Prescription for Love: An Experimental Investigation of Laypeople's Moral Disapprovalof Love Drugs

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Abstract

New technologies regularly bring about profound changes in our daily lives. Romantic relationships are no exception to these transformations. Some philosophers expect the emergence in the near future of love pills: a theoretically achievable biotechnological intervention that could be designed to strengthen and maintain love in romantic relationships. We investigated laypeople's resistance to the use of such technologies and its sources. Across two studies (Study 1, French and Peruvian university students, *N* after exclusion = 186; Study 2, Amazon Mechanical Turk sample, *N* after exclusion = 693, pre-registered), we found that love drugs are considered as more morally problematic than psychological therapy. In Study 2, we show that this last effect is partially due to the fact that the love resulting from the use of love drugs is perceived as less authentic, intense, and durable. We discuss the specific role of authenticity in the moral disapproval of love drugs.

Keywords: love, love drugs, moral judgment, morality, bioethics

"Allez viens, j't'emmène au vent

Je t'emmène au-dessus des gens

Et je voudrais que tu te rappelles

Notre amour est éternel

Et pas artificiel"

Louise Attaque - J't'emmène au vent

Prescription for Love: An Experimental Investigation of Laypeople's Moral Disapproval of Love Drugs

On February 14, 2038, on Valentine's Day, you realize that you no longer love your partner as much as in the early days of your romantic relationship. Fortunately, the latest biotechnological developments have allowed the emergence of an intervention under the form of a love pill that intensifies feelings of romantic love. Would you be willing to undergo this treatment, in agreement with your partner? Would you consider it morally acceptable for others to take this treatment?

Such questions might seem to come straight out of a sci-fi novel. However, these are questions ethicians and moral philosophers have been asking and thinking about in the past years (Earp, 2019; Earp et al., 2015, 2016; Earp & Savulescu, 2016, 2020a, 2020b; McGee, 2016; Naar, 2016; Nyholm, 2015a, 2015b; Savulescu & Sandberg, 2008; Spreeuwenberg, 2019). Indeed, according to some of them, not only are such love drugs theoretically achievable (Savulescu & Sandberg, 2008; Spreeuwenberg, 2019), but some drugs we are using for other purposes are already impacting our romantic relationships. For example, the Selective Serotonin Reuptake Inhibitors (SSRIs) can dampen libido and the ability to care about the partner's feelings, while 3, 4-methylenedioxymethamphetamine (MDMA) might bolster the effect of couple therapy (Earp & Savulescu, 2020a). Thus, coupled with our

increasing knowledge of the cognitive neuroscience of love, further research in the use of such drugs might provide tangible avenues for the development of biomedical love-enhancers that could be used to move one's romantic feelings in the desired direction (Savulescu & Sandberg, 2008).

However, not all philosophers welcome the use of such "love drugs". Opposition to the biomedical enhancement of romantic relationships can be motivated by a wide variety of reasons, but one recurring concern is *authenticity*. According to some, the romantic feelings elicited by such love drugs would be *inauthentic* (Plašienková & Farbák, 2020). Similar concerns about authenticity have been observed to drive laypeople's disapproval of cognitive enhancement (Mihailov et al., 2021).

Interestingly, recent research shows that laypeople spontaneously make a distinction between mere love, and *true* love – suggesting that, as the aforementioned philosophers, people *do* consider certain forms of love to be "more real" than others (Earp et al., 2021). This distinction can be connected to a more general tendency to distinguish two kinds of mental states: mental states that are part of who one *really* is (and are part of one's *true self*) and less integrated, more superficial mental states (Strohminger et al., 2017). This distinction has been shown to influence judgments about happiness (Newman et al., 2015), personal identity (De Freitas et al., 2018), and moral responsibility (Sripada, 2012). Overall, it seems that people consider that individuals acting under the influence of inauthentic mental states are not truly free, nor truly themselves. This perception might explain the negative reactions to the idea that love drugs elicits in some people.

In this paper, we explore the possibility that people's perception of the romantic feelings induced by love drugs as being "inauthentic" might drive moral disapproval and resistance to their use in the biomedical enhancement of romantic relationships. Thus, we investigate (i) whether people consider the use of love drugs are more morally problematic

than other interventions, such as psychological therapy, and (ii) whether this difference can be explained by participants' perception of the resulting romantic feelings as being "inauthentic". Additionally, we investigate whether authenticity is valued for itself or for further reasons: indeed, it could be that participants disvalue "inauthentic love" not because it is inauthentic, but because they consider it more intense, or less durable. Indeed, we hypothesize that people will recognize a higher efficiency (at least in the short term) of the love pill (compared to a control condition), which should result in an increase of a negative moral judgment of the use of this love pill. This mechanism could be a compensation for the perceived artificial character of the medicalization of love. Thus, (iii) we also assess the role played in moral disapproval by participants' perceptions about the intensity and durability of the resulting love.

Overview

The materials of our two studies, as well as the data and the corresponding statistical code are publicly available and can be found at https://osf.io/3an4q/?view_only=b457df1c5bdf4562aeda47f5b6590d91. We report how we determined our sample size, all data exclusions, all manipulations, and all measures in each study.

Study 1

In this study, we compared participants' attitudes about the use of *love drugs* (i.e., experimental condition) and *psychological therapy* (i.e., control condition) to rekindle one's romantic feelings. We predicted (H1) that participants would consider the use of love drugs less morally justifiable than the use of psychological therapy, and that this effect would be mediated by participants judging the resulting love state less authentic (H2), more intense (H3a), and less durable (H3b) in the love drugs condition than in the psychological therapy condition. The remaining exploratory hypotheses are described in the materials and procedure section.

Method

Participants

We planned to recruit 200 participants, allowing us to detect an existing difference corresponding to Cohen's $d_s = 0.40$, with power = .80 and α set to .05. Participants were university students, at a French or Peruvian University. We reached a total of 193 participants recruited, 186 of which had enough data available for inclusion in our analyses (29 male, 156 female, 1 "other"; $M_{age} = 20.05$, $SD = 3.32$).

Materials and Procedure

Participants were presented with a vignette in which the protagonist, after realizing they do not love their romantic partner as much as in the early days, decide to undergo a specific treatment to rekindle their own romantic feelings. At the end of the vignette, the treatment is successful (love came back gradually) and the protagonist is (again) madly in love with their partner. We developed two versions of the same materials: one in French and the other in Spanish, intended respectively for use on participants from France and Peru. The vignette was first written entirely in French before being translated into Spanish by a bilingual French-Spanish person. The Spanish version was also proofread by a native Peruvian to ensure the absence of ambiguity due to cultural specificities. We designed this original vignette to be as close as possible to a situation that one might encounter in real life by limiting ourselves to the situation of enhancing love to maintain an existing previously loving relationship rather than starting a new romantic relationship (Savulescu & Sandberg, 2008). Most importantly, we made sure to develop a situation in which the use of treatment as a solution to maintain a romantic relationship might seem justified by good reasons (moving away from a simple whim or an attempt to stay in a bad relationship, Savulescu & Sandberg, 2008).

