$, $p = .010$), as well as increased self-compassion ($\beta = 0.62$, $p = .001$) and practice automaticity ($\beta = 0.58$, $p = .002$). These findings are consistent with our PP analyses reported earlier for Aim 1. Thus, whether we analyze data only from participants who practiced regularly or examine the conditional effect of practice frequency, we find that more frequent practice is associated with better outcomes for those who received SCT compared to those who received AC.

Table 5
Interaction effect of practice frequency (SCT relative to AC).

	Interaction Effect of Frequency (ITT)	CI	p
	β		
Self-Compassion	**0.62**	**[0.25, 1.00]**	**.001**
Growth Mindset	0.21	[–0.17, 0.59]	0.283
Positive Affect	0.30	[–0.08, 0.67]	0.117
Stress	**−0.51**	**[–0.88, –0.13]**	**.008**
Psychopathology	**−0.49**	**[–0.86, –0.12]**	**.010**
Self-Compassion Automaticity	0.28	[–0.10, 0.65]	.148
Practice Automaticity	**0.58**	**[0.22, 0.95]**	**.002**

Note. SCT = Self-Compassion Intervention; AC = Active Control. Bolded numbers denote significant ($p < .05$) results. Italicized numbers denote trend-level ($0.05 < p < .10$) results. β refers to the standardized coefficient.

Tests of the moderating effects of self-compassion, self-compassion reactivity, contemplative practice experience, and self-compassion practice experience at T1 on the effects of SCT, relative to AC, are shown in Table S8. Only higher levels of contemplative practice experience moderated SCT, relative to AC, such that more experience predicted a stronger, more positive effect of SCT, relative to AC on self-compassion automaticity ($\beta = 0.40$, $p = .001$).

5. Discussion

We evaluated the effects of a single-session, self-guided intervention, leveraging micropractice (≤20 seconds/day exercise) of self-compassionate touch to enhance self-compassion. In pre-registered analyses, we found several key results. Although we found no significant differences between the self-compassionate touch condition (SCT) and active control (AC) in intention-to-treat (ITT) ($N = 135$) analyses, in our per protocol (PP) analyses ($N = 45$ who practiced>28 times), near-daily practice of SCT, relative to AC, predicted T1-to-T2 improvement in three primary outcomes—increased self-compassion and reduced stress and psychopathology. Thus, although ITT indicates the average student did not benefit more from SCT than AC, PP suggests that those participants assigned to practice self-compassionate touch for ≤20 seconds/day (SCT) and who did so near-daily in between assessments, demonstrated benefits, relative to AC. In our exploratory analyses, we found that all participants demonstrated a conditional effect of practice frequency on SCT effects in that more frequent practice was associated with more change in self-compassion, stress, and psychopathology.

Our findings are the first to our knowledge to show that daily self-compassionate touch can increase self-compassion. Specifically, for those who practiced SCT more frequently, we found an increase in self-compassion compared to those who practiced AC. These findings suggest that after repeated practice, SCT may promote self-compassion.

Our findings also partially support the promise of a brief, single-session self-compassionate touch intervention, particularly if it is followed by regular practice afterward. Indeed, our PP effect sizes (Self Compassion: 0.71 [0.09, 1.33]; Stress: −0.62 [–1.22, −0.01]; Psychopathology −0.61 [–1.22, −0.01]) fell within or above the range reported in meta-analyses of mindfulness-based interventions and self-compassion interventions—many of which require considerably more time and resources (see Table S10; Ferrari et al., 2019; Goldberg et al., 2022; Golden et al., 2021; Held & Owens, 2015). We note, however, that although PP effect sizes exceeded those of self-guided single-session interventions in youth (0.29 [0.06, 0.53]; Schleider & Weisz, 2017), SCT required approximately the same resource investment and slightly more time investment including home practice, than some single-session self-guided interventions (SCT: 12–15 min vs. as low as 5–8 min in Dobias et al. [2022]). Also, replication is needed as meta-analytic effect sizes may only be rough comparisons due to differing methodologies employed across studies. Regardless, the intervention in its current form did not significantly improve any primary outcome in the average college student who received it, as most did not practice daily.

