



Emphasizing Controllability over Biological Processes Underlying Depression: Effects on the Perceived Credibility of Psychotherapy

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Abstract

Background Laypeople tend to misunderstand that biological processes underlying mental disorders are largely uncontrollable with human effort. In contrast, psychotherapy is believed to require individual effort and is therefore seen as incompatible with addressing biological processes. This study examined whether explaining how some biological processes are controllable and malleable can remove distrust of psychotherapy when depression is attributed to biological factors.

Methods Participants from the general public ($n=898$) and individuals with symptoms of depression ($n=672$) rated the effectiveness of psychotherapy for depression before and after learning about biological causes of a depression case. In the biology-controllability condition, participants learned how psychotherapy helps people control biological processes underlying depression. In the psychotherapy-controllability condition, they learned how psychotherapy teaches control over depressive symptoms, rather than biological processes.

Results Unlike the control condition, participants in the biology-controllability and psychotherapy-controllability conditions judged psychotherapy as significantly *more* effective, and this increase was greater in the biology-controllability condition than in the psychotherapy-controllability condition.

Conclusions An intervention specifically counteracting the belief that biological processes are uncontrollable can best mitigate distrust of psychotherapy for biologically attributed depression.

Keywords Treatment beliefs · Biological malleability · Biological attributions for mental disorders

Introduction

Scientific and lay communities alike increasingly attribute mental disorders to biological etiologies, such as gene interactions and neurobiology (Deacon, 2013; Lebowitz, 2019; Pescosolido et al., 2010; Pilkington et al., 2013). There are important benefits to underscoring the biological bases of mental disorders, including reduced blame and personal responsibility of affected individuals (Kvaale et al., 2013). However, these benefits may in fact be a double-edged sword as the upside of reducing personal responsibility can be feelings of diminished agency over symptoms and greater pessimism about recovery among affected individuals (Kemp

et al., 2014; Lebowitz & Ahn, 2015, 2018; Lebowitz et al., 2013).

The present work examines another adverse consequence of emphasizing biological etiologies. Specifically, when mental disorders are biologically attributed, people perceive psychotherapy as less effective (Ahn et al., 2009; Kemp et al., 2014; Marsh & Romano, 2016; Perricone & Ahn, 2023; Zimmermann & Papa, 2020).¹ This distrust of psychotherapy has been found among lay people, affected individuals and even mental health clinicians (Deacon, 2013; Iselin & Addis, 2003; Lebowitz & Ahn, 2014; Schroder et al., 2020).

The view that psychotherapy is less effective for biologically attributed mental disorders is problematic because there is to date no support for the idea that disorders with presumed biological etiologies are necessarily better treated with pharmacotherapy than psychotherapy (Miller, 2010).

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¹ See Wallman and Melvin (2022) who found an association between parents endorsing biological etiologies of their child's depression and preferring psychotherapy for their child.

Indeed, the American Psychiatric Association continues to recommend the combination of medication and psychotherapy for most mental disorders (see Tadmon & Olfson, 2022 for further discussion). Despite this, among providers who are able to offer both types of treatment, namely psychiatrists, there has been an increasing reliance on pharmacotherapy alone and the use of psychotherapy has decreased by approximately 50% since 1996 (again, Tadmon & Olfson, 2022).² Even if people in need of treatment *do* receive psychotherapy, the treatment may be less effective if they have lower expectations (Constantino et al., 2011; Wampold, 2015).

Mitigating Distrust in Psychotherapy

In order to change the perception that psychotherapy is less effective for biologically attributed mental disorders, it is important to first understand where this distrust comes from. One explanation for the reduced trust in psychotherapy is related to the low perceived controllability of biological processes (Perricone & Ahn, 2023). Specifically, people perceive biological processes, such as the functioning of genes and brains, as passive and largely beyond their control (Berent & Platt, 2021; Dar-Nimrod & Heine, 2011; Gelman, 2004; Gould & Heine, 2012; Haslam, 2011; Satel & Lilienfeld, 2013). Furthermore, and as noted above, when biological processes are believed to underlie a mental disorder, people believe that they have less control over their symptoms (Ahn & Lebowitz, 2018; Dar-Nimrod & Heine, 2011; Dar-Nimrod et al., 2014; Lebowitz & Ahn, 2018; Pearl & Lebowitz, 2014).

In contrast, psychotherapy tends to be seen as requiring individual effort or control (e.g., Beck, 1979; Beck, 2005; Bohart & Tallman, 2010; von der Lippe et al., 2019). This is especially true of the evidence-based psychotherapies (e.g., Cognitive Behavioral Therapy (CBT), Dialectical Behavioral Therapy (DBT), Acceptance and Commitment Therapy (ACT)). For example, in cognitive-behavioral treatments, the client's individual effort is seen as critical both to the mechanics of the therapeutic process (e.g., skill acquisition via engagement with homework assignments) and more broadly to the therapeutic relationship between client and therapist (Beck, 1979; Kazantzis et al., 2013). Underscoring the importance of individual effort, a meta-analysis by Kazantzis and colleagues (2010) found that

client engagement with homework provided clinical benefit beyond that already afforded by CBT.

Client effort is also an inherent part of the therapeutic relationship. Psychotherapy is understood to be a collaborative process where clients are encouraged to articulate their own treatment goals and set the agenda for sessions (Norcross & Lambert, 2011). That is, the client is not a passive recipient of change, but instead takes an active role, engaging in a Socratic dialogue with the therapist often taking a more facilitative role (Kazantzis et al., 2017). More fundamentally, the client is seen as possessing the “ability to be his or her own change agent” (Kazantzis et al., 2017, p. 18). Indeed, a core aim of CBT is for the client to leave treatment with the skills and ability to “be their own therapist” in the future. The absence of client agency in relation to goal- and agenda-setting is seen as a problematic behavior in therapy (see Beck, 2005).