After randomization, each participant was given one of the 4 possible versions, combining two factors: the protagonist's gender (male or female) and the type of treatment (love drugs or psychological therapy). Only the second factor was designed to be of theoretical interest. The first one was only introduced to serve a methodological purpose, that is, to neutralize the potential effect of the gender of the target on the moral judgment. The differences between the two modalities of the main independent variable (i.e., the type of medical treatment) are highlighted below (in italics for the love drug condition and in brackets for the psychological therapy condition):

> Paul/Sophie is 30 years old and has been in a relationship with Sophie/Paul for about ten years. Regrettably, he/she realizes that he/she no longer loves Sophie/Paul as much as in the early days of their relationship. He/She hesitates to stay in a relationship with her/him. A doctor friend prescribes a revolutionary treatment, under the form of a *pill* [psychological therapy] that could improve his/her romantic condition. This revolutionary *pill* [psychological therapy] (which has been clinically tested and proven 100% reliable) intensifies the feeling of romantic love that one feels for a person. Paul/Sophie follows this treatment for one month and Sophie/Paul is aware that Paul/Sophie follows this treatment. One morning, one month after the beginning of his/her treatment, as he/she comes out of the bathroom, Paul/Sophie meets Sophie/Paul's eyes, he/she suddenly feels madly in love with her/him again and decides to stay in a relationship with her/him.

Participants were then asked about the *morality* of the protagonist's decision: "Was it morally justified for Paul/Sophie to decide to take this treatment?" (1 = *not at all* to 7 = *totally agree*). Four more questions assessed potential mediators: (a) the perceived *intensity* of love: "According to you, right after meeting Sophie/Paul's eyes, the love Paul/Sophie feels for Sophie/Paul is:" (1 = *not at all intense* to 7 = *extremely intense*), (b) the perceived *authenticity* of love: "Would you say that, just after crossing Sophie/Paul's eyes, Paul/Sophie loves Sophie/Paul in an authentic way?" and "Would you say that Paul/Sophie loves Sophie/Paul,

for real?" (1 = *not at all* to 7 = *totally agree*), and (c) the expected *durability* of love: "According to you, this love will last:" (1 = *for a very short time* to 7 = *for a very long time*). Two additional questions asked participants about the protagonist's morality (for exploratory purposes), and whether they found the scenario described in the vignette realistic. At the end of the study, for exploratory purposes, we measured the participant's relationship status "Are you currently engaged in a romantic/sentimental relationship?" (*yes* / *no* / *it is complicated*), and asked for their age and gender, before being debriefed and thanked.

Results

Confirmatory Analyses

Bivariate correlations between all the main variables measured in our study can be found in Table 1. As a preliminary analysis, we found an unexpected difference of the mean moral judgment regarding the decision to follow the physician's recommendation between the French (M = 2.86, SD = 1.80, n = 98) and the Peruvian sample (M = 3.52, SD = 1.98, n = 88), $t(184) = 2.40$, $p = .017$, Cohen's $d_s = 0.35$, 95% CI [0.06, 0.64]. For this reason, we systematically repeated the statistical analyses taking into account this variable. As including this variable did not change the results, for reasons of simplicity and brevity, we present the results without taking the participants' country into account. As predicted (H1), participants considered that the decision to undergo the treatment was less morally justified in the love drug condition (M = 2.72, SD = 1.86, n = 93) than in the psychological therapy condition (M = 3.62, SD = 1.87, n = 93), $t(184) = 3.31$, $p = .001$, Cohen's $d_s = 0.48$, [0.19, 0.77].

Thus, we ran a multiple mediation model, with the type of medical treatment as the independent variable (psychological therapy condition coded -1, love drug condition coded 1), perceived intensity, authenticity (averaging the two measures, $r[184] = .52$, $p < .001$), and expected durability of love as the mediators, and moral judgment about the decision to follow the medical treatment as the dependent variable (see Figure 1). The indirect effects were

estimated with a percentile bootstrap procedure (5,000 bootstrap samples; using the package 'PROCESS' [v. 4.0.1; Hayes, 2018] in R [v. 3.6.1]). None of the mediators tested significantly explained the deleterious effect of love drugs on moral judgment of the decision for authenticity (*ab* = -0.07, 95% CI [-0.18, 0.01], H2), for perceived intensity (*ab* = 0.00, [-0.03, 0.04], H3a), and for expected durability *ab* = -0.02, [-0.06, 0.03], H3b). However, at the descriptive level, we noted that perceived authenticity seemed to be the most promising mediator.

Exploratory Analyses

The results on the multiple mediation model remained unchanged when we controlled for participants' country, perceived realism, and relationship status (we provide more details in the Appendix A). Moreover, when we tested the main multiple mediation analysis (with or without controlling the control variables mentioned above) by replacing the measure of moral judgment of the decision by the measure of moral judgment of the person who decided to take the treatment, the results remained virtually the same (see the Appendix A).

Discussion

In this study, we found that seeking to solve one's sentimental problems by taking a love drug was considered less morally justifiable than undergoing psychological therapy to achieve the same goal. However, moral judgment was low (below the midpoint) for *both* the love drugs and psychological therapy conditions. One possible explanation is that the mere decision to resort to *unusual* methods to foster one's love is considered morally objectionable by some participants. Another limitation was that our vignettes did not make explicit whether the protagonist consulted their romantic partner before undergoing the treatment, or made this decision unilaterally, which might involve some degree of deception.

None of the mediators we tested for were significant. However, at a descriptive level, perceived authenticity seemed to be a plausible candidate. One possibility is that our sample

size was not large enough to detect the more subtle underlying mechanisms of our effect of interest. The next study aims to overcome these limitations.

