A Megastudy of Single-Session Interventions for Depression (Includes analysis plan and consent form) March 8, 2025

Protocol

Design

Participants will be randomly assigned to one of 13 conditions, with even odds of allocation, except that the passive control condition will have 3X odds of allocation. Researchers will use Qualtrics's "evenly present elements" feature to ensure each condition gets a roughly equal number of participants.

Procedure

1. **Screen.** Participants will be asked to complete the Patient Health Questionnaire (9-item, PHQ-9) to assess eligibility. Next, eligible participants will be asked to consent to participate in the study.
2. **Baseline session.** Participants who consented will immediately begin the first study session, starting with a baseline well-being questionnaire. Next, they will be randomly allocated to one of the 11 experimental SSI conditions, an active comparison SSI condition, or a passive control condition. After they complete the condition to which they were randomized, they will respond to some of the baseline measures again, as well as measures of SSI satisfaction.
3. **Follow-up.** Four weeks later, participants will be invited to a follow-up survey, in which they will complete the baseline well-being survey again.

Participants will be compensated directly after completing each study session. If participants drop out of the baseline session after randomization, they will still be invited to complete the follow-up survey. After each study session, participants will be offered access to a list of online mental health resources (see https://osf.io/wz5u6).

Measures

See the "Megastudy Measures" document (https://osf.io/76cfy) for information on measures, and the "Timepoints of megastudy measures" document (https://osf.io/hn83p) for information on measurement timepoints.

To measure depressive symptoms, researchers will use the reliable and valid Patient Health Questionnaire (9-item). Researchers will consider a change in PHQ-9 score of 5 or greater to be clinically meaningful (Kroenke, 2012). To measure agency, researchers will use the Pathways Subscale of the State Hope Scale, a reliable and valid three-item self-report measure of one's perceived ability to generate plans and work toward goals. To measure hopelessness, researchers will use the reliable 4-item Beck Hopelessness Scale. Researchers will measure depression change expectancies using three items from the

Depression Expectancies for Change scale (those with the highest item-total correlations in the original paper on the scale). Researchers will measure participants' positive actions and thoughts (aligning with the goals of cognitive-behavioral therapy) using the Frequency of Actions and Thoughts Scale (FATS). Researchers will also include two multiple-choice questions regarding participants' readiness to make changes toward challenging their depression.

Researchers will measure how acceptable participants find the SSIs with the Credibility / Expectancy Questionnaire, a few items asking if one experienced an Aha! moment during the SSI and how strongly the Aha! moment affected them, and a rating (out of 5 stars) of the intervention's overall quality.

References:

Kroenke K. (2012). Enhancing the clinical utility of depression screening. CMAJ : Canadian Medical Association journal, 184(3), 281–282. https://doi.org/10.1503/cmaj.112004

Interventions

11 *experimental SSIs* were included for testing. The active comparison SSI is the Action Brings Change Project, an evidence-based SSI for depression. The *passive control* condition aims to hold attention without influencing depressive symptoms or mood (a three-minute video, multiple-choice questions, two-minute reading passage, three-minute writing exercise, all about trout). All 11 experimental SSIs, the active comparison SSI, and the passive control condition are available in browser (https://osf.io/nqdte) and downloadable versions (https://osf.io/ujbdf).

Data Collection

Researchers have not yet started data collection. Participants will be recruited from the online participant recruitment platform CloudResearch Connect and, if needed, CloudResearch and Prolific. All study activities will take place through the online survey and experience management platform Qualtrics, except participants will be invited to participate in each study session and be compensated through their online recruitment platform. Participants can choose to skip any items in the study, except ones that are critical for an intervention to function properly.

Hypotheses

Primary Hypothesis

For each SSI, we hypothesize that participants assigned to the SSI will report a different extent of change in depressive symptoms between baseline and four-week follow-up than participants assigned to the passive control condition.

Secondary Hypotheses

1. For each experimental SSI, researchers hypothesize that participants assigned to the SSI will report a different extent of change in depressive symptoms from baseline to four-week follow-up than participants in the active comparison condition.
2. For each SSI, researchers hypothesize that participants assigned to the SSI will report a different extent of change in each secondary well-being outcome (agency, hopelessness, depression change expectancies, readiness for change, frequency of positive actions and thoughts) compared to participants in the passive control. researchers will compare change in all outcomes from baseline to four-week follow-up, as well as from baseline to immediate post-intervention for outcomes collected at all three timepoints.
3. For each experimental SSI, researchers hypothesize that participants assigned to the SSI will report a different extent of change in each secondary well-being outcome (from baseline to week four or baseline to post-intervention) than those assigned to the active comparison condition.
4. For each experimental SSI, researchers hypothesize that participants will rate the SSI as differently acceptable than the active comparison SSI according to CEQ scores, star ratings, and rate of Aha! Moments.
5. We hypothesize that participants who expect they can improve their depression more at baseline will show a different change in depressive symptoms from baseline to week four.
6. We hypothesize that, on average, the SSIs will be more effective at improving all well-being outcomes (from baseline to week four or baseline to post-intervention) than the passive control.