Furthermore, the importance of client agency in therapy is not only acknowledged by practitioners, but also by clients themselves. As one meta-analysis found, in over 70 studies on the therapeutic process, psychotherapy clients viewed their own agency as an essential part of therapy (Levitt et al., 2016). More specifically, clients value their agentive role in therapy, citing their therapists' receptiveness to goal setting and feedback as important to therapy outcome (Timulak & Keogh, 2017).

Future iterations of psychotherapy will likely put still greater emphasis on the role of the individual in treatment. The field is shifting towards more personalized, process-based approaches to intervention, where the client's effort towards relating their underlying vulnerabilities (including biological and psychosocial risk), determining treatment goals and identifying change-facilitating techniques is likely to be especially important (Hayes & Hofmann, 2018; Hayes et al., 2019, 2020; Hofmann & Hayes, 2019).

Thus, our central claim in the present study is that the discrepancy between the perceived controllability of biological processes versus psychotherapy leads to the perception that psychotherapy is incompatible with and therefore less effective in addressing biological causes. This association was recently documented by Perricone and Ahn (2023). Participants in this study rated the ability to control thoughts and behaviors to enhance the effectiveness of psychotherapy to be significantly greater than the ability to influence the functioning of brain processes contributing to depression. Furthermore, the extent to which participants endorsed this discrepancy between the perceived controllability of psychotherapy processes and brain processes predicted the extent to which they distrusted psychotherapy for a case of biologically attributed depression.

Still, Perricone and Ahn's (2023) study provided only correlational evidence of how discrepancy in controllability beliefs relate to the distrust in psychotherapy. As a result, it

² Of course, various barriers (notably insurance reimbursement policies) likely drive this trend; for further discussion see Tadmon and Olfson (2022). Yet increasing endorsement of biological explanations for mental disorders and the perception that psychotherapy is less effective for biologically based disorders, may also be contributing.

is an open question whether addressing laypeople's misunderstanding on controllability of biological processes can restore trust in psychotherapy when mental disorders are biologically attributed.

A Controllability Intervention

The present study is the first to examine whether controllability beliefs *cause* distrust in psychotherapy. To do this, we used the strategy recommended in the causal reasoning literature (Pearl, 2009), namely intervening on a hypothesized cause to see whether it results in changes in the outcome. Thus, we taught participants in the “biology-controllability” condition that biological causes of depression are controllable with human effort and are mutable. Afterwards, we examined whether this intervention reduces distrust in psychotherapy. The intervention used in the current study consisted of a brief psychoeducational reading passage, explaining how people in psychotherapy learn healthy skills, which can change some of the biological processes underlying depression. This explanation emphasized that biological processes are not fixed and deterministic, but malleable.

Similar materials, underscoring the malleability of biological processes were tested by Lebowitz and colleagues (). These materials were found to be effective at mitigating feelings of diminished agency over symptoms and prognostic pessimism that occurs when a mental disorder is biologically explained. The intervention tested in the present study, however, is the first to examine whether materials emphasizing the controllability and malleability of biological processes can affect the credibility and expectations that people hold about psychotherapy.

Yet, if the controllability intervention effectively mitigates distrust in psychotherapy, this may be because the materials emphasize agency over depression symptoms, and not that explaining agency over biology provides any additional benefit. Thus, to test whether emphasizing controllability over biological processes is the more effective intervention when a mental disorder is biologically explained, we created a second experimental condition, called the psychotherapy-controllability condition. In this condition, participants also received a brief, psychoeducational reading passage, but these materials only emphasized that people can exercise control over their depression symptoms by learning and practicing skills taught in psychotherapy. That is, there was no mention of controllability of biological processes underlying a mental disorder.

Overview of Experiments

To test the effectiveness of the biological controllability intervention, the present work used a pretest-posttest design, where participants rated the effectiveness

of psychotherapy treatment for depression before and after learning about the biological causes of depression. Depression was used as a target condition because it is highly prevalent (WHO, 2017) and would therefore be easy for lay participants to reason about in answering the study outcome questions. In between learning about the biological causes of depression and re-rating the effectiveness of psychotherapy, participants in either experimental condition also received the respective psychoeducational materials. We also included a control condition, where participants received no psychoeducational materials.

There were two participant samples. Study 1 tested a general population sample, to gauge whether public attitudes towards psychotherapy for biologically explained depression would be affected by our intervention. Even individuals without current symptoms may develop depression at some point in their lives or may be involved in helping a family member or friend seek treatment. However, it is also important to examine whether those more immediately in need of psychotherapy could also benefit from our intervention. Thus, Study 2 tested the intervention in a sample of lay participants who reported current symptoms of depression.

There is also good reason to believe that the intervention might not be as effective with a symptomatic sample as with a general population sample. First, hopelessness and diminished feelings of agency are often considered a hallmark of depression (Catanzaro & Mearns, 1990; Kassel et al., 2007; Peterson et al., 1993; Rubenstein et al., 2016). As noted above, numerous studies have further found that exposure to biological explanations for a mental illness decrease feelings of self-efficacy and agency among those affected by depression (Kemp et al., 2014; Lebowitz & Ahn, 2018). Thus, it may be less likely that our brief intervention will persuade symptomatic participants that they can learn to exercise agency over biological processes through skills learned in psychotherapy. Some previous work has also documented that the flipside of decreased agency resulting from biological explanations is decreased blame among affected individuals for their symptoms (Kvaale et al., 2013). Arguably, symptomatic individuals may be unconsciously motivated to embrace the view that biological processes implicated in depression are beyond their control to alleviate feelings of personal responsibility and guilt.