Table 1

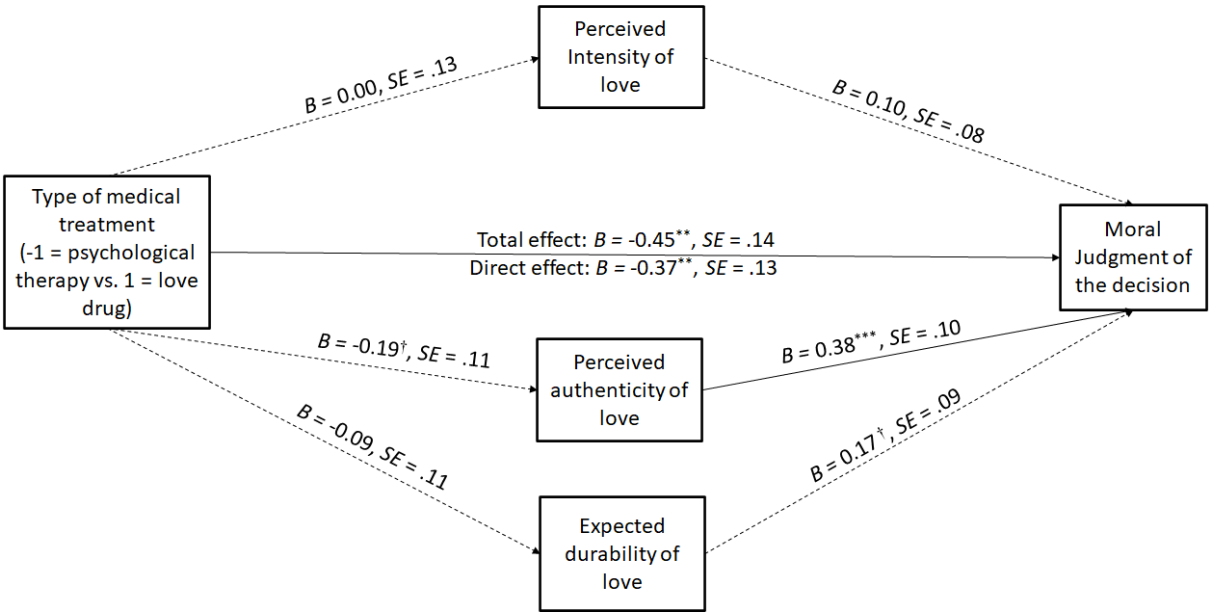
Bivariate Correlations (With 95% Confidence Intervals) Between all the main Variables (Study 1)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Type of medical treatment [a]	0.00	1.00	-							
2. Moral judgment of the decision [b]	3.17	1.91	-.24** [-.37, -.10]	-						
3. Intensity	4.85	1.78	.00 [-.14, .14]	.22** [.07, .35]	-					
4. Authenticity	2.65	1.47	-.13 [-.27, .02]	.39*** [.26, .51]	.29*** [.15, .41]	-				
5. Duration	2.74	1.50	-.06 [-.20, .08]	.29*** [.15, .41]	.33*** [.19, .45]	.39*** [.27, .51]	-			
6. Moral judgment of the person [b]	4.06	1.80	-.16* [-.30, -.02]	.56*** [.45, .65]	.21** [.07, .35]	.35*** [.22, .47]	.27*** [.14, .40]	-		
7. Realism	2.13	1.58	-.09 [-.23, .06]	.30*** [.16, .43]	.05 [-.10, .19]	.32*** [.18, .44]	.24*** [.10, .37]	.32*** [.19, .45]	-	
8. Country [c]	-0.05	1.00	.02 [-.12, .16]	.17* [.03, .31]	.01 [-.14, .15]	-.02 [-.16, .12]	.00 [-.14, .15]	.16* [.01, .30]	-.02 [-.17, .12]	-

Notes. $N = 186$. Values in square brackets indicate the 95% confidence interval for each correlation.
a Values represent point-biserial correlations, psychological therapy was coded -1, love drug was coded 1.
b Higher values on these scales indicate more favorable moral judgments.
c Values represent point-biserial correlations, France was coded -1, Peru was coded 1.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Decision via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love.



Note. The *B* values represent unstandardized regression coefficients. Solid lines represent significant paths and dashed lines represent non-significant paths. Higher values on the measure of moral judgment of the decision indicate more favorable moral judgments.

$^{\dagger}p < .077$, $^{**}p < .01$, $^{***}p < .001$.

Study 2

Method

Materials and Procedure

Study 2 was very similar to Study 1, but differed from it in several ways. First, we modified our vignettes to make it clear that the protagonist received the consent of their partner before making their decision (the vignettes are presented in the Appendix B). To make them more realistic, we specified that the protagonist's love came back gradually during treatment, rather than all at once (as in Study 1).

Then, to better understand what was objectionable with our previous control condition (psychological therapy), we introduced a second control condition (self-care), in which the protagonist uses "traditional" solutions to rekindle their love for their romantic partner, such as spending more quality time with their partner. This meant that we now had a total of 6 different vignettes (2 gender × 3 treatments). Because the question we originally used to assess the morality of the protagonist's decision ("Was it morally justified for Paul/Sophie to decide to take this treatment?") did not make sense in this condition, it only appeared in the two other treatment conditions. Rather, to compare the self-care condition to the two others, we introduced a second question about the morality of the protagonist's decision: "Was it morally justified for Paul/Sophie to decide to make this decision?" (1 = *not at all*, 7 = *totally agree*).

To explore participants' attitudes towards love drugs in more depth, we added two questions. First, we added a measure of willingness to follow the treatment "If you were in Paul/Sophie's position, would you have made the same decision?" with the following anchors (1 = *clearly not* to 7 = *clearly yes*). Second, we also introduced a measure of willingness to *ban* the treatment: "If this pill/therapy really existed, should it be allowed or should it be banned?" (*allowed*, *banned*). This second measure did not appear in the self-care condition.

Finally, we also made the decision to recruit a much larger number of participants than in Study 1. To increase the generalizability of our results, we turned to a U.S. sample on Amazon's Mechanical Turk (MTurk) by using TurkPrime.com (Litman et al., 2017). To ensure data quality, we added one attention check (with the open question: "What are the names of the two main characters in this story?") and a seriousness check, to exclude inattentive and uninvolved participants. At the end of the study, we measured relationship status "Are you currently engaged in a romantic/sentimental relationship?" (*yes*, *no*, *it is*

complicated…) and personal experience of couple therapy "Are you currently in or have you ever participated in couples therapy?" (*yes*/ *no answer*).

Preregistration and Hypotheses

We preregistered our hypotheses, planned sample size, exclusion rules, and general analytic strategy on Open Science Framework (OSF; https://osf.io/f5u87/?view_only=ead355b4cbbd46818420cf9b3d2e9643). We planned to recruit 450 participants, with the idea of reaching a sample of at least 414 participants after exclusion. This sample size (i.e., $N = 414$) would allow us to detect an existing difference (in moral judgment about the decision to follow the medical treatment, H1a, and the person who decided to take the treatment, H1b) between the love drug condition and the psychological therapy condition corresponding to Cohen's $d_s = 0.32$, with power = .90 and α set to .05.

We also preregistered secondary analyses, involving running the same multiple mediation model as in our previous study, with the contrast opposing psychological therapy versus love drug as the independent variable, perceived intensity, authenticity, and duration of love as the mediators, and moral judgment about the decision to follow the treatment as the dependent variable. We expected that the decision to use love drug would be considered less morally justifiable than the decision to undergo psychological therapy, and that this effect would be mediated by participants perceiving the resulting love state as less authentic (H2a), less durable (H3a), and more intense (H4a). We planned to run the same model using as dependent variable participants' moral judgment about the person who decided to take the treatment (H2b, H3b, H4b). We also added two additional secondary hypotheses (H5 & H6) corresponding to a lower willingness to make the same decision and a higher willingness to prohibit the treatment if it actually existed in the love drug condition compared to the psychological therapy condition.

As in the previous study, for exploratory analyses, we intended to run the multiple mediation models described above by controlling for a number of variables. Furthermore, the inclusion of the new self-care psychological treatment condition was carried out to deepen the results.

Participants

A total of 754 MTurkers completed our study[1]. Participants were paid U.S.$ 0.50. We restricted our study (titled "psychology study") to workers residing in the United States, who completed more than 500 MTurk studies and had an approval rate greater than 95%. We excluded participants who spent too little time on the study (n = 3), who failed the seriousness check (n = 14), who provided incorrect answers to the question "Please give us the names of the two main characters in this story" (n = 39), and/or who were identified (according to https://itaysisso.shinyapps.io/Bots/) as coming from suspicious IPs (n = 12). Our final sample included 693 participants (407 male, 283 female, 3 "other"; M_{age} = 39.51, SD = 13.12).