We do not make any specific hypotheses about which SSIs will be more effective or acceptable than others.

Statistical Analysis Plan

Inclusion criteria

Participants will need to be at least 18 years old, be able to read and write fluently in English, and have enough access to the internet to complete two sessions over four weeks. They must also score at least 10 on the PHQ-9 screen (suggesting moderate depression) and pass the bot check (https://osf.io/kba7v) during the screen (Kroenke et al., 2001).

All participants who are randomized to an experimental condition (and therefore completed all baseline measures) will be included in analyses. If a participant begins a survey multiple times, researchers will only keep data from the first time.

Please see the measures document (https://osf.io/76cfy) and the data cleaning script (https://osf.io/jpk38) for details on measures and recoding. Before sharing the study data, researchers will remove any potentially identifiable information, included in written response items. Deviations from this pre-registration will be documented.

References:

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9. Journal of General Internal Medicine, 16(9), 606–613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Primary analysis

Researchers will use a mixed-effects linear regression model to test if depressive symptoms decrease more from baseline to four-week follow-up in each of the 12 active conditions compared to the passive control condition. Timepoint is a three-level factor (i.e., baseline, post-test, and week 4 follow up). The model will include a participant identifier as a random intercept.

Using the "lme4" and "lmerTest" packages in R, this analysis will take this form:

lmer(depressive_symptoms ~ timepoint * condition + (1|participant_id))

Using lmerTest's default, p-values will be calculated using Satterthwaite's method for denominator degrees of freedom.

Secondary analyses (matching the hypotheses above):

1. To test if each experimental SSI changes PHQ-9 scores differently from the active comparison SSI, researchers will redo the main analysis, except using the active comparison condition as the comparator.

2. To test if each SSI changes secondary well-being outcomes to a different extent than the passive control, researchers will replicate the primary analysis for each secondary outcome. For outcomes measured at three timepoints, researchers will compare baseline to each timepoint.
3. To test if each experimental SSI changes secondary well-being outcomes to a different extent than the active comparison SSI, researchers will redo analysis #2, but instead use the active comparison SSI as the comparison condition.
4. To test if each experimental SSI differs in acceptability from the active comparison SSI, researchers will conduct a linear regression model testing between-group differences in intervention acceptability for each acceptability outcome at each timepoint the outcome was collected. For these analyses, researchers will drop data from the passive control because it does not make sense to compare satisfaction with a mental health intervention to satisfaction with an educational program about trout.
5. To test if participants who expect that they can change their depression more at baseline will show a different reduction in depressive symptoms from baseline to week four, researchers will run a linear mixed-effects regression model with depressive symptoms as the DV, timepoint, baseline depression expectancies, and the interaction between the two as predictors, and a participant identifier nested in experimental condition as a random intercept.
6. To test if, on average, the SSIs will be change each outcome differently than the passive control, researchers will re-run the main analysis with *experimental condition* re-coded into a two-level factor in which any of the 12 active SSIs will be coded as "active." The random intercept, participant ID will be nested within experimental condition. For outcomes measured at three timepoints, researchers will compare the baseline to each timepoint

Sensitivity analyses:

1. Researchers will re-run the primary analysis with demographic covariates: age, gender, disability, race, education, relationship status, political party, employment status, household income, and perceived socioeconomic standing (Social Ladder).
2. Researchers will re-run the primary analysis with demographic and baseline mental health covariates: age, gender, disability, race, education, relationship status, political party, employment status, household income, perceived socioeconomic standing (Social Ladder), baseline depression change expectancies, baseline

positive actions and thoughts, baseline readiness for change, baseline agency, and baseline hopelessness.

3. Researchers will test for differential attrition across conditions and by the interaction of condition and each covariate. If researchers find evidence for differential attrition, researchers will conduct a sensitivity analysis re-running primary and secondary analyses accounting for differential attrition using inverse probability weighting. See the analysis script (https://osf.io/5eya3) for details.

Robustness Check: Researchers will not correct for multiple hypotheses in primary and secondary analyses because each test of an intervention's effect is viewed as a separate hypothesis. However, it might be that some statistically significant results detected are false positives that occur due to testing so many hypotheses at once. To examine this possibility, researchers will conduct a robustness check that replicates all analyses that compare an outcome across many conditions correcting for multiple hypotheses using the Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995).

Inference Criteria: P-values will be used as the criterion for statistical significance. Two-sided tests will be used for all analyses. Effects of $p \leq .05$ will be reported as significant, $.05 < p \leq .1$ as marginally significant, and $p > .1$ as nonsignificant.