Given these, it is imperative to empirically evaluate whether our intervention can effectively address skepticism towards psychotherapy for biologically attributed depression held by symptomatic individuals. If their concerns regarding the controllability of their depression symptoms stem from misconceptions about the brain's malleability or a lack of understanding that biological abnormalities can arise from psychosocial experiences, then rectifying these misunderstandings might alleviate their doubts about addressing the biological issues.

Hypotheses

We hypothesized that, in both studies, participants in the control condition, without any intervention materials, would judge psychotherapy to be significantly less effective after learning about the biological causes, replicating previous work (replicating previous work, e.g., Iselin & Addis, 2003; Lebowitz & Ahn, 2014; Perricone & Ahn, 2023). In the psychotherapy-controllability condition and the biology-controllability condition, however, it was hypothesized that ratings of perceived effectiveness of psychotherapy would increase even though they also learned that the depression was biologically caused. This is likely because both intervention materials underscored that depression is controllable. However, we predicted that those participants who learn specifically about how psychotherapy involves controllability over biological processes would show a significantly greater increase in psychotherapy ratings than those who receive the materials merely emphasizing controllability over symptoms.

Study 1: General Population

Methods

Participants

Participants were recruited through CloudResearch using Amazon mTurk Toolkit.³ Pilot data indicated that a sample size of 732 was needed to detect a significant interaction effect in our test of the two experimental conditions, described below. Because we ultimately included an additional control condition, we recruited 899 participants. One participant was excluded for failing an attention check. The final sample ($n = 898$) was 58.0% female and 82.5% white with mean age of 41.44 years ($SD = 12.83$).

Design, Materials, and Procedures

The Yale University Institutional Review Board approved this study and Study 2, below. All participants provided informed consent and were compensated. See Fig. 1 for the study procedures.

Because the primary study measures asked participants to reason about treatments for depression, they first read a

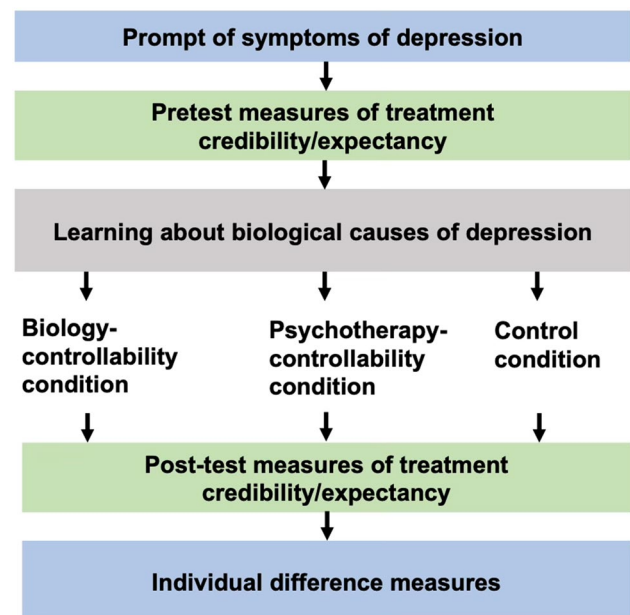


Fig. 1 Procedures Used in Studies 1 and 2. See Fig. 2 for the verbatim description of the biological causes of depression. See Fig. 3 for the verbatim materials presented to participants assigned to the biology-controllability and psychotherapy-controllability conditions

passage describing a fictitious woman with symptoms of Major Depressive Disorder as defined in DSM-V (i.e., “For the past 2 weeks Alex has been feeling down and unhappy... nothing gives her pleasure...”). The verbatim passage is provided on an OSF page found here: https://osf.io/q9pna/?view_only=f38d7d05521e481183aeb5d28962c605.

Next, participants completed a modified version of the Credibility Expectancy Questionnaire (CEQ) (Devilly & Borkovec, 2000), a validated 6-item measure of treatment beliefs. The original CEQ was developed for administration with client samples in treatment. Because the present study did not use such a sample, the original CEQ was adapted so that participants in the current study rated the credibility and expectancy of psychotherapy for the fictional woman, “Alex”, rather than their own symptoms or treatments. See Table 1 for the verbatim questions. As in the original CEQ, questions 1–3 and 5 were answered using a 1–9-point scale and questions 4 and 6 were answered using a 0–100% scale.⁴

Although not the focus of our study, we also explored the effect of our intervention on medication ratings by creating a second version of the CEQ, to measure the perceived credibility/effectiveness of antidepressant medication. The results of these measures are presented in the Supplement.

³ Mturk Toolkit is a platform developed by CloudResearch, which recruits Mturk workers, but independently vets workers (i.e., by blocking workers with hidden locations, running VPN checks and creating anonymized CloudResearch IDs for respondents). The platform also independently collects worker demographic information. In both Studies 1 and 2 we also used Captchas to avoid recruiting bots.

⁴ In order to average across all 6 items, we subsequently recoded items #4 and #6 to a 1-9-point scale by multiplying each score on items #4 or #6 by 9 and then dividing that score by 100.

Table 1 Modified CEQ used in study 1

Question #	Prompt
1	How logical do you think it is to treat Alex's depression with psychotherapy?
2	How useful do you think psychotherapy would be in reducing Alex's symptoms?
3	How confident are you in psychotherapy treatment for Alex?
4	How much improvement in Alex's symptoms do you think will occur with psychotherapy?
5	How much do you really feel that psychotherapy will help Alex to reduce her symptoms?
6	How much improvement in Alex's symptoms do you really feel will occur with psychotherapy?