Results

Confirmatory Analyses

Bivariate correlations between all the main variables measured in our study can be found in Table 2 and participants' answers to the different questions for each condition are presented in Table 3. In line with (H1a), participants considered that the decision to take the treatment was less morally justified in the love drug condition (M = 4.37, SD = 1.86, n = 226) than in the psychological therapy condition (M = 4.94, SD = 1.62, n = 235), $t(459) = 3.53$, $p < .001$, Cohen's d_s = 0.33; 95% CI [0.14, 0.51]. With respect to the framework of LeBel et al. (2018), a signal was detected (because the effect is significant) and the replication effect size was consistent with the original effect size point estimate (because the confidence interval calculated in Study 2 includes the effect size point estimate calculated in Study 1). This time,

[1] This unexpected large sample size was due to an unanticipated and unusual situation presumably corresponding to an uncontrolled flow of multiple people signing up at the same time on MTurk.

scores were above the midpoint. We reached the same conclusion with the other dependent variable (H1b), that is, the person who took the treatment was considered less moral in the love drug condition (M = 4.77, SD = 1.49, n = 226) than in the psychological therapy condition (M = 5.15, SD = 1.36, n = 235), $t(459) = 2.89$, $p = .004$, Cohen's $d_s = 0.27$; 95% CI [0.08, 0.45].

In line with these results (H5), participants were less willing to make the same decision in the love drug condition (M = 3.50, SD = 2.02, n = 226) than in the psychological therapy condition (M = 4.26, SD = 1.93, n = 235), $t(459) = 4.08$, $p < .001$, Cohen's $d_s = 0.38$; 95% CI [0.20, 0.57]), and (H6) a larger proportion of participants were willing to ban the treatment (38.9%) in the love drug condition compared to the psychological therapy condition (27.2%), Wald $\chi^2(1) = 7.08$, $p = .008$, odds ratio = 1.70, 95% CI [1.15, 2.53].

Then, we ran a multiple mediation model, with the type of medical treatment as the independent variable (psychological therapy vs. love drug), perceived intensity, authenticity (averaging the two measures, $r[459] = .85$, $p < .001$), and expected durability of love as mediators, and moral judgment about the decision to follow the medical treatment as the dependent variable (see Figure 2). We estimated the indirect effects with a percentile bootstrap procedure (5,000 bootstrap samples), using the package 'PROCESS' (v. 4.0.1; Hayes, 2018) in R (v. 3.6.1). The indirect effects indicated that all the identified mediators significantly explained the deleterious effect of love drug on moral judgment of the decision. As expected, compared to undergoing psychological therapy, taking love drug increased moral disapproval of the decision to take the treatment, partly because the resulting love was perceived as less authentic (ab = -0.17, 95% CI [-0.27, -0.09], H2a) and less durable (ab = -0.04, [-0.09, -0.01], H3a). However, contrary to H4a, this love was perceived as *less* intense (ab = -0.03, [-0.08, -0.01]). We obtained the same pattern of results with the other dependent variable (see Figure 3). More specifically, taking a love drug (vs. following a psychological

therapy) resulted in a less favorable moral evaluation of the person, partly because this resulting love was perceived as less authentic (*ab* = -0.09, 95% CI [-0.14, -0.04], H2b), durable (*ab* = -0.05, [-0.10, -0.02], H3b), and intense (*ab* = -0.04, 95% CI [-0.08, -0.01], H4b).

Table 2

Bivariate Correlations (With 95% Confidence Intervals) Between all the main Variables (Study 2)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Type of medical treatment [a]	-0.02	1.00	-							
2. Moral judgment of the decision 1 (main DV) [b]	4.66	1.76	-.16*** [-.25, -.07]	-						
3. Moral judgment of the person [b]	4.96	1.44	-.13** [-.22, -.04]	.63*** [.57, .68]	-					
4. Intensity	4.71	1.65	-.15** [-.23, -.06]	.47*** [.40, .54]	.47*** [.39, .54]	-				
5. Authenticity	3.98	1.81	-.19*** [-.28, -.10]	.68*** [.63, .73]	.58*** [.52, .64]	.51*** [.44, .58]	-			
6. Duration	4.07	1.72	-.15** [-.24, -.06]	.58*** [.51, .63]	.56*** [.49, .62]	.49*** [.42, .56]	.71*** [.66, .75]	-		
7. Realism	3.49	2.03	-.10* [-.19, -.01]	.36*** [.28, .44]	.33*** [.25, .41]	.32*** [.24, .40]	.58*** [.52, .64]	.53*** [.46, .59]	-	
8. Willingness	3.89	2.01	-.19*** [-.27, -.10]	.64*** [.59, .69]	.56*** [.49, .62]	.45*** [.37, .52]	.80*** [.76, .83]	.67*** [.62, .72]	.55*** [.49, .61]	-

Notes. $N = 461$ (including only the data from our two main conditions). Values in square brackets indicate the 95% confidence interval for each correlation.
a Values represent point-biserial correlations, psychological therapy was coded -1, love drug was coded 1.
b Higher values on these scales indicate more favorable moral judgments.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

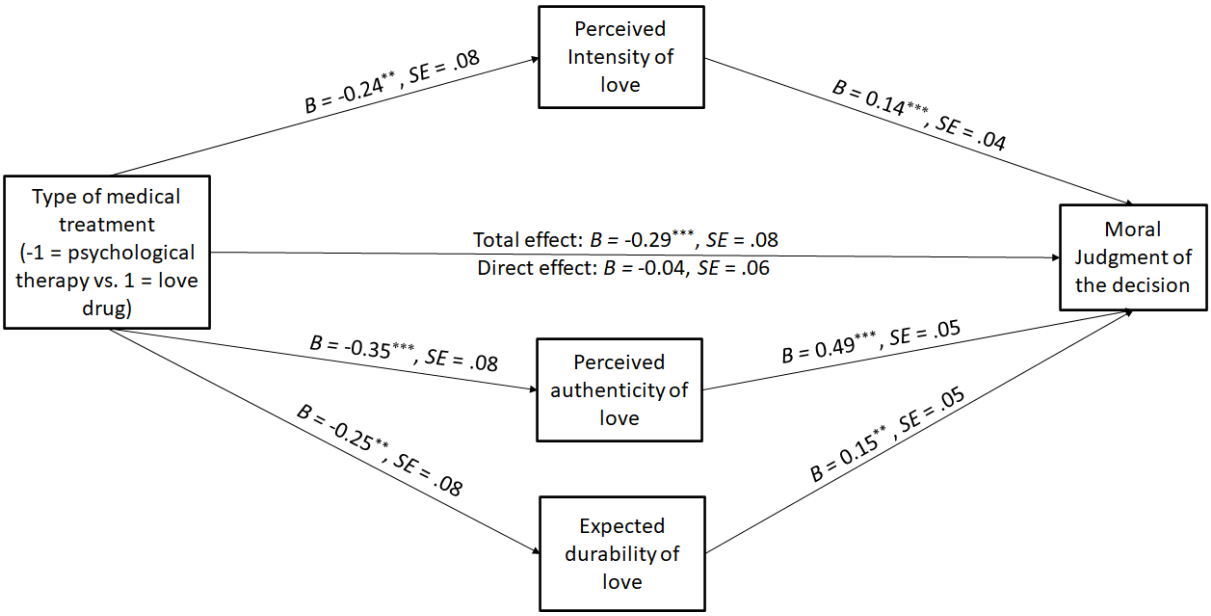
Differences Between the Conditions on the Main Variables Measured in Study 2

