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ORIGINAL ARTICLE

Reasons for the Belief that Psychotherapy is Less Effective for Biologically Attributed Mental Disorders

Annalise Perricone[1] · **Woo-kyoung Ahn**[1]

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Abstract

Background Upon learning that a mental disorder has a biological etiology (e.g., multiple gene interactions, brain abnormalities), people tend to doubt the effectiveness of psychotherapy even though psychotherapy combined with pharmacotherapy is often considered optimal. The aim of this study was to empirically identify reasons for this lessened perceived effectiveness of psychotherapy.

Methods Participants (N = 278 U.S. adults) indicated their endorsement of three beliefs hypothesized to explain the reduced perceived effectiveness of psychotherapy for a mental disorder with a biological etiology; (1) the belief that mental activities affect the brain less than they affect the mind, (2) the belief that biological processes are less controllable than psychological processes, and (3) the belief that psychosocial causes are less likely to be present when biological causes are present. Additionally, participants judged the effectiveness of psychotherapy for a hypothetical case of depression before and after learning about its biological etiology.

Results Participants endorsed each of the proposed beliefs. Furthermore, the extent of holding these beliefs correlated with the extent to which psychotherapy was undermined after learning that a hypothetical patient's depression was biologically caused.

Conclusions By identifying these beliefs, the current findings offer specific strategies to mitigate the lessened perceived effectiveness of psychotherapy for mental disorders with biological etiologies.

Keywords treatment beliefs · psychotherapy · biological attributions for mental disorders

Increasingly, mental disorders are explained as arising from biological[1] etiologies (e.g., from genetic and neurobiological factors) and such explanations are now prevalent among scientific and lay communities alike (e.g., Deacon 2013; Lebowitz, 2019; Pescosolido et al., 2010; Pilkington et al., 2013; Salm et al., 2014). While there are important benefits of emphasizing the biological bases of mental illnesses, including reduced blame of affected individuals (Kvaale et al., 2013), research has also uncovered some adverse consequences, such as increased pessimism about recovery among individuals with a mental disorder (e.g., Kemp et al., 2014; Lebowitz et al., 2013).

The current study examines an additional unintended effect of biological explanations: when mental disorders are attributed to biological factors, people appear to endorse psychotherapy's effectiveness less strongly (e.g., Ahn et al., 2009; Deacon & Baird, 2009; Kemp et al., 2014; Marsh & Romano, 2016; Zimmermann & Papa, 2020[2]). For instance, in Iselin and Addis (2003), participants learned about either

[1] At points, the texts or the materials for participants refer to biological / brain / mental / psychological processes or causes. Although all mental and psychological processes are biological, the uses of these terms are for the sake of brevity and to reflect the typical usage of these terms, not to endorse dualistic reasoning. For instance, "biological causes of mental disorders" refer to genetic risks and brain abnormalities, as opposed to childhood trauma or environmental stressors.

✉ Annalise Perricone
annalise.perricone@yale.edu

Woo-kyoung Ahn
woo-kyoung.ahn@yale.edu

[1] Department of Psychology, Yale University, New Haven, Connecticut, United States of America

[2] See Wallman and Melvin (2022) for evidence of an association between endorsing biological etiologies and preferring psychotherapy among parents of adolescents with depression when considering treatment for their children.

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biological etiologies of depression ("he has low levels of an important chemical called serotonin in his bloodstream") or psychological etiologies (e.g., "he recently got a bad job evaluation"), and rated the efficacy of various treatment methods. Participants rated psychotherapy as significantly less helpful given the biological etiologies than the psychological ones.

Lebowitz and Ahn (2014) demonstrated that even mental health clinicians show this tendency. Given biological explanations for a hypothetical patient's symptoms (e.g., genetic causes, brain abnormalities), clinicians judged psychotherapy to be less effective than when given psychosocial explanations for the same person's symptoms (e.g., childhood trauma). Also, when Ahn and colleagues (2009) examined mental health clinicians' existing beliefs about the entire 445 mental disorders listed in the DSM-IV-TR (i.e., the version in use at the time of the study), they found that the more these clinicians believed mental disorders were biologically based, the less they judged psychotherapy to be effective ($r = -.83$).[3]

Changes in clinical practice may also reflect the trend, as biological explanations for mental disorders increasingly prevail (Deacon, 2013; Lebowitz, 2019; Pescosolido et al., 2010; Pilkington et al., 2013; Salm et al., 2014). For instance, among psychiatrists, the use of pharmacotherapy alone is increasing, while the use of psychotherapy is decreasing rapidly. Whereas 44.4% of psychiatrist visits involved psychotherapy in 1996, by 2016 only 21.6% of visits did (Tadmon & Olfson, 2022). Although various barriers (e.g., insurance reimbursement rates and time constraints, again Tadmon & Olfson 2022) are likely driving this, the decreased perceived effectiveness of psychotherapy for biologically attributed disorders may also be contributing.

This trend is concerning given that combined medication-psychotherapy treatment is often considered optimal for many mental disorders (see Cuijpers et al., 2020; Kupfer et al., 2016 for further discussion). Indeed, as noted by Tadmon and Olfson (2022), the American Psychiatric Association's clinical practice guidelines recommend combined treatment for numerous mental disorders, including depression, bipolar disorder, anxiety disorders, OCD and schizophrenia. Furthermore, treatment perceptions can affect actual treatment outcomes (e.g., Constantino et al., 2011; Wampold, 2015), so viewing psychotherapy as less effective for mental disorders with presumed biological etiologies could be a barrier to recovery for those in need of psychotherapy.