Fig. 2 Passage describing the biological causes of depression used in study 1

According to Alex's medical records, it is highly likely that she had a genetic predisposition for depression. Both her parents suffered from depression, which increased Alex's risk of also experiencing depression by 2-3 times. In addition, a recent brain scan revealed some abnormalities in Alex's brain functioning. Specifically, Alex's brain scan showed that a brain area called the amygdala—which is involved in processing fear and emotional responses—was overactive in response to negative stimuli compared to that of a typical person. Additionally, Alex's brain scan showed that her amygdala overactivation may be due to weaker neural connections between her amygdala and her prefrontal cortex (the brain's control center). The brain scan also showed that there was a loss of gray matter (a loss of neurons that communicate information) in a brain region called the hippocampus, which is involved in learning and memory.

After the pretest measures, participants received information about the biological causes contributing to Alex's depression. See Fig. 2 for the verbatim passages.

Following this passage, participants were randomly assigned to one of three conditions (control: $n = 302$; biology-controllability: $n = 299$; psychotherapy-controllability: $n = 297$). Participants assigned to the biology-controllability and psychotherapy-controllability conditions received a condition-specific passage about how people can learn to exert control over depression through psychotherapy (see Fig. 3).

The biology-controllability materials explained how individuals in psychotherapy can learn healthy skills (e.g., behaviors and thinking styles) as a way of exerting control over biological processes that contribute to depression. These materials explained that this was possible because some biological processes are malleable, rather than fixed. Specifically, the materials stated, "genes can be turned on or off through healthy lifestyle behaviors that can be learned in psychotherapy." The materials also emphasized that the brain is highly plastic and capable of developing new neural connections in response to learning and experiences. Thus, as a result of learning healthy behaviors in psychotherapy, an individual with depression can develop new, healthy neural connections and change their own brain. The materials compared this to learning to ride a bike, and stated, "The brain can be compared to a muscle: it grows and changes according to how it is used or exercised".

The psychotherapy-controllability condition also emphasized individual controllability over one's depression symptoms. However, this controllability was explained in terms of

controllability over making psychotherapy effective per se rather than biological processes. Specifically, these materials explained how individuals in psychotherapy can learn skills for how to control their own thinking, emotions, and behaviors. The materials compared the experience of learning skills in psychotherapy to learning to speak another language, and explained, "In psychotherapy, people learn a "new vocabulary" of healthier thinking styles, better emotion regulation techniques and more skillful interpersonal communications." The materials emphasized that "the more one engages with psychotherapy, by speaking with a therapist and learning and practicing the new skills taught in sessions, the more that person is likely to utilize these new, healthy skills".

After reading these passages, participants assigned to the biology-controllability and psychotherapy-controllability conditions completed six comprehension check questions on all the materials they had read up to that point. Although they had not received any additional condition-specific passage, control condition participants also received six attention check questions pertaining to the passages they had read so far. Participants who missed any attention check question on their first attempt, were allowed to retake the questions. It was determined a priori that participants who missed more than 3 questions on their second attempt would be excluded. Only one participant was excluded based on the criterion, demonstrating high readability of the experimental passages.

Next, all participants responded to the post-test outcome measures, which were identical to the pretest measures. Finally, participants completed demographic questions and

Biology-controllability condition (348 words)

Research has shown that many biological factors (like genetics and brain processes) affect whether a person becomes depressed. While biology can play a role in causing depression, this doesn't mean that the individual has no power over the biological processes underlying their depression. In fact, **many biological processes can be influenced by our own actions.**

First, genetics alone can never make someone depressed. Even if a person has depression-related genes, these genes may not be active. Like a light switch, **genes can be turned on or off through healthy lifestyle behaviors that can be learned in psychotherapy.** For example, in psychotherapy one can learn to manage one's stress, engage in an active lifestyle and avoid self-destructive behaviors. All these can affect whether or not genes related to depression are actually "turned on" and causing the person to experience symptoms.

In addition, the human brain (including the adult brain) is always changing and growing. **The brain can create new neurons and connections between neurons in response to learning and experiences.** The brain can be compared to a muscle: it grows and changes according to how it is used or "exercised." One way to "exercise" the brain is through learning, which can strengthen or change the activity of neurons in the brain. For example, a depressed person in psychotherapy can learn healthier thinking patterns, better emotion regulation techniques and more skillful interpersonal communication. The more one engages with psychotherapy, by speaking with a therapist and learning and practicing new skills taught in sessions, the more their brain is likely to develop new, healthy neural connections. So, **individuals with depression can change their own brains by being in psychotherapy where they learn and work on new skills,** just like what happens to your muscle memory when you learn to ride a bike.

So even when a person's depression is caused by biological factors, they can still exercise agency and take control over changing those biological factors, to help themselves become symptom free. Making healthy lifestyle choices and learning skills in psychotherapy can help people to be in control of their depression.

Psychotherapy-controllability condition (336 words)

Research has shown that people who suffer from depression have difficulty engaging in healthy thinking patterns and regulating their negative emotions, but psychotherapy can help people learn healthier ways of thinking and behaving. **Many thinking processes and emotions can be controlled by our own actions, and those with depression can choose to participate in psychotherapy where they will learn how to do that.**

First, studies have found that individuals with depression tend to fixate on negative thoughts. By fixating on negative thoughts, people with depression may also experience negative emotions, like sadness. By **working with therapists, people with depression can learn and practice how to manage their stress, engage in an active lifestyle and avoid self-destructive behaviors,** which all contribute to negative thoughts.

It's just like learning to speak another language. At first your vocabulary is small, and words may not come to your mind easily, but as you work on learning new words and practice using those words in conversation, your vocabulary can grow and your speech becomes more fluent. Similarly, **in psychotherapy, people learn a "new vocabulary" of healthier thinking styles, better emotion regulation techniques and more skillful interpersonal communications.** But just like in language learning, you can't just memorize vocabulary and expect that you can communicate effortlessly; you also need to practice what you've learned in real-life settings. **The more one engages with psychotherapy, by speaking with a therapist and learning and practicing the new skills taught in sessions, the more that person is likely to utilize these new, healthy skills.**

So, individuals with depression can change their unhealthy thinking habits and emotions by being in psychotherapy where they learn and work on new skills, just like what happens when you learn a new language. That is, even when someone with depression experiences destructive thinking patterns and difficulty controlling their emotions, **they can still exercise agency and take control over changing those patterns and behaviors.** Making healthy lifestyle choices and learning skills in psychotherapy can help people to be in control of their depression.