Variable	Condition						Welch's *F*-test	df_d
	Love drug (n = 226)		Self-care (n = 232)		Psychological therapy (n = 235)			
	M	*SD*	*M*	*SD*	*M*	*SD*		
Moral judgment of the decision 1 (main DV)	4.37	1.86	-	-	4.94	1.62	-	-
Moral judgment of the decision 2	4.38^{c}	1.83	5.85^{a}	1.11	4.93^{b}	1.56	63.37^{***}	437.66
Moral judgment of the person	4.77^{c}	1.49	5.49^{a}	1.12	5.15^{b}	1.36	17.59^{***}	452.04
Intensity	4.46^{b}	1.74	4.91^{a}	1.33	4.94^{a}	1.52	6.00^{**}	453.12
Authenticity	3.62^{c}	1.85	5.39^{a}	1.23	4.32^{b}	1.71	79.64^{***}	442.59
Duration	3.81^{c}	1.78	4.85^{a}	1.52	4.31^{b}	1.63	23.15^{***}	456.97
Realism	3.28^{b}	2.06	5.48^{a}	1.44	3.7^{b}	1.99	113.04^{***}	445.12
Willingness	3.50^{c}	2.02	5.50^{a}	1.44	4.26^{b}	1.93	81.12^{***}	446.91
Ban	38.9%	-	-	-	27.2%	-	-	-

Note. N = 754. df_d = degrees of freedom of the denominator of the corresponding Welch's F-test. Means sharing a common subscript are not significantly different at $\alpha = .05$ according to Games-Howell post-hoc test. Note that in our pre-registration, we originally planned to run Tukey's HSD test to analyze the differences between pairs, but then we replaced them with Games-Howell post-hoc tests because of systematic violation of the homogeneity assumption for all the tests.
$^{**}p < .01$. $^{***}p < .001$.

Figure 2

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Decision via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love.



Note. The *B* values represent unstandardized regression coefficients. Higher values on the measure of moral judgment of the decision indicate more favorable moral judgments.

** $p < .01$, *** $p < .001$.

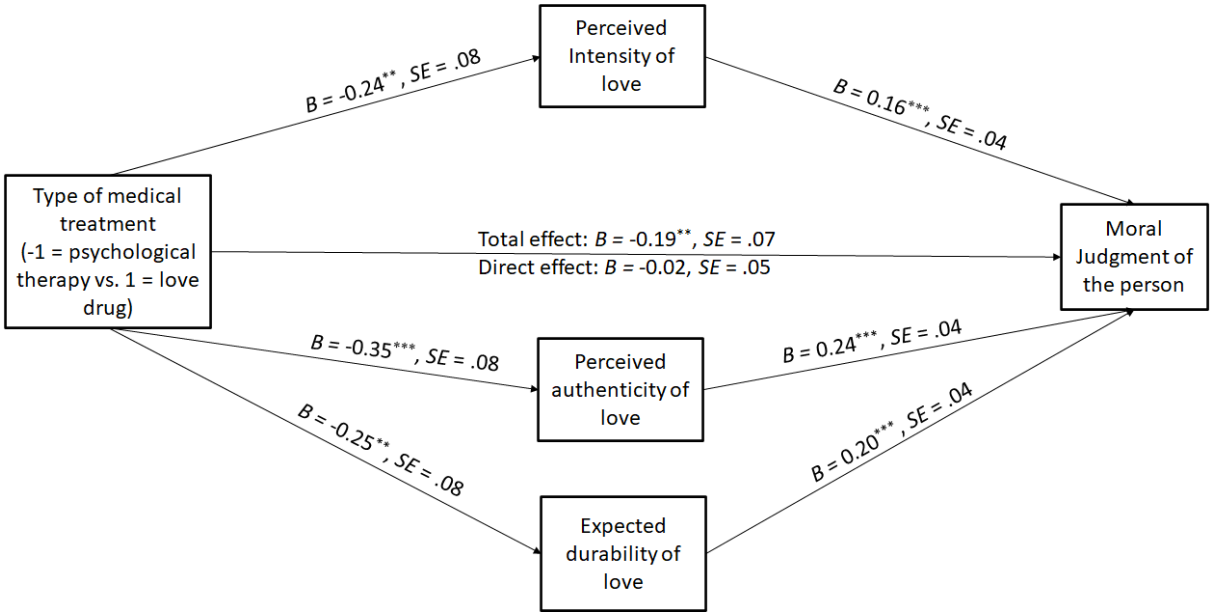
Exploratory Analyses

As part of our pre-registered exploratory analyses, we compared participants' assessment on the protagonist's decision across all three conditions, and observed that participants' answers (about morality) in the self-care condition were significantly higher than participants' answers in both the love drugs and psychological therapy conditions, meaning that certain participants still found something morally objectionable about the psychological therapy condition (see Table 3). Moreover, the conclusions that can be drawn from the results of the two multiple mediation models (i.e., one by dependent variable) remained unchanged

when we adjusted for perceived realism, relationship status, and personal experience of couple therapy (see the Appendix C for more details)[2]

Figure 3

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Person via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love.



Note. The *B* values represent unstandardized regression coefficients. Higher values on the measure of moral judgment of the decision indicate more favorable moral judgments.

** $p < .01$, *** $p < .001$.

Discussion

Using a larger sample than in Study 1, Study 2 allowed us to reinforce the strength of the main result of our previous study: the use of love drugs to rekindle one's love for one's partner was perceived as less morally justifiable than the use of psychological therapy. Moreover, going further than the previous study, we can now argue that this difference can be

[2] We had originally planned to run separate tests for these different covariates and to check that they did not interact, but given the number of tests involved, we preferred to make it simpler and deviate from the pre-registration by running a single test containing all the potential covariates in one go.

partly explained in part by the perception that the love resulting from the use of love drugs is less intense, less durable, and less authentic.

General Discussion

Through two studies, we showed that participants tended to consider the use of love drugs to rekindle one's romantic feelings as more morally objectionable than the use of psychological therapy. Results of Study 2 suggest that this difference can be partly explained by the fact that participants considered the romantic feelings induced by love drugs as less "authentic" or "real" than the ones produced by a psychological therapy. Though the effect of treatment on moral disapproval was also mediated by the perceived intensity and durability of the romantic feelings, taking these variables into account did not prevent authenticity to be a significant mediator, suggesting that authenticity is valued for itself, and not only because authentic love is perceived as more intense and more durable. Thus, our results suggest that the distinction people make between "true" (or "authentic") love and "inauthentic" love can impact their attitudes towards the use of love drugs. Of course, we did not investigate the reason why people tend to value "authentic" love more than "inauthentic love". However, previous literature on the "true self" suggests that people under the influence of "inauthentic" mental states might be perceived less free and less in touch with their own values (Newman et al., 2015), while "authentic love" might be associated with more freedom (Boudesseul et al., 2016).