***Missing data handling*:** Because participants can choose to skip items, there may be some missing data within outcome measures. If one's response to a scale is missing 33% of its items or fewer, researchers will impute a value for each missing item using the mean of the other items of the scale that the participant answered.

If an outcome scale is missing more than 33% of its items, researchers will consider the entire scale to be missing. In these cases, researchers will not impute missing outcome data because linear mixed models' estimates for longitudinal clinical trial data are not improved by outcome data imputation (Chakraborty & Gu, 2009). Researchers will impute missing covariate data as described in the cleaning script (https://osf.io/jpk38).

***Sample Size**:* Researchers will aim to recruit 500 participants per intervention condition, except that the passive control condition will have 3X as many participants as the other conditions because it will improve the statistical power of analyses comparing conditions to the passive control. Thus, researchers aim for a total baseline sample size of $n = 7{,}500$. This sample size will enable us to detect change in depressive symptoms from baseline to follow-up between each intervention condition and the passive condition with an effect size smaller than Cohen's $d = 0.17$, with 90% power and alpha = 0.05. This sample size will also allow us to detect differences in change in depressive symptoms from baseline to follow-up between each intervention condition smaller than $d = 0.19$.

References:

Bates, D. (2014). Fitting linear mixed-effects models using lme4. arXiv preprint arXiv:1406.5823.

Benjamini, Y., & Hochberg, Y. (1995). Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing. Journal of the Royal Statistical Society Series B: Statistical Methodology, 57(1), 289-300.

Chakraborty, H., & Gu, H. (2009). A Mixed Model Approach for Intent-to-Treat Analysis in Longitudinal Clinical Trials with Missing Values. RTI Press. http://www.ncbi.nlm.nih.gov/books/NBK538904/

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: tests in linear mixed effects models. Journal of statistical software, 82(13).

Consent Form

Please read through the study consent form below and indicate if you agree to participate.

Title of Research Study: A Megastudy of Single-Session Interventions to Challenge Depression in American Adults

Principal Investigator: Dr. Jessica Schleider, Ph.D.

Supported By: This research is supported by the National Institute of Mental Health and the Medical Social Sciences and Preventive Medicine departments at Northwestern University.

Conflict of Interest Disclosure:

We have no conflicts of interest relevant to this study to disclose.

Key Information about this research study:

The following is a short summary of this study to help you decide whether to be a part of this study. Information that is more detailed is explained later on in this form.

- The purpose of this study is to compare different short programs that are intended to help people overcome feelings of depression.
- In this session, you will be asked to answer some questions about your feelings and experiences, complete a short program intended to help you improve your mental health, and then share your thoughts on the program and answer some more questions about yourself. Four weeks from now, we will invite you through CloudResearch to complete a five-minute follow-up questionnaire about how you are feeling.
- This session will likely take about 20 minutes and the next session will be about 5 minutes.
- The primary potential risk of participation is that the program you complete could make you feel worse than you do now. However, we have done our best to ensure that the program you complete will be helpful and not harmful.
- The main benefit of being in this study is a benefit to society: the study's results could help make programs for mental health that are more helpful in the future.
- A description of this clinical trial will be available on www.ClinicalTrials.gov, as required by U.S. Law. This Web site will not include information that can identify you. At most, it will include a summary of the results. You can search this Web site at any time.

Why am I being asked to take part in this research study?

We are asking you to take part in this research study because you are an adult 18 years or older in the United States, your score on the measure of depression symptoms you just completed met criteria as "moderate" or more severe, you are fluent in English, and you have access to the internet via a computer, tablet or smartphone. We would like your help to test if the programs we are studying can improve well-being and reduce feelings of depression.

How many people will be in this study?

We expect 7,500 people will participate in this research study.

What should I know about participating in a research study?

- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.
- You do not have to answer any question you do not want to answer.

What happens if I say, "Yes, I want to be in this research"?

- You will be asked to complete two sessions: one now and one in four weeks. At several points in the study, you will be asked questions about yourself and how you are feeling. You will complete a short online program intended to help you deal with feelings of depression and be asked for your feedback on the program.
- This session should take 20 minutes, the second session should take 5 minutes.
- You will not interact with anyone during this survey or the next two surveys. You can complete the surveys independently at your own pace, within the time window allotted by CloudResearch.
- The research will be carried out entirely online.
- There are 13 groups of study participants in this study, and each group completes a different program. The group of study participants you will be assigned to will be chosen by chance, like flipping a coin. Neither you nor the study team will choose which study group you are assigned to. You will have an equal chance of being

assigned to any given group, except for the “control group”, to which you will have three times higher change of being assigned.

Will being in this study help me in any way?