We also evaluated the effects of repeated practice. Less than half of participants practiced daily, and it's possible that PP and ITT results differed because the effects of SCT, relative to AC, are practice-dependent. Indeed, our findings extend those of Dreisoerner et al. (2021) in that we found reduced stress among those who practiced SCT more frequently, suggesting repeated practice may be necessary to confer meaningful effects. In qualitative data, although many participants reported positive impressions of SCT, a considerable number of participants reported practicing less than daily because they were too busy and/or forgot. These appeared to be the most common barriers to practice (see osf.io/bd9z7). Given the majority struggled to practice for ≤20 seconds daily, one can imagine the barrier this poses for longer (e.

g., 40-minute) contemplative practices employed in self-compassion interventions (Neff & Germer, 2013). Importantly, self-guided single--session interventions are completed at substantially lower rates outside the context of clinical trials compared to naturalistic contexts among adolescents (Cohen & Schleider, 2022). Thus, given null results from ITT, additional strategies may be needed to further develop SCT as a viable approach in the real world. As habits strongly predict behavioral frequency, an important future direction is how to foster daily practice habits (Gardner et al., 2012). Many participants suggested using smartphone alerts as reminders to practice (see osf.io/bd9z7), which has shown promising effects on practice automaticity in other contexts (i.e., physical activity, Fournier et al., 2017). Future studies should examine whether such strategies promote practice of SCT.

Finally, we sought to assess whether self-compassion interventions promote self-compassion habits. SCT did not form stronger practice- or self-compassion automaticity (i.e., habits) than AC. Habits may take longer than one month to fully develop (Lally et al., 2010), and thus, future research should investigate SCT over longer timeframes. In exploratory ITT ($N = 135$), we identified a conditional effect of practice frequency, such that SCT predicted greater T1-to-T2 increases in practice automaticity than AC among those who practiced frequently. This raises the interesting possibility that the SCT micropractice may be more habit-forming with each performance than AC. Given that SCT did not result in superior practice- and self-compassion automaticity and the relatively small number of participants who practiced every day, identifying associations with habit formation may inform future targets for improving SCT.

To identify targets for promoting habit formation, we explored what changes in outcomes were associated with greater T1-to-T2 increases in practice- and self-compassion automaticity across interventions. In ITT and PP, greater increases in *self-compassion* automaticity were associated with greater T1-to-T2 increases in self-compassion, positive affect, and practice automaticity. Greater increases in *practice* automaticity were associated with greater increases in positive affect and greater reductions in psychopathology. These findings suggest positive affect may help the formation of practice- and self-compassion habits. This extends research on the utility of rewards in habit formation (Kaushal & Rhodes, 2015). Increases in self-compassion automaticity, but not self-compassion, were associated with increases in practice automaticity—raising the possibility that effortful self-compassion is insufficient to promote habit formation. Self-compassion may need to become habitual before it can facilitate the forming of other habits. Studies should investigate self-compassion automaticity as a potential target for helping to form other habits.

As with any study, there are limitations and constraints on generality. We tested SCT in undergraduates as the rate of psychological distress in this group has grown substantially in the past few years (Elharake et al., 2022). Nevertheless, studies are needed to extend generalizability beyond college student samples, as our retention rate was relatively high (~90%), and recruiting via course credit may bias study participation, retention, or enrollment. Despite recruiting a racially and socioeconomically diverse sample, about two-thirds were female. Although sex did not differ across conditions or between drop-outs and completers, more balanced-sample replications are needed. Also, our sample was generally non-treatment seeking. Yet, it is notable that over two-thirds of our participants scored at or above the cut-off recommended by the American Psychological Association on the DSM-5 Cross-Cutting Measure, suggesting that a majority had clinically significant symptoms (Narrow et al., 2013). Nevertheless, replications in treatment-seeking populations are needed.