To curtail this trend as biological explanations for mental disorders continue to rapidly grow, the current study investigates *why* people perceive psychotherapy to be less effective for biologically caused mental disorders. It has long been suspected by various researchers that some versions of mind-body dualism underlie clinicians' or laypeople's reasoning about mental disorders (see Kendler 2001). In fact, the term "mental disorders" already presupposes a separation of mental and physical phenomena. Recent studies in cognitive science made significant progress in articulating specifically what types of dualism people hold (Ahn et al., 2009; Bear & Knobe, 2015; Valtonen et al., 2021). Three such beliefs are identified: (1) neurodualism, (2) beliefs about controllability, and (3) causal discounting. The goal of the current study is to test whether participants endorse each of these beliefs in relation to mental disorders and then to examine whether the extent to which they hold these beliefs is associated with the perceived effectiveness of psychotherapy treatment. In what follows, we first explain each of the three beliefs and their potential implications for the perception of psychotherapy's effectiveness.

Neurodualism It has been argued that people tend to endorse mind-body dualism, or the idea that the mind and body, including the brain, are distinct substances occupying separate domains (Descartes, 2008; Robinson, 2017). Consequently, when reasoning about mental disorders, people may deem treatments across the biological and psychological domains less effective. For instance, when antidepressants were popularized in the early 1990s, people were intrigued to learn that there were "PILLS FOR THE MIND" (Time Magazine, July 6, 1992). However, "substance dualism" may not accurately capture contemporary lay beliefs, as most would now agree that mental activities result from the brain. Indeed, many laypeople have accepted that medications, such as antipsychotics, anxiolytics, and antidepressants, affect psychological processes (Angermeyer et al., 2016).

Nonetheless, a recent study demonstrated that laypeople are still reluctant to endorse causation in the opposite direction, namely, that mental activities change the brain (Valtonen et al., 2021). For instance, although participants judged antidepressants to equally affect the mind and the brain, they judged psychotherapy to affect the mind much more than the brain. This belief, called neurodualism, can explain the lessened perceived effectiveness of psychotherapy for biologically attributed mental disorders; people may believe that psychotherapy can treat the mind but not necessarily the

[3] It is also worth noting that in Iselin and Addis (2003), Lebowitz and Ahn (2014), and Ahn and colleagues (2009), medications were thought to be less effective for treating disorders attributed to psychosocial etiologies. While this is also worth investigating, the current study focuses solely on the effect of biological explanations on the perceived effectiveness of psychotherapy because the trend appears to be towards describing mental disorders in biological terms (again, Deacon 2013; Lebowitz, 2019; Pescosolido et al., 2010; Pilkington et al., 2013; Salm et al., 2014).

brain. Thus, when symptoms are described as arising from biological etiologies, these brain phenomena are perceived to be less likely to be affected by the activities in the mind.

To measure neurodualism in this study, participants rated the extent to which psychotherapy affects mental processes (i.e., feeling and thinking) or brain processes (i.e., the functioning of neurotransmitters and brain regions). It was hypothesized that participants would judge psychotherapy to affect mental processes more than brain processes (Hypothesis 1a), and that the *difference* in these judgments would predict the lessened perceived effectiveness of psychotherapy for biologically caused mental disorders (Hypothesis 1b).

Beliefs about controllability People perceive biological processes, such as the operations of genes and neurotransmitters, as passive and largely beyond their control (e.g., Berent & Platt 2021; Dar-Nimrod & Heine, 2011; Gelman, 2004; Gould & Heine, 2012; Haslam, 2011; Haslam & Kvaale, 2015; Heine et al., 2019; Satel & Lilienfeld, 2013). For example, when people with depression learned that their depression was genetically caused, they felt less control over their future negative mood compared to participants who did not learn this (Lebowitz & Ahn, 2018, also see Ahn & Lebowitz 2018; Dar-Nimrod et al., 2013; Dar-Nimrod et al., 2014; Pearl & Lebowitz, 2014). Yet, the activities of psychotherapy (e.g., collaborative agenda setting; completing homework assignments) are presumed to involve or even require individual effort or control (e.g., Bohart & Tallman 2010; von der Lippe et al., 2019). Psychotherapy would thus be perceived as incompatible with and therefore less effective in addressing biological causes because of this apparent difference in controllability.

To measure the discrepancy in the role of controllability in psychotherapy versus biological causes, participants rated the extent to which one can control their thoughts and behaviors to make psychotherapy more effective, and the extent to which one can control the functioning of their neurochemistry and brain regions. It was expected that participants would judge that one has greater controllability over psychological than biological processes (Hypothesis 2a), and the extent of the incongruity in these judgments would predict the extent to which participants reduce their beliefs in effectiveness of psychotherapy for biologically caused mental disorders (Hypothesis 2b).

Discounting of psychosocial etiologies The diminished perceived effectiveness in psychotherapy may also be due to the discounting principle found in the attribution literature. Work by Kelley and Michela (1980) found that people use different frameworks for reasoning about multiple causes. One such framework is a multiple necessary cause schema in which both cause A (e.g., effort) and cause B (e.g., motivation) are necessary to bring about a particular effect (e.g., successful career). Another framework is a multiple sufficient cause schema, where multiple possible causes are individually sufficient to produce an outcome. For example, either a sprinkler or rain can cause wet grass. In case of a multiple sufficient cause schema, if one of these causes is known to be present (e.g., a sprinkler was turned on), people discount the plausibility of other causes (e.g., it rained; Jones et al., 1961; Kelley, 1972).