We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include:

- The program that you complete could be helpful for you, improving your well-being or helping you learn about yourself. At the end of the study, you will also be given access to other free online programs for depression that you can use as you wish.
- This research can benefit society and other people who struggle with their mental health by advancing knowledge about how to make online mental health programs more helpful. Once we know which programs are most (and least) helpful, we will do our best to share this knowledge so that others can build on our work.

Is there any way being in this study could be bad for me?

Possible risks include:

It is possible that the program you complete could make you feel worse than you do. For example, it might make you reflect on negative experiences or aspects of yourself that are painful to think about. The program might also encourage you to make a change in your life that ends up being a mistake. However, the program will not expose you to more risk than you could reasonably be expected to face in your normal daily life. We have taken care to ensure the program you will test is as helpful and as harmless as possible.

Some of the questions in this study ask about sensitive topics that may be upsetting to think about, including asking about thoughts of self-harm or suicide.

We will not be able to link your responses to you, so we will not be providing you with personal feedback or referrals based on your responses to questions. If you are concerned about your mood, please refer to the resource referral information sheet provided at the bottom of this document. In addition, if you would like to talk to a member of the research team about negative feelings you experience resulting from these questions or anything else in the study, please do not hesitate to reach out via the contact information, also at the bottom of this document. If you have been thinking about death or suicide, we encourage you to visit http://www.suicidepreventionlifeline.org/ or call 988.

A possible risk for any research is that confidentiality could be compromised – that is, people outside the study might get hold of confidential study information. We will do everything we can to minimize this risk, as described in more detail later in this form. For

one, we do not ask you for any information that someone could use to identify you. We plan to share the data from this study publicly but we will exclude all data that could possibly be used to identify who participated in the study.

What happens if I do not want to be in this research, or I change my mind later?

Participation in research is voluntary. You can decide to participate or not to participate. If you do not want to be in this study or withdraw from the study at any point, your decision will not affect your relationship with Northwestern University.

if you just want to try out a program without being in this research study, you can reach out to benjamin.kaveladze@northwestern.edu and he will send you the programs you could have completed in the study.

If you decide to leave this study, we will keep your data unless you disallow us to do so. You can write to anyone on our research team through CloudResearch or email asking us to destroy your data. If you say yes now, you can change your mind at any time without getting into any trouble. You will not have to reveal your identity to contact us because messaging is anonymous on CloudResearch.

How will the researchers protect my information?

We will use Qualtrics at Northwestern University to host our surveys. Qualtrics is a secure, HIPAA compliant, web-based application that collects online research data. Your data will be kept on a secure server at Northwestern University, accessible only to the research team. That is, no one other than the research team will have access to the information you provide.

Who will have access to the information collected during this research study?

Efforts will be made to limit the use and disclosure of your personal information, including research study records, to people who need to review this information. We cannot promise complete secrecy. We will not ask you for any information that could be used to identify you.

There are reasons why information about you may be used or seen by other people beyond the research team during or after this study. Examples include:

University officials, government officials, study funders, auditors, and the Institutional Review Board may need access to the study information to make sure the study is done in a safe and appropriate manner.

We will publicly share the data for this study when we publish it, but we will remove any responses you give that could possibly reveal your identity.

How might the information collected in this study be shared in the future?

We will keep the information we collect about you during this research study for study recordkeeping. De-identified data from this study will be shared with the research community, with journals in which study results are published, and with databases and data repositories used for research. We plan to contact you again in four weeks as part of this research study.

Will I be paid or given anything for taking part in this study?

You will receive compensation electronically through CloudResearch for your participation in this study. If you do not complete a study session, you will not be compensated for it. You already earned $0.25 for answering the screening questions. You will be paid $3.00 USD for completing this 20-minute first part of the study and $1.00 for completing the second part in four weeks.

Who can I talk to?

If you have questions, concerns, or complaints, you can contact the Principal Investigator Dr. Jessica Schleider at 917-439-1872, Dr. David Mohr at 312-503-1403, or Dr. Benjamin Kaveladze at 312-503-8039.

If you'd like, you can access a list of mental health resources that we put together at this link: https://drive.google.com/file/d/11xAwnRJn1Lk_EL4aUzZyAWkbmojBEL_p/view?usp=sharing.

This research has been reviewed and approved by an Institutional Review Board ("IRB") – an IRB is a committee that protects the rights of people who participate in research studies. You may contact the IRB by phone at (312) 503-9338 or by email at irb@northwestern.edu if:

Your questions, concerns, or complaints are not being answered by the research team.

You cannot reach the research team.

You want to talk to someone besides the research team.

You have questions about your rights as a research participant.

You want to get information or provide input about this research.

If you want a copy of this consent for your records, you can print it from the screen.

If you cannot print the consent and would like a copy for your records, contact the Principal Investigator with the contact information above.

If you wish to participate, please click the “I Agree” button and you will be taken to the survey.

If you do not wish to participate in this study, please select “I Disagree” and you will still receive your $0.25 payment.