Of course, authenticity, intensity, and durability are not the only factors that might drive people's opposition to the use of love drugs. For example, moral disapproval was higher in Study 1 than in Study 2, probably due to the fact that, in Study 1, participants may infer that our protagonist made the decision to undergo the treatment without consulting their partner. This involved an element of deception that should be taken into account in the future constitution of ethical guidelines about the use of love drugs.

Interestingly, the difference in moral judgment of the decision between the love drugs and the psychological therapy condition is not obvious (Study 1: $d_s = 0.48$; Study 2: $d_s = 0.33$). However, these results should not be interpreted as meaning that people tend to have few objections to the use of love drugs – rather, these small-to-medium effect sizes seem to be due to the fact that many participants already have moral objections to the use of psychological therapy. Indeed, in Study 2, we included a third case (self-care), in which the protagonist only decides to spend more quality time with their partner, in hope that this will rekindle their romantic feelings for them. This more ordinary approach to the situation was considered significantly more morally justified than the use of psychological therapy. In fact, the difference between the self-care and psychological therapy conditions ($\Delta = 0.92$) was greater than the difference between the psychological therapy and love drugs condition ($\Delta = 0.55$). Moreover, love was also considered less authentic in the psychological therapy condition, compared to the self-care condition. This suggests that the perceived inauthenticity of the drug-induced love is not simply due to the fact that it is the product of "artificial" and "chemical" substances, but that the mere fact of trying to engineer one's feelings using unusual methods might already lead participants to judge the resulting feelings as inauthentic.

Because of the novelty of this empirical investigation and the resulting methodological constraints, we have only considered one case of use of love drugs in a specific romantic relationship (i.e., heterosexual monogamy). Future research could examine moral judgments of the use of love drugs within different contexts, whether it be forms of love (e.g., parental love, Liao, 2011) forms of relationship (e.g., polyamory, Cardoso et al., 2021), or even effect intended by the pill (e.g., "anti-love drugs", which for example can justify its existence in the case where a person wants to end a harmful relationship such as domestic abuse, Earp et al., 2013). All these potential variations open the door for a rich and promising research program on love drugs.

Further research will be needed to precisely understand what makes romantic feelings elicited by psychological therapy and love drugs less "authentic" than the one elicited by more ordinary methods. However, in their current state, our results seem to undermine one key argument used by the promoters of love drugs. Indeed, according to them:

> "People go on romantic vacations, try to spice up their sex life, and so on, all in an effort to coax their love in a positive direction. Of course, those activities also have 'biological' effects that are relevant to love: having sex with your partner, for example, causes the release of serotonin, dopamine, oxytocin and other brain chemicals that may reinforce attachment directly. The point is that, if you believe it is okay to work on love – to try to bring it back into a tired marriage, or help it last in a committed relationship, or improve its quality through talk therapy or other means – then the sheer idea of taking deliberate steps to influence love's course in your life should not be controversial. (Earp & Savulescu, 2020b, p. 11)

But our results precisely suggest that people see a difference between these more mundane activities and more deliberate methods such as psychological therapy or taking love drugs. Understanding why might both foster our understanding of how people think about "true love" and the reasons why they resist the development and use of love drugs.

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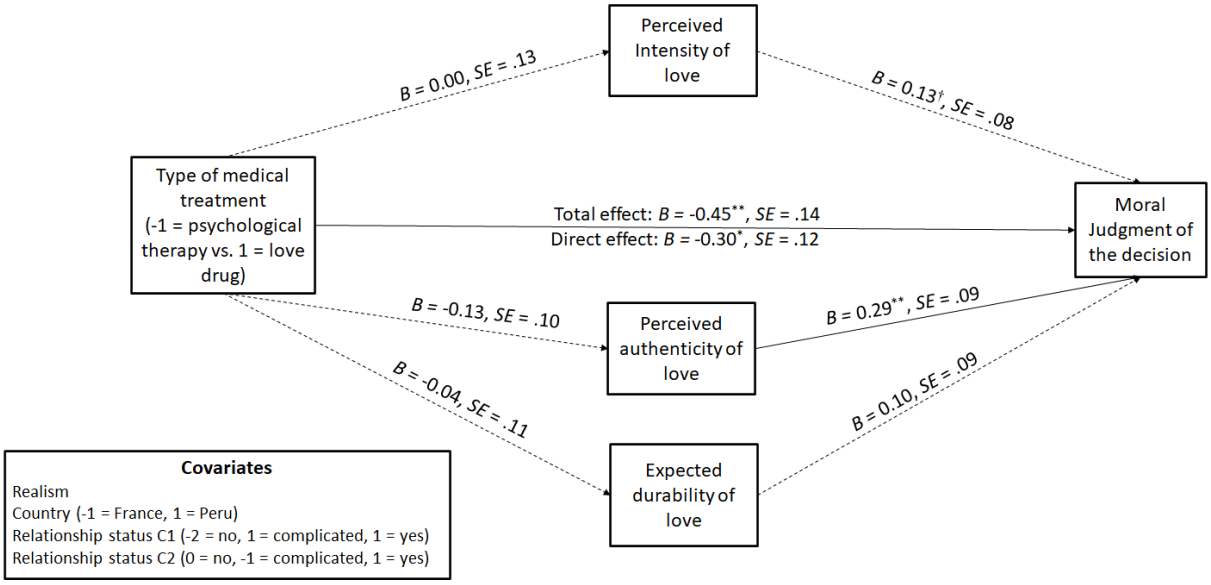
Appendix

Appendix A: Study 1 – Additional analyses

We ran the same multiple mediation model as described in the Study 1 results section by adding the following covariates: country, perceived realism, and relationship status (using two orthogonal contrasts for the latter, see Figure A1). The results we found remain the same: none of the mediators tested significantly explained the harmful effect of love drug on moral judgment of the decision for perceived intensity (*ab* = 0.00, 95% CI, [-0.04, 0.04]), for authenticity (*ab* = -0.04, [-0.12, 0.02]), and for expected durability (*ab* = -0.00, [-0.04, 0.03]). This multiple mediation model is depicted in Figure A1.

Figure A1

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Decision via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love and Controlling for Country, Perceived Realism, and Relationship Status.



Note. The *B* values represent unstandardized regression coefficients. Solid lines represent significant paths and dashed lines represent non-significant paths. Higher values on the measure of moral judgment of the decision indicate more favorable moral judgments.