When reasoning about biological and psychological causes of mental disorders, people appear to apply a multiple sufficient cause schema rather than a multiple necessary cause schema. Thus, people may discount psychosocial etiologies for depression (e.g., environmental stressors) when biological etiologies (e.g., hereditary risks) are present. Such discounting counters the well-accepted biopsychosocial model of psychopathology, where biological, psychological, and social factors conjointly produce illnesses (Engel, 1978). For instance, not everybody born into a family with a history of depression develops depression later in their life; psychosocial stressors interact with genetic susceptibility to produce depression. Therefore, just because biological factors (like genetics) contribute to someone's depression, we cannot rule out psychosocial stressors (like relationship breakups). Furthermore, biological abnormalities (e.g., reduced hippocampal volume, see Lucassen et al., 2014) are often considered the consequences of psychological stressors.

Nevertheless, even clinicians show discounting (e.g., Ahn et al., 2009; Miresco & Kirmayer, 2006) such that when a mental disorder is believed to be biologically caused, they believe that it is much less likely to be psychologically caused. Because people tend to discount the presence of psychosocial etiologies when biological etiologies are present, they may perceive psychotherapy – which is believed to treat psychosocial causes – as less effective when biological etiologies are present.

In this study, participants rated the likelihood that psychosocial factors caused a person's depression when no etiologies were known (i.e., the baseline measure), and the likelihood that psychosocial factors were also contributing when biological factors were already known to have contributed. Compared to the baseline, participants would discount psychosocial causes, given biological causes (Hypothesis 3a), and the amount of discounting (i.e., the difference between the baseline ratings and ratings when biological causes were given) would predict the reduction in perceived effectiveness of psychotherapy for biologically caused mental disorders (Hypothesis 3b).

Additional notes Although the three explanatory constructs discussed so far were selected for the current study as they have been discussed as being related to mind-body dualism in the literature, causal discounting may not be a clear-cut case of dualism. On one hand, believing that either psychosocial causes or biological causes are individually sufficient to produce mental disorders may reflect a dualistic separation of these classes of causes into those that occur in the mind versus the brain (Miresco & Kirmayer, 2006). On the other hand, as discussed in Ahn et al. (2009), distinguishing between psychological and biological causes may be a matter of linguistic pragmatics (e.g., certain causes are pragmatically easier to call psychological even though they are always manifested in the brain). If mind-body dualism does not necessarily underlie causal discounting, then this construct may not correlate with neurodualism or controllability measures.

It is also important to note that there may also well be other explanatory beliefs underlying the diminished perceived effectiveness of psychotherapy that were not tested here. That is, we do not attempt to claim that the beliefs tested here represent a complete explanation for why people perceive psychotherapy to be less effective for biologically caused disorders.

Overview of Experiment In the current experiment, participants' endorsement of neurodualism, beliefs in controllability, and causal discounting (Hypotheses 1a, 2a, and 3a) were first measured as explained above. Then, to examine whether neurodualism, beliefs in controllability, and discounting explain the diminished perceived effectiveness of psychotherapy, participants rated the effectiveness of psychotherapy for a hypothetical case of depression before and after learning about the biological causes of this case.[4] Replicating previous findings, participants would judge psychotherapy to be significantly less effective after learning about the biological bases of depression, relative to their baseline ratings. Most critically, the extent to which participants endorse neurodualism, controllability, and discounting would predict the extent to which revealing biological causes of a depression case would reduce the perceived effectiveness of psychotherapy for that case (Hypotheses 1b, 2b, and 3b).

Method

Participants

All data were collected on September 15, 2022. U.S. adults were recruited through Amazon Mechanical Turk Toolkit, a CloudResearch platform[5] A power analysis, using WebPower (Zhang & Yuan, 2018) over pilot data, indicated that 195 participants would detect (with 0.90 power) whether individual differences in the neurodualism, controllability and causal discounting measures predict the lessened perceived effectiveness of psychotherapy. To be conservative, we aimed to recruit 300, and 296 were recruited. Eighteen were excluded for failing attention checks (described below). The remaining 278 were 49.6% women; 19 to 74-years-old (M_{age} = 38.68, SD = 11.08); 46% with a bachelor's degree; 7.2% Asian, 11.2% Black or African American, 76.6% White. No demographic variables significantly interacted with any of the main dependent measures, except that men showed less controllability discrepancy (see results section for explanations of this measure), M = 3.84, SD = 2.62, than women, M = 4.61, SD = 2.37, $t(274)$ = 2.53, p = .012, although both genders showed statistically significant results.

Procedures

Figure 1 shows an overview of the procedures.

Participants first read about the symptoms of major depressive disorder (MDD) (American Psychological Association, 2013) and simple descriptions of its treatments, antidepressant medications and psychotherapy. Participants were told that "In general there are two types of treatment for Major Depression. One is to use antidepressant medications. They work to balance some of the natural chemicals in the brain and also regulate the activity of certain brain

[4] Depression was chosen as a target disorder because it is among the most prevalent mental disorders, affecting more than 8% of the U.S. adult population (National Alliance on Mental Health). Partly due to its prevalence, depression is also familiar among lay people, making it easier for participants in this study to understand our reading materials and questions.