Although we identified the strongest effects among those who practiced SCT near-daily, we did not randomly assign practice frequency. Nevertheless, PP only differed on T1 self-compassion, which did not moderate SCT effects on any primary outcomes influenced by practice frequency. Thus, it is unlikely that PP was confounded by T1 self-compassion. Because less than half the participants practiced daily, and the PP sample size limited our ability to effect small-to-moderate effect size differences, larger sample replications are needed. We conceptualized this initial study as an opportunity to investigate a range of constructs. However, this approach has the drawback of necessitating multiple comparisons, which raises the risk of Type I error. Therefore, replications are needed, and future research should use this study to narrow down the constructs of interest. Although SCT did not increase positive affect, relative to AC, our positive affect measure did not cover low-activation positive emotions (e.g., calm, content, serene) that may have been more likely to change following SCT and should be examined in future research. Although qualitative data (osf.io/bd9z7) indicates that many participants evaluated SCT favorably, future research should include a formal assessment of the acceptability of the intervention.

In conclusion, although SCT did not improve outcomes in the average college student who received it, when practiced near-daily, it promoted self-compassion and reduced stress and psychopathology—-with effect sizes comparable to more time-intensive interventions (see Table S10; Ferrari et al., 2019; Goldberg et al., 2022; Golden et al., 2021; Held & Owens, 2015). Our findings extend research demonstrating that briefer contemplative practices could be a cost-effective first-line intervention, but perhaps only when practiced regularly (Manigault et al., 2021; Strohmaier et al., 2021). Formal contemplative practices, although effective, are time-intensive, more often accessed by white, high-income, and college-educated people, and may be less persistently practiced among those using them for mental health reasons (Burke et al., 2017; Goldberg et al., 2022; Lam et al., 2023). By contrast, micropractices are grounded in modern contemplative approaches like the Plum Village Tradition, which incorporate micropractices like a moment of mindfulness when the phone rings (Hạnh, 2004), and are more readily accessible to all. Key to deriving benefits from SCT, like any contemplative practice—is practice (Parsons et al., 2017). Incorporating the science of habit formation to increase practice presents an exciting avenue of research to improve SCT and perhaps contemplative practices more broadly. Daily micropractices have the potential for augmenting single-session interventions and for offering help when more time-intensive approaches may be less accessible.

Funding

The National Science Foundation Graduate Research Fellowship (grant number DGE2146752 to E.S.S.) and the National Institute of Child Health and Human Development (grant number R01HD071065 to A.G.H.) supported this work. The funding agency has no role in the conduct or reporting of this study.

CRediT authorship contribution statement

Eli S. Susman: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Serena Chen:** Conceptualization, Methodology, Writing – review & editing. **Ann M. Kring:** Conceptualization, Methodology, Writing – review & editing. **Allison G. Harvey:** Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. At the time of writing this manuscript, Eli S. Susman served as a scientific advisor for Chorus Wellness Inc. and had received compensation for his time. However, he is no longer serving in this role and is no longer affiliated with Chorus Wellness Inc. His role was to ensure the quality and rigor of Chorus's science, and he has no specific obligations to the company, nor does he receive financial incentives (e.g., stocks) related to the growth or success of the company.

Eli S. Susman has received research support from the National Science Foundation. Dr. Allison G. Harvey has received research support from the National Institutes of Health, the National Institute of Child Health and Human Development, and book royalties from American Psychological Association, Guilford Press, and Oxford University Press. Dr. Ann M. Kring has received research support from the National Institutes of Health, and book royalties from Wiley, Guilford Press, the Authors Guild, and New Harbinger. Dr. Serena Chen has no conflicts of interest related to this work to declare. The views expressed in this article do not represent those of any public entity.

Data availability

All data, materials, and analysis code are publicly available on the Open Science Framework (osf.io/wq8mf/).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2024.104498.

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