Fig. 3 Biology-controllability and psychotherapy-controllability condition materials. The bolded text was also bolded in the materials presented to participants, to underscore certain key pieces of information

the BDI-II, allowing us to examine any effect of depression symptoms on the outcome measures.

Results

All data used in the analyses below and in Study 2 are publicly available via: https://osf.io/q9pna/?view_only=f38d7d05521e481183aeb5d28962c605.

Both the six pretest and posttest revised CEQ items showed good reliability (Cronbach's $\alpha = .94$ and $.97$, respectively). Each set of pretest and post-test measures was thus averaged, and these average scores (pretest CEQ and post-test CEQ, henceforth) were used in the analyses below.

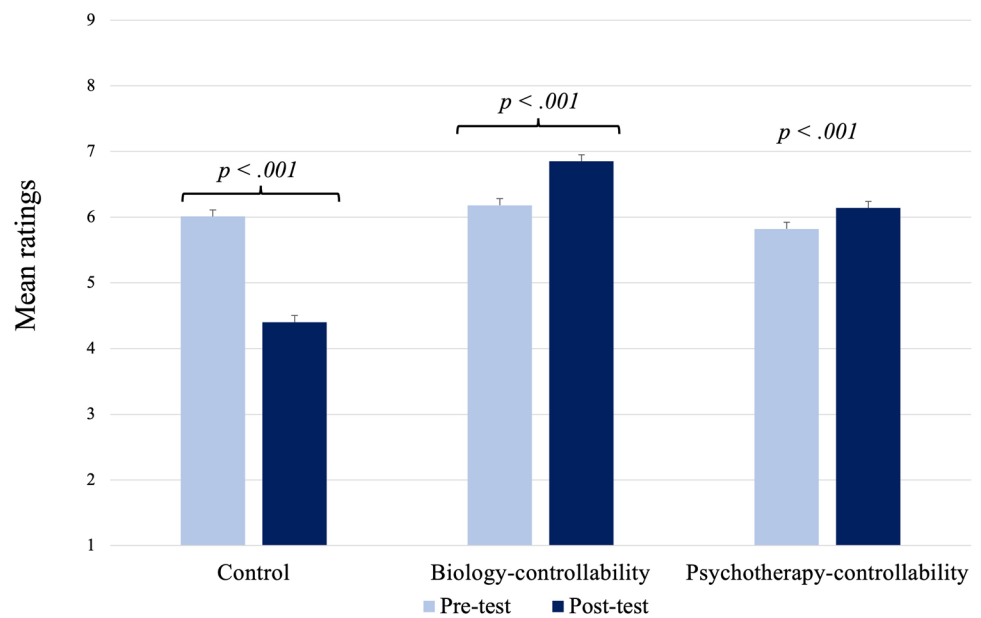
There was no significant correlation between BDI-II scores and change from pretest to post-test ratings in any condition (all p 's $> .35$) and BDI-II scores did not differ significantly across conditions, $p = .574$, so BDI-II scores were not included in the analyses below.

The pretest and post-test CEQ ratings were analyzed using a 2 (timepoint: pretest vs. post-test) \times 3 (condition) mixed ANOVA with timepoint as a within-subject variable. There were a significant main effect of timepoint, $F(1, 834) = 16.58$, $p < .001$, $f = .14$, 95% CI [.07, .21] and of condition, $F(2, 834) = 55.31$, $p < .001$, $\eta^2_p = .12$, 95% CI [.08, .16]. Most importantly, the change from pretest to post-test ratings after learning about the biological causes of depression depended on the condition, $F(2, 834) = 196.13$, $p < .001$, $\eta^2_p = .32$, 95% CI [.27, .37]⁵ (see Fig. 4).

In the control condition, post-test scores were significantly decreased after the biological explanations ($M_{pretest} = 6.01$, $SD_{pretest} = 1.59$, $M_{post-test} = 4.40$, $SD_{post-test} = 2.02$, $t(276) = 16.02$, $p < .001$, $d = .96$, 95% CI

⁵ Using the SPSS procedure for missing data, participants with any missing data on the collapsed dependent measures were not included in ANOVAs.

Fig. 4 Mean pretest and post-test ratings, broken down by condition in Study 1 with a general population sample. Mean ratings refers to average CEQ scores. Error bars represent standard error of the mean. P-values are the results from paired *t*-tests comparing pretest and post-test CEQ scores within each condition



[.82, 1.10], replicating previous work (e.g., Perricone & Ahn, 2023).

In contrast, post-test ratings of participants who learned that psychotherapy increases controllability over biological processes were significantly higher than pretest, despite that depression was attributed to biological factors, $M_{pretest} = 6.18$, $SD_{pretest} = 1.51$, $M_{post-test} = 6.85$, $SD_{post-test} = 1.49$, $t(277) = -10.07$, $p < .001$, $d = .60$, 95% CI [- .73, - .48].

In the psychotherapy-controllability condition, where the materials emphasized controllability over making psychotherapy effective, there was also a significant increase in ratings from pretest to post-test, $M_{pretest} = 5.82$, $SD_{pretest} = 1.50$, $M_{post-test} = 6.14$, $SD_{post-test} = 1.71$, $t(281) = -3.47$, $p < .001$, $d = .21$, 95% CI [- .33, - .09].