[5] Mturk Toolkit recruits and interfaces with Mturk workers, but independently collects demographic information over time, and provides more protections against poor-quality workers (i.e., by blocking workers with hidden locations, running VPN checks and creating anonymized CloudResearch IDs for respondents. Participants completing this survey did so in an average of 8.40 min and the survey was advertised as taking 10 min or less. To help ensure data quality we used two captchas at the start of the survey, one asked participants to select a box with the label, "I'm not a robot" and a second captcha asked participants to select "all statements that are true" with four options including 1) "the earth is flat", 2) "the sun revolves around the Earth", 3) 3 + 5 = 8 and 4) "plants need water to grow". Respondents who failed either captcha did not proceed to the survey.

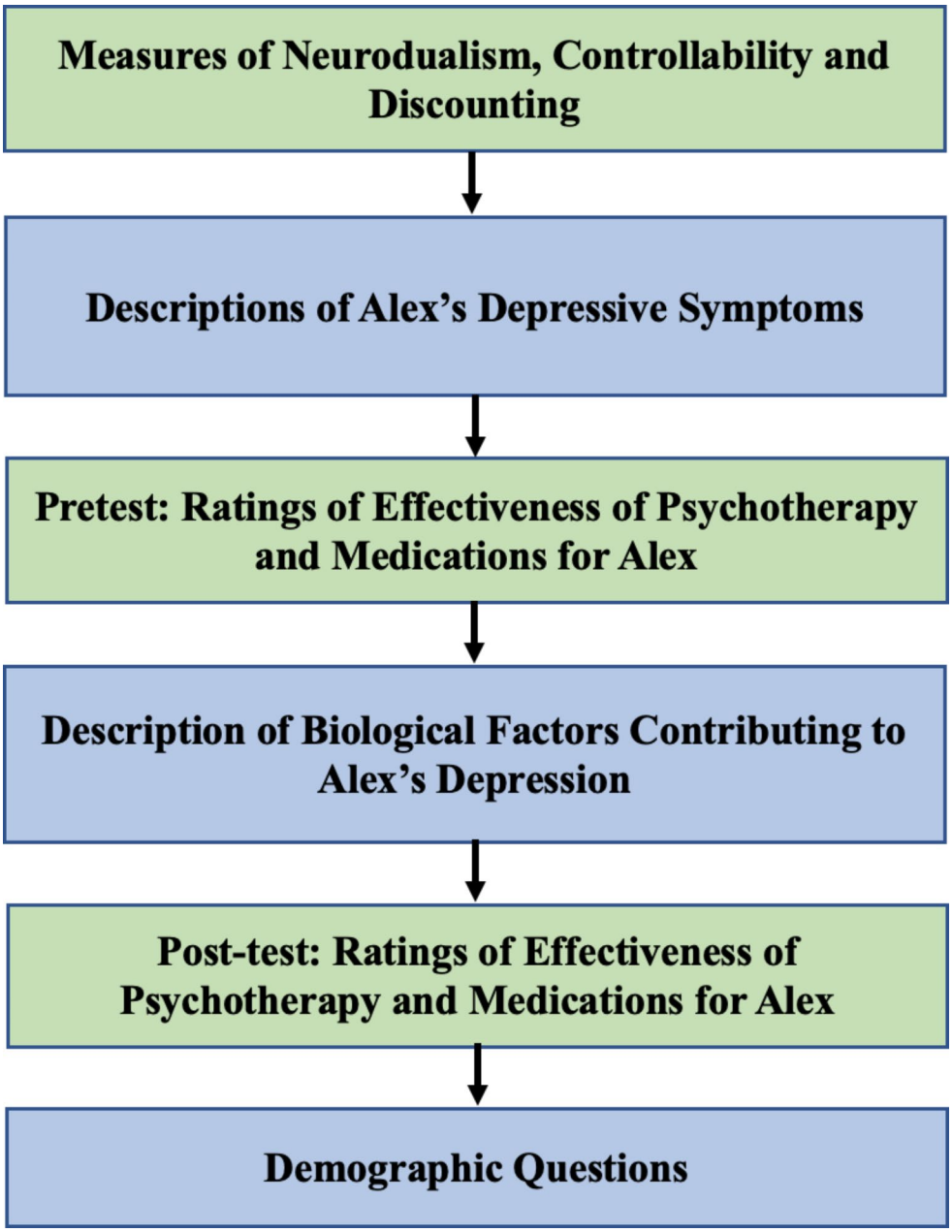

Fig. 1 Overview of the procedures

regions involved in Major Depression. The other is psychotherapy. It is also called "talk therapy" because patients and therapists talk about the patients' problems and seek solutions to the problems."

Afterwards, participants answered three sets of questions measuring neurodualism, controllability, and discounting (see Table 1 for the verbatim measures). These questions were developed following the operational definitions and hypotheses provided in the introduction.

First, neurodualism is the belief that mental activities (e.g., psychotherapy) affect the mind but are less likely to affect the brain. Hence, items 1 and 2 measured the extent to which participants thought psychotherapy affects the mind, and items 3 and 4 measured the extent to which participants thought psychotherapy affects the brain.