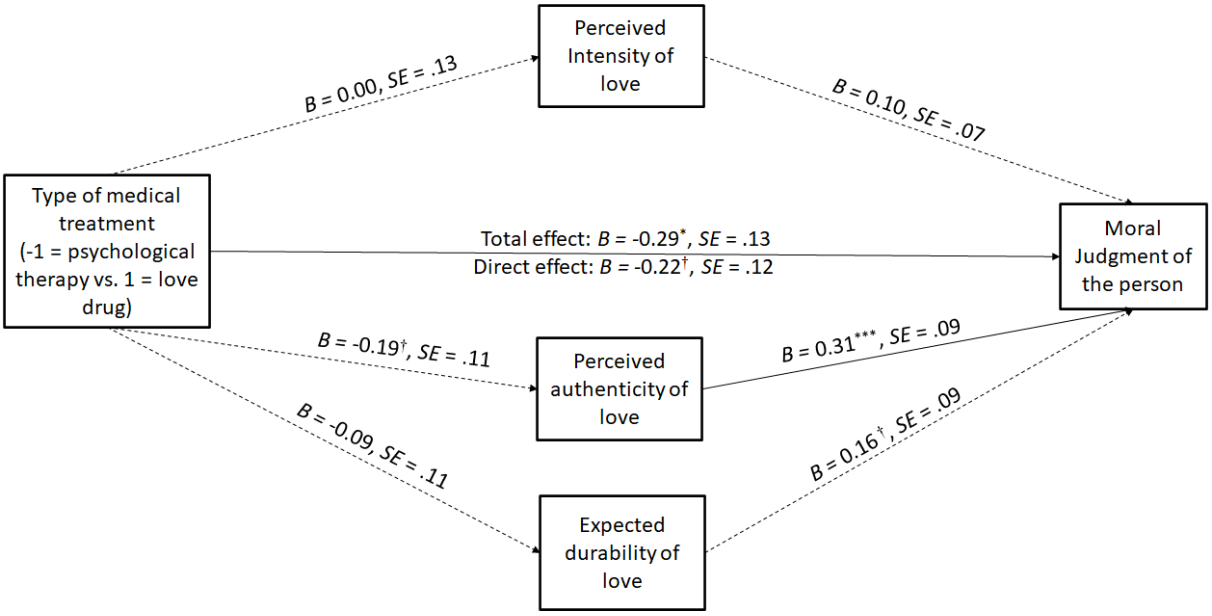
† $p = .063$, * $p < .05$, ** $p < .01$.

Then, we ran the same multiple mediation model as described in the Study 1 results section's, by only substituting the dependent variable moral judgment about the decision to follow the medical treatment by moral judgment of the person who decided to take the treatment. Despite this change, the results remain the same as those of the main analysis with this other dependent variable. That is, none of the mediators tested significantly explained the harmful effect of love drug on moral judgment of the person for perceived intensity (*ab* =

0.00, 95% CI, [-0.04, 0.04]), for authenticity (*ab* = -0.06, [-0.16, 0.01]), and for expected durability (*ab* = -0.01, [-0.06, 0.03]). This multiple mediation model is depicted in Figure A2.

Figure A2

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Person via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love.



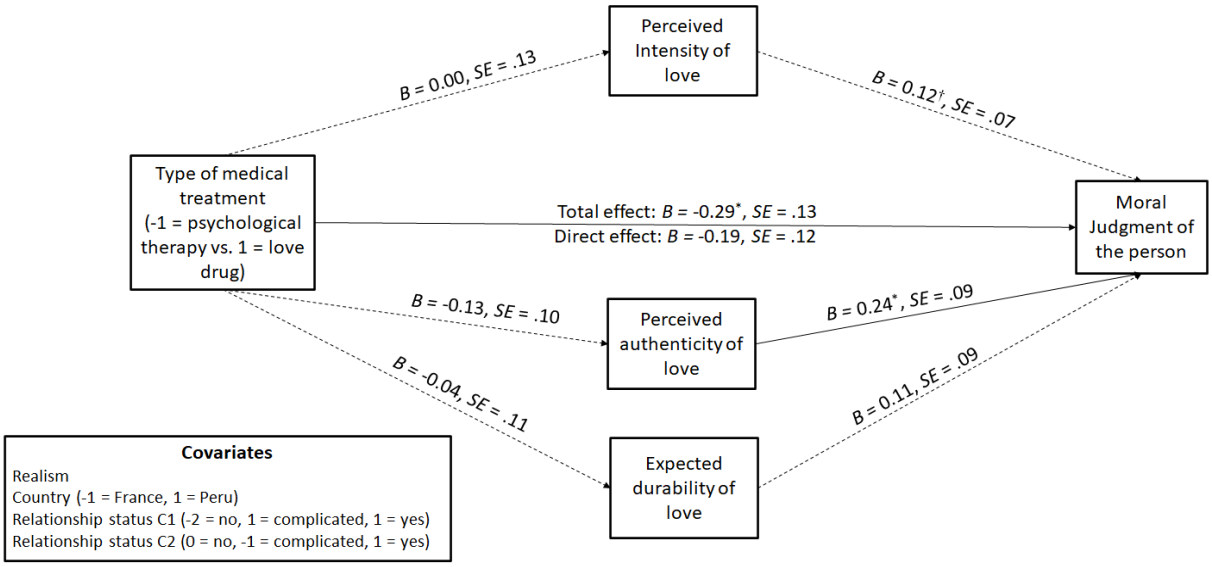
Note. The *B* values represent unstandardized regression coefficients. Solid lines represent significant paths and dashed lines represent non-significant paths. Higher values on the measure of moral judgment of the person indicate more favorable moral judgments.

† *p* < .082, * *p* < .05, ** *p* < .01, *** *p* < .001.

Lastly, we ran the same multiple mediation model described above by adding country, perceived realism, and relationship status as covariates (using two orthogonal contrasts for the latter, see Figure A3). Again, the results did not change: none of the mediators tested significantly explained the harmful effect of love drug on moral judgment of the person for perceived intensity (*ab* = 0.00, 95% CI, [-0.04, 0.04]), for authenticity (*ab* = -0.03, [-0.10, 0.02]), and for expected durability (*ab* = -0.00, [-0.04, 0.03]). This multiple mediation model is depicted in Figure A3.

Figure A3

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Person via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love and Controlling for Country, Perceived Realism, and Relationship Status.



Note. The *B* values represent unstandardized regression coefficients. Solid lines represent significant paths and dashed lines represent non-significant paths. Higher values on the measure of moral judgment of the person indicate more favorable moral judgments.

† $p = .099$, * $p < .05$.

Appendix B: Vignette used in Study 2.

The differences between the three modalities of the main independent variable (i.e., the type of treatment) are highlighted below (in italics for the love drug condition, in brackets for the psychological therapy condition, and in bold for the self-care condition):

Paul/Sophie is 30 years old and is in a relationship with Sophie/Paul for about ten years. Regrettably, he/she realizes that he no longer loves Sophie/Paul as much as in the early days of their relationship. He/She hesitates to stay in a relationship with her/him.

Paul/Sophie then goes to a doctor who recommends that he/she chooses one among several treatments. After having obtained Sophie's/Paul's consent, Paul/Sophie chooses to take a revolutionary new treatment, under a *pill* [psychological therapy] form, that could improve his/her romantic condition by facilitating his appreciation of Sophie's/Paul's qualities. This revolutionary *pill* [psychological therapy] (which has been clinically tested and proven 100% reliable) intensifies the feeling of romantic love that we feel for a person.