Although learning about controllability increased the posttest ratings in both conditions, the extent to which the posttest ratings increased differed between the two conditions. A 2 (timepoint: pretest vs. post-test) \times 2 (condition: biology-controllability vs. psychotherapy-controllability) mixed ANOVA revealed a significant main effect of timepoint, $F(1, 558) = 76.10$, $p < .001$, $f = .37$, 95% CI [.28, .45] and of condition, $F(1, 558) = 20.51$, $p < .001$, $\eta^2_p = .04$, 95% CI [.01, .07]. Most critically, there was a significant interaction effect, $F(1, 558) = 9.77$, $p = .002$, $\eta^2_p = .02$, 95% CI [.00, .04]. The interaction effect was obtained because the change from pretest to post-test was significantly greater in the biology-controllability condition ($M_{change} = .68$, $SD = 1.12$) than the psychotherapy-controllability condition ($M_{change} = .32$, $SD = 1.54$), $t(558) = -3.13$, $p = .002$, $d = .26$, 95% CI [- .43, - .10].

Study 2: Symptomatic Individuals

Although the biology-controllability intervention increased the credibility and expectancy of psychotherapy in the general population sample, it remains uncertain whether this intervention can provide similar benefit to individuals with symptoms of depression. As discussed above, there are several reasons to believe that this intervention will be less effective for a symptomatic sample. To reiterate, if symptomatic individuals have lower levels of baseline agency, a characteristic of depression (Rubenstein et al., 2016), it might prove more difficult to persuade such individuals that they can in fact exercise agency over biological processes through skills learned in psychotherapy. This may be especially true if these individuals embrace the given biological explanation for their depression symptoms, which may further decrease feelings of controllability. In contrast, if these doubts primarily arise from misconceptions about biological processes, our intervention may effectively restore symptomatic participants' trust in psychotherapy even for biologically attributed depression.

Methods

Participants

Individuals who self-reported to MTurk Toolkit that they had depression were recruited through CloudResearch. Pilot data showed that a substantial portion of the recruited

sample using the same recruitment method did not meet BDI-II criteria for depression, so 893 were recruited, aiming for 740 in the final sample. Of these, 220 were eliminated because their BDI-II scores were below 14, a conventional cutoff for having at least mild depression symptoms (Beck et al., 1996). One participant was also excluded for failing an attention check. The final sample ($n=672$) was 68.5% female, 83.5% white with *mean age* of 36.71 years ($SD=10.99$) and a mean BDI-II score of 27.31 ($SD=9.85$). BDI-II scores did not differ by condition, $p=.619$. Participants were randomly assigned to one of the three conditions (control: $n=228$ symptomatic; biology-controllability: $n=215$ symptomatic; psychotherapy-controllability: $n=229$).

Design, Materials, and Procedures

The Study 2 design, materials, and procedures were identical to those used in Study 1, except as described here.

First, symptomatic participants did not receive the hypothetical case describing “Alex’s” depression symptoms. Instead, to prompt these participants to think about their own depression symptoms when answering subsequent questions, they received the BDI-II at the start of the experiment. Each question in the pretest and post-testing measures then referred to participants’ own symptoms (e.g., “how logical do you think it is to treat your depression with psychotherapy?”) and treatments for themselves.

Second, the passage describing the biological causes of depression (i.e., Fig. 2) referred to their own case of depression. For example, participants were instructed to “Imagine that you review your medical records and that you learn about some of the causes of your depression symptoms” and that “the results of a recent genetic test you took showed elevated risk for depression, which increased your risk of experiencing depression by 2 to 3 times”.

Third, at the end of the study, symptomatic participants additionally received questions about their mental health treatment experiences, as well as the biological subscale of the Reasons for Depression Questionnaire (RFD) (Addis & Jacobson, 1996; Thwaites et al., 2004). The RFD is a 4-item scale measuring the extent to which an individual genuinely attributes their depression to biological factors, as such beliefs could affect the ease of imagining biological attributions and changing treatment beliefs.

Finally, participants were debriefed, reminding them that the biological causes of depression that they were asked to imagine as contributing to their symptoms were hypothetical. They were also given information about how to find mental health treatment, as well as the phone number for a support line.

Results

The six pretest and post-test CEQ items showed good reliability in this sample (Cronbach’s $\alpha=.95$ and $.97$). Thus, as in Study 1, we averaged each set of pretest and post-test measures, and these average scores (pretest CEQ and post-test CEQ) were used in the analyses below.

BDI-II scores were positively correlated with pretest vs. post-test difference scores in the biology-controllability condition, $r(200)=.17$, $p=.019$; the more severe participants’ depression symptoms were, the greater the increase in ratings from pretest to post-test was. Although no such correlations were found in the other two conditions, BDI-II was entered as a covariate in the main analyses to ensure the differences among conditions are above and beyond the effect of depression severity.⁶