Second, we theorize that psychotherapy can be seen as less effective for biologically caused disorders because people believe that while successful psychotherapy involves a client's active control of their thoughts and behaviors, biological causes are much less controllable. Items 5 and 6 measured the former, and items 7 and 8 measured the latter. In measuring controllability of biological causes, we used stronger tests without querying about obvious facts. Needless to say, distal biological causes such as genetic risk factors for depression are not under one's control, and because that would be logically impossible, we did not ask about

Table 1 Measures of neurodualism, controllability and discounting. (Note: Question numbers were not displayed to participants but are provided here so that for brevity we can refer to each question by their corresponding number in the main text.)

Neurodualism

Gale was diagnosed with depression and was treated with **psychotherapy**. She met with a licensed therapist over the course of six months, to discuss her childhood and current life and ways to deal with stress in her current life and to dispel destructive thinking patterns. This psychotherapy had a considerable impact, such that now Gale is no longer depressed.

1. To what degree do you think the psychotherapy directly affected the way Gale feels now?
2. To what degree do you think the psychotherapy directly affected the way Gale thinks now?
3. To what degree do you think the psychotherapy directly affected the way neurotransmitters in Gale's brain operate now?
4. To what degree do you think the psychotherapy directly affected the way various brain regions in Gale's brain interact now?

***All questions asked using a 0–10 point scale**: 0 = "no effect," 5 = "somewhat affected," 10 = "totally affected"

Controllability

Depression can be treated with psychotherapy by changing one's maladaptive thought patterns, such as negatively interpreting situations and dwelling on pessimistic thoughts.

5. To what extent can a person exert control over their thought patterns to make psychotherapy more effective?
6. To what extent can a person exert control over their behaviors to make psychotherapy more effective?
7. Depression can be caused by a chemical imbalance. To what extent can a person exert control over their own neurochemical imbalances in the brain, such as serotonin or dopamine?
8. Depression can happen because of the way a person's brain region called the amygdala reacts to negative stimuli. To what extent can a person exert control over the way the amygdala responds?

***All questions asked using a 0–10 point scale**: 0 = "cannot exert any control," 5 = "can exert some control," 10 = "can exert total control"

Discounting

9. Suppose a person has depression. And we don't know anything yet about what caused this person's depression. How likely is it that **psychosocial factors** (for example life stressors, interpersonal relationships) caused this person's depression?
10. Suppose a person has depression. And this time we know for sure that this person's depression was caused by **biological factors** (for example a chemical imbalance or issues with how brain regions interact). How likely is it that **psychosocial factors** (for example life stressors, interpersonal relationships) **<u>also</u>** caused this person's depression?

***All questions asked using a 0–10 scale**: 0 = "0%: definitely did not cause" to 10 = 100%: "definitely caused"

genetic causes. Yet, people may believe that even proximal biological causes (e.g., overactivation of the anterior hippocampus/amygdala complex) underlying depression symptoms are outside one's control, even though recent studies in neuroscience have demonstrated that active participation in psychotherapy can treat those proximal biological causes (Buchheim et al., 2012; see also Beauregard 2022 for a review of such findings). Thus, items 7 and 8 measured beliefs in controllability of such proximal biological causes.

Third, we suggest that people undermine the effectiveness of psychotherapy once they learn that the target disorder is biologically caused, because upon learning about the presence of biological causes, they discount the likelihood that psychological causes – what psychotherapy presumably addresses – are also present. To measure how much people discount the likelihood of psychological causes after learning about biological causes, item 9 first measured participants' baseline beliefs about the likelihood that psychosocial causes were present in a case of depression when no other causes are known, and item 10 then measured the likelihood that psychosocial causes were also present when biological causes were known to be present. Note that the possibility of multiple causes was emphasized in item 10 by bolding and underlining "also" in the question to underscore the possibility of other causes.

The order of each set of items was counterbalanced across participants and each set was displayed on a separate screen. The order of the items within each set was fixed as shown in Table 1. After receiving all ten items, participants indicated which questions they had *not* received so far. Seventeen who selected a foil were excluded from the analyses.

After responding to the neurodualism, controllability and discounting questions, participants provided their judgements of the effectiveness of psychotherapy for biologically caused depression. Participants first read about a woman experiencing symptoms of MDD ("For the past two weeks Alex has been feeling down…She isn't enjoying things the way she normally would…[and] feels overwhelmed by guilt"). Afterwards, participants rated the effectiveness of psychotherapy and antidepressant medication[6] in treating Alex's depression on a 7-point scale (1 = "not at all effective; 7 = "extremely effective").

Following this pretest, participants learned that biological factors contributed to Alex's depression (e.g., "she has low levels of an important chemical (or neurotransmitter) in the brain called serotonin…Alex's brain scan also showed that a brain area called the amygdala…was overactive in response to negative stimuli…"),[7] and rated the effectiveness of

[6] Although the current study's focus is on perceptions of psychotherapy, perceptions of medication were measured to ensure replicability of previous findings.

[7] Although the materials referred to chemical imbalances and amygdala activation, we recognize that these theories of depression have been scrutinized and sometimes discredited (e.g., respectively, Moncrieff et al., 2022; Grogans et al., 2022). The inclusion of these theories should not be seen as endorsement of them, but rather as a way of providing lay participants with accessible information, as such theories have been popularized over many years (e.g., Pescosolido et al., 2010), are still implied in practice (e.g., SSRI), and are still debated (again, Moncrieff et al., 2022). Future work should modify the materials using current theories of depression.

psychotherapy and antidepressants again. To further ensure data quality, participants received four True/False questions about the biological factors contributing to Alex's depression. One participant who answered 75% of these questions incorrectly was excluded from analyses. Lastly, participants provided demographic information. After the completion of the study, they were debriefed, which included information about the role of serotonin in depression being controversial.