Paul/Sophie then goes to a doctor who recommends that to spend more time with his/her wife/husband. Paul/Sophie chooses to spend more time with his/her wife/husband (taking several initiatives), thinking that this may improve his/her romantic condition by facilitating his appreciation of Sophie's/Paul's qualities.

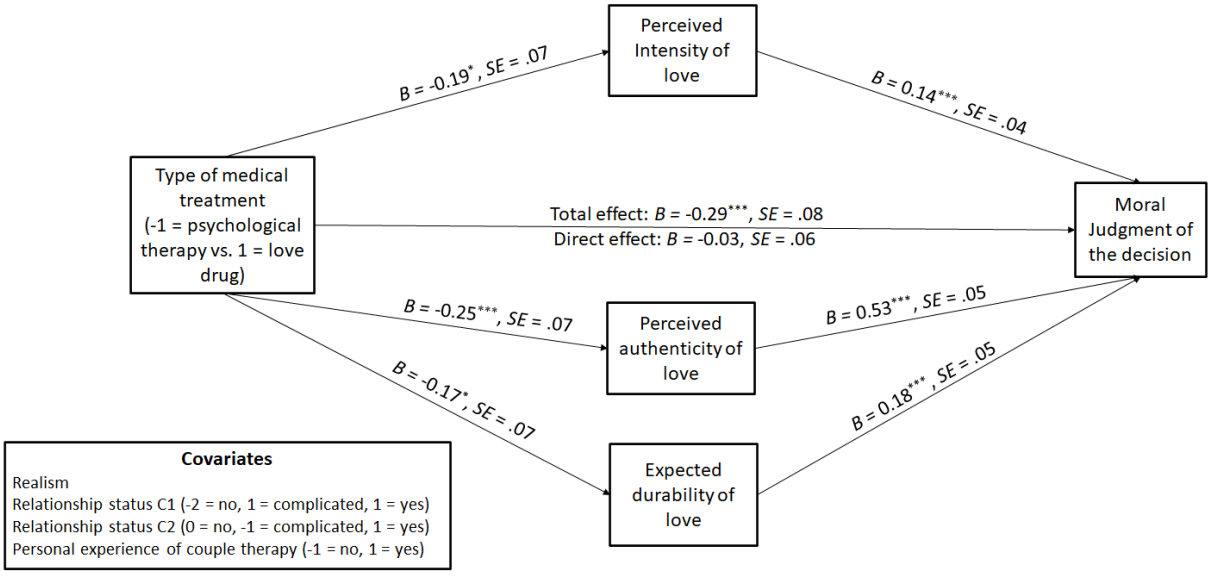
After one month of treatment during which Paul/Sophie had the feeling of a gradual increase of his love for Sophie/Paul, he/she feels again, as in the early days, love for his/her partner with whom he/she decides to stay.

Appendix C: Study 2 – Additional analyses

We ran the same multiple mediation model as described in the Study 2 results section by adding the following covariates: perceived realism, relationship status, and personal experience of couple therapy (using two orthogonal contrasts for the latter two, see Figure C1). The results we found remain the same: all the mediators tested significantly explained the harmful effect of love drug on moral judgment of the decision for perceived intensity (*ab* = -0.03, 95% CI, [-0.06, -0.003]), for authenticity (*ab* = -0.13, [-0.22, -0.05]), and for expected durability (*ab* = -0.03, [-0.07, -0.004]). This multiple mediation model is depicted in Figure C1.

Figure C1

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Decision via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love, and Controlling for Perceived Realism, Relationship Status, and Personal Experience of Couple Therapy.



Note. The *B* values represent unstandardized regression coefficients. Higher values on the measure of moral judgment of the person indicate more favorable moral judgments.

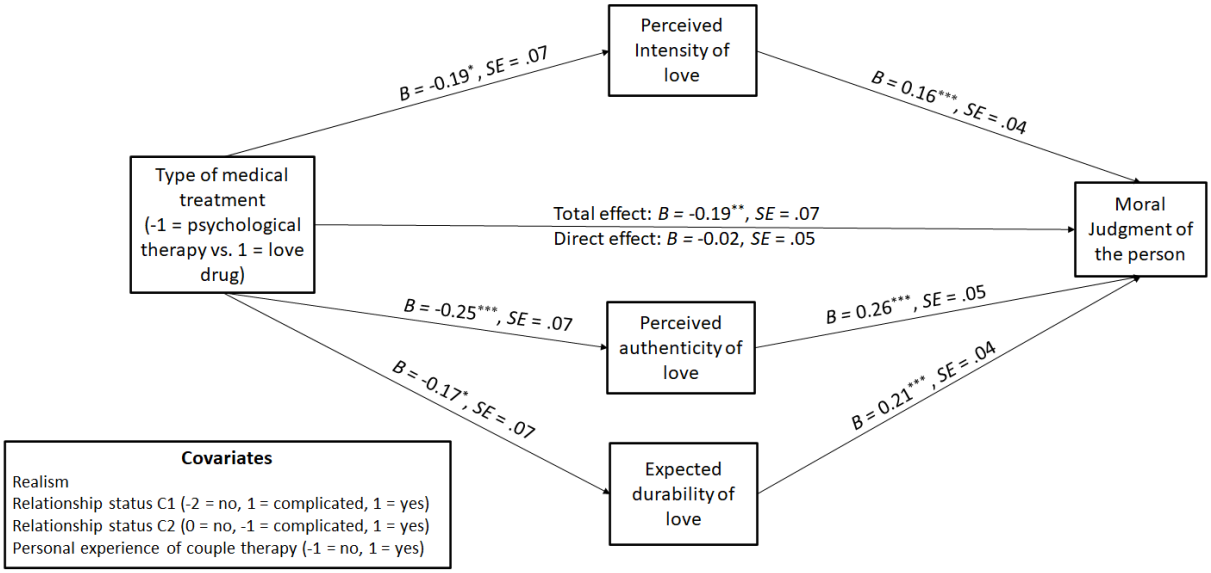
* $p < .05$, *** $p < .001$.

Then, we ran the same multiple mediation model as described previously by only substituting the dependent variable moral judgment about the decision to follow the medical treatment by moral judgment of the person who decided to take the treatment. Despite this change, the results were identical as those of the main analysis with this other dependent variable. Indeed, all the mediators tested significantly explained the harmful effect of love drug on moral judgment of the person for perceived intensity (*ab* = -0.03, 95% CI [-0.06, -

0.006]), for authenticity (*ab* = -0.07, [-0.12, -0.03]), and for expected durability (*ab* = -0.04, [-0.08, -0.006]). This multiple mediation model is depicted in Figure C2.

Figure C2

A Multiple Mediation Model of the Association between the Type of Medical Treatment and Moral Judgment of the Person via Perceived Intensity of Love, Perceived Authenticity of Love, and Expected Durability of Love, and Controlling for Perceived Realism, Relationship Status, and Personal Experience of Couple Therapy.



Note. The *B* values represent unstandardized regression coefficients. Higher values on the measure of moral judgment of the person indicate more favorable moral judgments.

* $p < .05$, ** $p < .01$, *** $p < .001$.