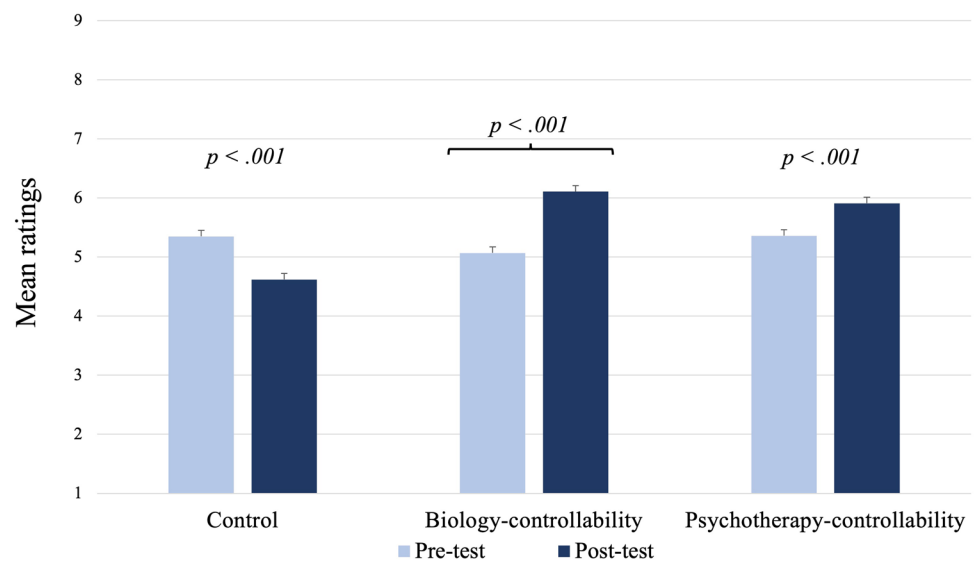
Mean RFD scores did not correlate significantly with the pretest vs. post-test difference scores in any condition (p ’s $>.16$). RFD scores did not differ significantly between the biology-controllability ($M=2.91$, $SD=.54$) and the psychotherapy-controllability condition ($M=2.95$, $SD=.61$), $t(440)=-.70$, $p=.483$, 95% CI $[-.25, .12]$, but RFD scores in the control condition ($M=3.06$, $SD=.53$) were significantly higher than the biology-controllability and psychotherapy-controllability conditions, respectively $t(440)=2.89$, $p=.004$, $d=.28$, 95% CI $[.09, .46]$ and $t(452)=2.02$, $p=.044$, $d=.19$, 95% CI $[.01, .37]$. Thus, RFD scores were included as a covariate in the main analyses. See the Supplement for further demographic analyses.

The pretest and post-test CEQ ratings were analyzed using a 2 (timepoint: pretest vs. post-test) \times 3 (condition) mixed ANOVA with timepoint as a within-subject variable and RFD and BDI-II scores as covariates. There was no significant main effect of timepoint, $F(1, 627)=1.90$, $p=.169$, $f=.04$, 95% CI $[0, .13]$, but a significant main effect of condition, $F(2, 627)=9.66$, $p<.001$, $\eta^2_p=.03$, 95% CI $[.01, .06]$. Most importantly, as observed in Study 1, the change in CEQ scores after learning about biological causes of depression, compared to at pretest, depended on the condition, $F(2, 627)=86.09$, $p<.001$, $\eta^2_p=.22$, 95% CI $[.16, .27]$ (see Fig. 5).

In the control condition, biological explanations decreased participants’ ratings at post-test ($M_{\text{post-test}}=4.62$, $SD_{\text{post-test}}=2.12$) compared to at pretest ($M_{\text{pretest}}=5.35$, $SD_{\text{pretest}}=1.83$), $t(215)=7.50$, $p<.001$, $d=.51$, 95% CI $[.37, .65]$. These findings replicated Study 1 and previous work (again, Perricone & Ahn, 2023).

⁶ In the Supplement, we also report analyses involving BDI-II as an additional interaction term using regression analyses. BDI-II scores did not interact with condition effects.

Fig. 5 Mean pretest and post-test ratings, broken down by condition in Study 2 with a symptomatic sample. Mean ratings refers to average CEQ scores. P-values are the results from paired *t*-tests comparing pretest and post-test CEQ scores within each condition. Error bars represent standard error of the mean



Replicating Study 1 and in contrast to the control condition, participants who learned that psychotherapy increases controllability over biological processes provided significantly higher credibility and expectancy ratings at post-test ($M_{post-test} = 6.11$, $SD_{post-test} = 2.03$) than pretest ($M_{pretest} = 5.07$, $SD_{pretest} = 2.07$), $t(201) = -10.97$, $p < .001$, $d = .77$, 95% CI $[-.93, -.61]$. This increase was found, despite participants also learning about the biological causes of depression.

In the psychotherapy-controllability condition where the materials also discussed controllability over making psychotherapy more effective, but not over biology, there was also a significant increase in psychotherapy ratings from pretest ($M_{pretest} = 5.36$, $SD_{pretest} = 1.80$) to post-test ($M_{post-test} = 5.91$, $SD_{post-test} = 1.86$), $t(215) = -5.30$, $p < .001$, $d = .36$, 95% CI $[-.50, -.22]$. This result also replicated Study 1.

Although CEQ scores increased in both controllability conditions, this increase was significantly greater in the biology-controllability condition, as had also been observed in Study 1. A 2 (timepoint: pretest vs. post-test) \times 2 (condition: biology-controllability vs. psychotherapy-controllability) mixed ANOVA with BDI-II and RFD entered as covariates in the model revealed no significant main effect of timepoint, $F(1, 412) = .04$, $p = .849$, $f < .01$, 95% CI $[0, .10]$ or of condition, $F(1, 412) = .02$, $p = .878$, $\eta^2_p < .01$, 95% CI $[0, .01]$. Yet, there was a significant interaction effect, $F(1, 412) = 11.78$, $p < .001$, $\eta^2_p = .03$, 95% CI $[\.01, \.07]$. To probe the interaction effect, a one-way ANOVA was carried out over the post-test minus pretest difference scores testing the effect of condition (biology-controllability vs. psychotherapy-controllability) with BDI-II and RFD scores as covariates. The difference score was significantly greater in the biology-controllability condition ($M_{change} = 1.04$, $SD = 1.35$) than the psychotherapy-controllability condition ($M_{change} = .55$,

$SD = 1.53$), $F(1, 416) = 12.23$, $p < .001$, $\eta^2_p = .03$, 95% CI $[\.01, \.07]$. Because BDI-II and RFD scores did not differ between the two controllability conditions, an independent sample *t*-test was additionally conducted over the difference scores, and also found a significant difference, $t(416) = 3.50$, $p < .001$, $d = .34$, 95% CI $[\.15, \.54]$.