All study measures were approved by the Institutional Review Board and all participants provided informed consent after the procedures had been fully explained; all procedures were in accordance with the Helsinki Declaration. A pre-registration for an earlier version of this study was filed with Open Science Foundation (see https://osf.io/4wdyu/?view_only=fbacd366f6844ccc841ed36e915a85a2 for a copy; raw data are also available at this link). The current design is identical to the pre-registration, except that we refined the wording of some questions to better capture each construct and to avoid participants' confusion found in the pre-registered study.

Results

Data Recoding

Within the neurodualism set, the two items measuring either psychosocial (items 1–2 in Table 1) or biological (items 3–4) processes showed good reliability (Cronbach's *alphas* of 0.85 and 0.96). Thus, psychotherapy-on-mind and psychotherapy-on-brain scores were created by averaging items 1–2 and 3–4, respectively. Then, as a measure of neurodualism, we calculated difference scores by subtracting psychotherapy-on-brain scores from psychotherapy-on-mind scores. The reason why difference scores were used rather than individual measures of psychotherapy-on-the-mind or the brain is because neurodualism is a version of dualism, a belief that the mind and the brain operate differently to a certain extent. Accordingly, it is the *difference* in people's judgments about the impact of psychotherapy on the mind versus the brain that serves as a measure of dualism. Thus, for example, if one gives low ratings on the effectiveness of psychotherapy on the brain, that alone is not evidence for neurodualism if the person also gives low ratings on the effectiveness of psychotherapy on the mind; instead, it indicates that the person simply does not trust psychotherapy's effectiveness.

Within the beliefs in controllability set, the two items measuring controllability of psychotherapy (items 5–6 in Table 1) and the two measuring controllability of biological processes (items 7–8) each showed good Cronbach's alphas (0.72 and 0.80, respectively). Accordingly, ratings on each pair of items were averaged to yield controllability-psychotherapy scores and controllability-brain scores, respectively. As explained in the introduction, it is hypothesized that psychotherapy is discredited for biologically attributed mental disorders because psychotherapy is believed to require active participation of clients while biological causes are seen as less controllable by clients. Thus, as a measure of this discrepancy in controllability, we calculated difference scores by subtracting controllability-brain scores from controllability-psychotherapy scores. The difference score captures beliefs in incompatibility between psychotherapy and brain processes that could not be captured by individual measures (i.e., averages of items 5–6 or items 7–8) alone. For instance, if someone gives a low rating on the controllability of the brain measure, this does not suggest incompatibility if they also think that psychotherapy is uncontrollable.

As a measure of discounting of psychosocial factors upon learning about the presence of biological causes, we calculated difference scores by subtracting ratings on item 10 in Table 1 (the likelihood of psychosocial causes being present when biological causes were known) from ratings on item 9 (the likelihood of psychosocial causes being present when no other causes were known), as is typically done in the attribution literature. As explained in the introduction, it is theorized that people perceive psychotherapy to be less effective upon learning that a mental disorder is biologically caused because they assume that in this case, psychosocial causes, which apparently are addressed by psychotherapy, are unlikely to also be present. Such discounting would entail significantly higher ratings of the likelihood that psychosocial causes are present when no other causes are known, compared to when biological causes are already present. In contrast, rating the likelihood of psychosocial causes being present as high in both items 9 and 10 would indicate minimal discounting, as it indicates reasoning that psychosocial causes were just as likely even when biological causes were already known (i.e., that multiple necessary causes can contribute to depression).

To summarize so far, for each of the neurodualism, controllability and discounting measures, a large, positive difference score indicates, respectively, that a participant believes that (1) psychotherapy is much more effective on mental processes than on brain processes, (2) people can exert control over psychotherapy more than over brain processes, and (3) psychosocial causes are much more likely to be present before biological causes are given.

Finally, a difference score (i.e., pretest minus post-test scores) was created for each participant as a measure of the perceived effectiveness of psychotherapy and was used to examine its relationship with the neurodualism, controllability and discounting indices.

Analysis of Explanatory Measures

Figure 2 summarizes the mean ratings of psychotherapy-on-mind and psychotherapy-on-brain scores, illustrating the extent of neurodualism (Panel A), controllability-psychotherapy and controllability-brain scores, illustrating the discrepancy in perceived controllability (Panel B), and scores on items 9 and 10, illustrating the amount of causal discounting (Panel C).

Paired *t*-tests were conducted to compare each of these pairs. Supporting Hypothesis 1a, participants rated psychotherapy as exerting a significantly greater effect on mental processes ($M_{psychotherapy-on-mind}$ = 8.69, SD = 1.30) than on brain processes ($M_{psychotherapy-on-brain}$ = 5.03, SD = 2.82), $t(277) = 20.76$, $p < .001$, $d = 1.25$, 95% CI [1.09, 1.40]. Supporting Hypothesis 2a, participants judged mental processes in psychotherapy to involve a significantly greater degree of controllability ($M_{controllability-psychotherapy}$ = 6.69, SD = 1.59) than brain processes ($M_{controllability-brain}$ = 2.45, SD = 2.29), $t(277) = 27.98$, $p < .001$, $d = 1.68$, 95% CI [1.50, 1.86]. Supporting Hypothesis 3a, participants discounted psychosocial causes given biological causes ($M_{psychosocial|biological}$ = 5.08, SD = 2.22), compared to when no information about other non-psychosocial factors were given ($M_{psychosocial}$ = 6.38, SD = 1.66) than $t(277) = 8.86$, $p < .001$, $d = 0.53$, 95% CI [0.41, 0.66].

Analysis of Treatment Effectiveness Ratings

Figure 2 (Panel D) also shows mean ratings of participants' judgments of the effectiveness of psychotherapy before (pretest) and after (post-test) they learned about biological causes. Paired *t*-tests revealed that participants rated psychotherapy as significantly less effective after learning about the biological causes of Alex's depression ($M_{post-test}$ = 3.83, SD = 1.43) than at baseline ($M_{pre-test}$ = 5.14, SD = 1.22), $t(277) = 15.61$, $p < .001$, $d = 0.94$, 95% CI [0.79, 1.08], supporting Hypothesis 4.

Although not the focus of the current study, participants' judgments of the effectiveness of medications were also examined. Opposite to psychotherapy, participants judged medication to be significantly more effective after learning

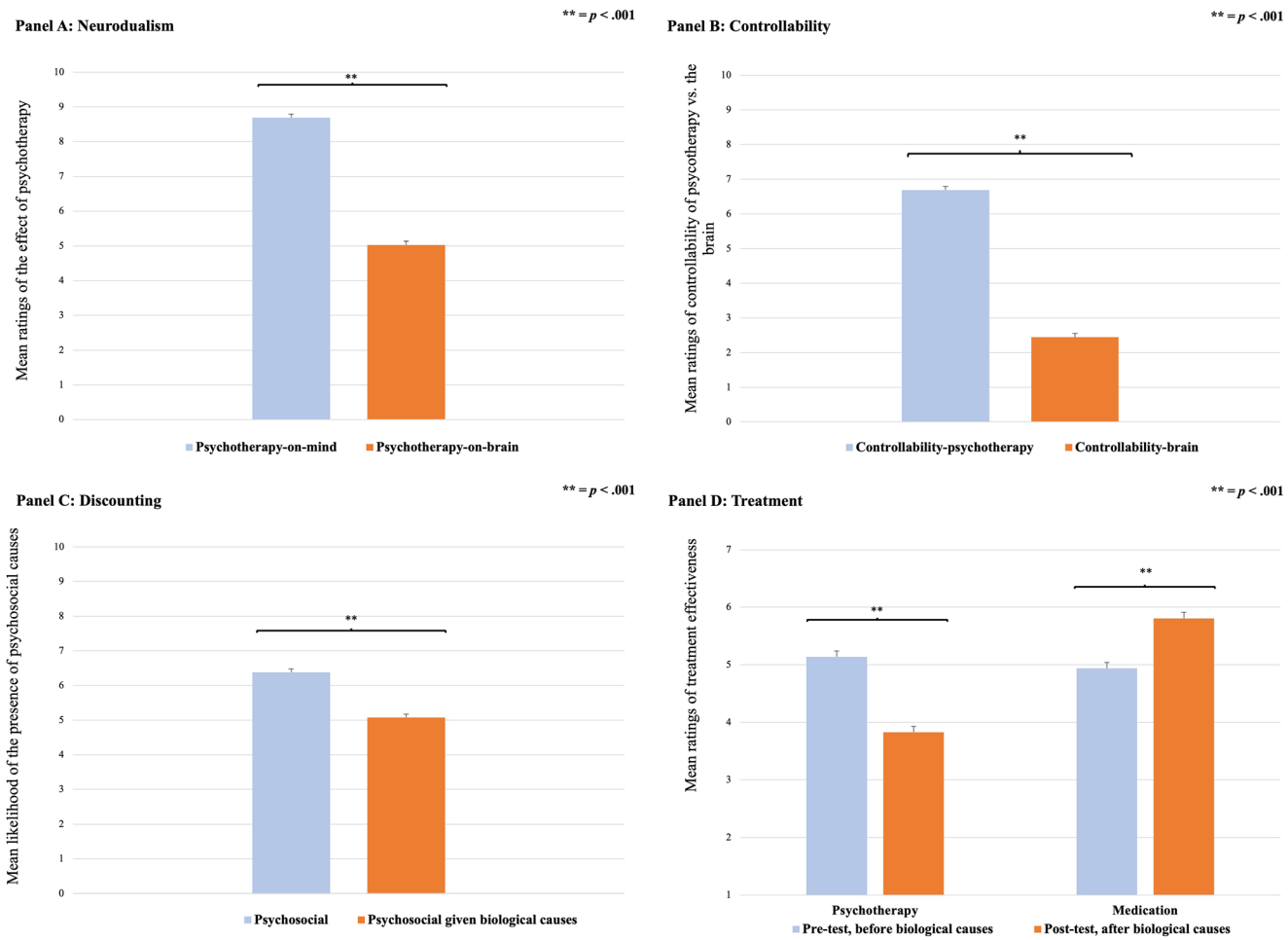

Fig. 2 Mean ratings on outcome measures; error bars represent Standard Error of the Mean

about the biological causes of Alex's depression ($M_{post-test}$ = 5.81, SD = 1.23) than before ($M_{pre-test}$ = 4.94, SD = 1.32), $t(277)$ = -12.06, $p < .001$, $d = -0.72$, 95% CI [-0.86, −0.59] (Fig. 2, Panel D), replicating previous work.