One potential concern is that, even though we used a BDI-II score of 14 as a cutoff for study participation, some participants may still not have perceived themselves as having depression and thus may not have felt a lack of agency over depression attributed to biological factors. This concern is mitigated by the fact that we recruited individuals who self-reported to MTurk Toolkit that they had depression. Nonetheless, we also conducted the same analyses described above, while including only participants ($n = 619$) who indicated the age of their depression onset ($M = 15.03$, $SD = 7.31$) and responded that they had previously received treatment for a psychological problem. Of course, given the episodic nature of depression, this was not a foolproof method of capturing just those who perceive themselves as depressed. However, the results above all replicated with this subsample.

Discussion

Previous research found that distrust of psychotherapy for biologically attributed depression could be related to an underlying belief that biological processes implicated in depression are uncontrollable with human effort. The present study intervened on this misperception that biology is uncontrollable, and thus could increase the trust in psychotherapy even for biologically attributed mental disorders. This demonstration contributes to the theoretical

understanding of beliefs about psychotherapy for biologically attributed disorders. By experimentally manipulating controllability beliefs to remove the distrust in psychotherapy, the present study establishes the causal role of controllability beliefs in contributing to this misgiving.

Moreover, the biology-controllability intervention was significantly more effective than the materials merely emphasizing that psychotherapy can help individuals learn to control their depression symptoms. This suggests that there is an additional benefit to specifically underscoring how people can exercise agency over biological processes because these processes are malleable.

Beyond this theoretical contribution, the present study has significant clinical implications. Our intervention was found to be effective not only among the general public (Study 1) but also among individuals with current symptoms of depression (Study 2). Interestingly, Study 2 found that this intervention was in fact more effective at increasing psychotherapy ratings among individuals with higher depression symptom severity. Although it remains uncertain why this occurred, one possibility is that individuals with worse depression may simply know more about the disorder, including about the biological causes. Thus, the intervention may have been more accessible and convincing to them. As alluded to above, it is also possible that individuals with higher levels of depressive symptoms may have also had lower levels of perceived controllability over their symptoms. Consequently, information about how psychotherapy can actually enhance controllability over biological processes underlying depression might have been more novel and impactful to such individuals. This is speculation, however, and future work should continue to explore what could be underlying this relationship, as it suggests promisingly that those with a greater need for treatment may benefit more from this type of intervention. Specifically, future work could include a measure of beliefs about one's controllability over symptoms to help elucidate the role that changing agency perceptions has in the perceived credibility and expectancy of psychotherapy.

Relatedly, the type of brief intervention tested here could be practically employed in treatment settings. Thus, future studies should examine whether this intervention could encourage the patients' adherence to psychotherapy and improve outcomes among those in psychotherapy who attribute their depression to biological causes. Testing this intervention in a clinical setting could also provide further insight into how patients with diverse treatment experiences and perceptions of their symptoms would respond to the intervention. For instance, Study 2 focused only on symptomatic participants who self-reported having depression. However, it is still uncertain whether the intervention would be effective for those who exhibit symptoms of depression but do not acknowledge having it.

Although the aim of this study was not to examine how people perceive the effectiveness of medication when exposed to our intervention (see the Supplement for full results), it is also worth noting that the biology-controllability intervention did not worsen medication ratings. That is, because this intervention emphasizes the effectiveness of psychotherapy over biological processes, it was possible that participants would have reasoned that medication wouldn't provide any distinct or additional benefit. Since medication can also be critical for optimal treatment, it would be problematic if the intervention harmed medication expectations. However, in both studies, participants who received the biology-controllability intervention showed no significant change in medication ratings from pretest to post-test (all p 's $> .17$). It is also notable that in both studies, medication ratings in the other two conditions increased significantly from baseline to post-test (all p 's $< .02$). If medication continues to grow to be a more preferred treatment for many mental disorder presentations (as described in the introduction), it may be beneficial for an intervention to uniquely improve psychotherapy judgements, without further enhancing medication judgements.

The current study has several additional limitations. First, there are likely to be other explanations underlying the distrust of psychotherapy when mental disorders are biologically attributed. For instance, Perricone and Ahn (2023) found that another construct related to the distrust in psychotherapy is a tendency to causally discount the contribution of psychosocial etiologies when biological etiologies are known. Future studies should test interventions to mitigate this tendency, so as to provide causal support for this other explanation.

Second, while it is important to remove the distrust of psychotherapy among lay people, ultimately, mental health clinicians and other treatment providers play crucial roles in determining what type of treatment affected individuals receive. As noted above, mental health clinicians have also been shown to demonstrate distrust in psychotherapy for biologically attributed mental disorders (e.g., Ahn et al., 2009; Lebowitz & Ahn, 2014). Thus, future work should examine whether the biology-controllability intervention tested here could also remove any misgivings that clinicians may have when mental disorders are biologically attributed. Since clinicians are often tasked with helping patients decide what treatment to pursue, it is important to understand how to remove distrust in this population.

An additional limitation is that the samples used in both studies were predominantly white, non-Hispanic or Latino. As such, the results found here might not generalize to more diverse samples, which should be a focus of future work.

As knowledge of the biological etiologies of mental disorders advances, biological attributions for such disorders are likely to become increasingly prevalent. Although

there are many benefits to this, one important pitfall is the tendency to view psychotherapy as less effective for biologically explained disorders. The present study empirically tested one belief theorized to underlie distrust in psychotherapy for biologically based disorders and found that a brief intervention on the controllability of biological processes could remove this distrust.

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Declarations

Conflict of interest Annalise M. Perricone and Woo-kyoung Ahn declare that they have no conflict of interest.

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