Relationship Between Explanatory Measures and the Lessened Perceived Effectiveness of Psychotherapy

The lessened perceived effectiveness of psychotherapy was positively correlated with neurodualism discrepancy scores, $r(276) = 0.15$, $p = .012$, controllability discrepancy scores, $r(276) = 0.14$, $p = .022$, and discounting discrepancy scores, $r(276) = 0.21$, $p < .001$, supporting Hypotheses 1b, 2b, and 3b. That is, the more participants endorsed neurodualism, the more they believed that psychotherapy, and not biological processes, involves controllability, or the more they discounted the role of psychosocial causes given biological causes, the more they believed that psychotherapy was less effective after learning that depression was biologically caused (i.e., at post-test, relative to pretest).

It is worth noting that the strength of these correlations may have been underestimated because of the restricted range issue, where limited variability in participants' scores leads to weaker correlation coefficients. In our sample, 67.2% of participants had a difference score of 1, 2 or 3 on the psychotherapy effectiveness measure, where possible scores could range from −6 to 6. That is, a large majority of our participants responded so similarly to the psychotherapy effectiveness measure that there was not much variance in their responses to yield large correlations. Future studies can address this problem by experimentally manipulating the three explanatory constructs (see Discussion for details.)

Additionally, neurodualism discrepancy scores significantly correlated with the controllability discrepancy scores, $r(276) = 0.34$, $p < .001$, which is expected given that they both presume a sort of mind-brain dualism. Discounting did not correlate with either neurodualism, $r(276) = 0.09$, $p = .15$, or the controllability discrepancy scores, $r(276) = 0.01$, $p = .86$.

Discussion

The present study empirically evaluated three potential explanations for why people judge psychotherapy to be less effective when mental disorders are attributed to biological factors. These explanations included the belief that psychological processes do not affect the brain as much as brain processes affect the mind (i.e., neurodualism), the belief that biological processes are less controllable than psychological processes underlying psychotherapy, and the tendency to discount psychosocial etiologies when biological etiologies are present. Participants' endorsement of each of these beliefs was fairly strong (Cohen's d's of 1.25, 1.68, and 0.53, respectively).

This study also replicated previous work by showing that, relative to their baseline ratings, participants judge psychotherapy to be less effective and medication to be more effective after learning that a hypothetical case of depression was biologically caused. Most importantly, the extent of neurodualism, differential beliefs in controllability, and discounting predicted the belief that psychotherapy is less effective for biologically caused depression. To our knowledge, this is the first such empirical demonstration.

There are several important limitations to this work, however. First, this study did not examine methods for counteracting the beliefs that may be underlying the lessened perceived effectiveness of psychotherapy when mental disorders are biologically attributed. Building on the findings here, future work can test psychoeducational interventions targeting neurodualism, controllability beliefs, and the tendency to discount psychosocial etiologies. For instance, such interventions could emphasize that psychotherapy can cause brain-level changes, or that individuals can exert controllability over biological processes, or that etiologies of mental disorders follow the biopsychosocial model.

In addition to the potential clinical utility of developing actionable interventions, the studies suggested in the above would help to draw causal conclusions about the sources of the belief that psychotherapy is less effective for biologically attributed mental disorders. A clear limitation of the current findings is that they are correlational. If mitigating each belief counteracts the tendency to judge psychotherapy as less effective for biologically attributed depression, this would establish the causal roles of the beliefs in contributing to the decreased perceived effectiveness of psychotherapy.

An additional limitation is that this study examined only three possible explanations underlying the lessened perceived effectiveness of psychotherapy and there are likely other explanations that were not considered here. As noted above, the explanations tested here were chosen as they had been discussed in the cognitive science literature in relation to mind-body dualism. Further studies should explore how these constructs are associated and whether constructs unrelated to dualism can also explain the diminished perceived effectiveness of psychotherapy.

Future research can also examine situations in which medications are perceived to be less effective when pharmacotherapy is considered the first-line treatment (e.g., psychotic disorders). As noted in the Introduction, describing mental disorders in terms of psychosocial etiologies has been found to cause people to view medications as less effective (see Ahn et al., 2009; Lebowitz & Ahn, 2014; Iselin & Addis,

2003). Viewing medications as less effective for disorders that are psychosocially attributed could also be clinically problematic because it may similarly discourage people in need of medications from seeking them out, including when combined treatment is optimal. Identifying and mitigating beliefs underlying the reduced perceived effectiveness of medication is an important area for future work.

As biological explanations for mental disorders become increasingly prominent among lay and scientific communities, the belief that psychotherapy is less effective for such disorders may also become more prevalent. Among other factors, this belief could contribute to a further decline in the use of psychotherapy or combined treatment, even when these are indicated. This adverse consequence should be addressed by better understanding the beliefs underlying the lessened perceived effectiveness of psychotherapy and developing interventions to mitigate these beliefs.

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Availability of Data and Materials Raw data generated and analyzed for this study are publicly available via the study's OSF page: https://osf.io/4wdyu/?view_only=fbacd366f6844ccc841ed36e915a85a2.

Declarations

Conflict of Interest The authors acknowledge no conflicts of interest.

Ethics Approval All study measures were approved by the Institutional Review Board; all procedures were in accordance with the Helsinki Declaration.

Consent to Participate All participants provided informed consent after the study procedures had been fully explained.

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