Attitudes about Memory Dampening Drugs Depend on Context and Country

ERYN J. NEWMAN¹, SHARI R. BERKOWITZ², KALLY J. NELSON², MARYANNE GARRY¹ and ELIZABETH F. LOFTUS²*¹

1Victoria University of Wellington, New Zealand
2University of California, Irvine, USA

Summary: When people take drugs such as propranolol in response to trauma, it may dampen their bad memories – tempering recall of a traumatic event. We examined people’s attitudes toward these drugs. Americans and New Zealanders read about a hypothetical assault inserting themselves into a scenario as a victim attacked while serving on a peacekeeping mission (soldier role) or while walking home from a job as a restaurant manager (civilian role). Then they told us whether they should receive a memory dampening drug, and whether they would want to take a memory dampening drug. Subjects were negatively disposed towards a memory dampening drug, but Americans who adopted the soldier role were more in favor of having access to the drug than those who adopted the civilian role. We discuss the implications of these findings in relation to an increasing trend in ‘cosmetic neurology’, medicating with the goal of enhancement, rather than therapy. Copyright © 2010 John Wiley & Sons, Ltd.

Distressing memories do not simply feel terrible in the moment; they are associated with an array of psychological consequences, such as dysphoria, depression and low self-esteem (Berntsen & Rubin, 2006, 2007; Ross & Wilson, 2002). Profoundly distressing memories are a hallmark of posttraumatic stress disorder (PTSD; APA, 1994). PTSD produces mental anguish, and significant costs to sufferers, their families, and society (Kessler, 2000; McNally, 2003a,b). In some cases, people with PTSD come to feel as though they are haunted by those memories, which can intrude on their everyday thinking, surface in flashbacks or nightmares, or set off exaggerated physiological responses. One Holocaust survivor said his awful memory is ‘in front of me. I can’t get rid of it’ (Langer, 1993: p. 96; see also Kuch & Cox, 1992; Wagenaar & Groeneweg, 1990). Similarly, Berntsen and Rubin (2008) found that Danish tourists who survived the 2004 Indonesian tsunami experienced intrusive memories of escaping the wave.

These studies and others suggest that distressing memories keep us stumbling on unhappiness (with apologies to Gilbert, 2006). One interesting question that arises from this research is whether people would be interested in taking a drug that could dampen – that is, lessen the emotion associated with and diminish content of – a traumatic event? In what context should people have access to such a drug? These are the questions we address in the experiment described here.

Given the myriad bad consequences associated with horrible memories, it is little wonder that scientists have investigated drugs that might blunt them. Memory dampening drugs, such as the beta-blocker propranolol, may offer some relief by disrupting the biological processes that make emotional memories so intensely remembered in the first place. Emotionally arousing experiences – positive or negative – cause the release of adrenal stress hormones that enhance some aspects of memory (see McGaugh, 2000, for a review). Propranolol blocks epinephrine receptors, and in doing so prevents memory enhancement (Cahill, Prins, Weber, & McGaugh, 1994; McGaugh, 2004). In a well-known study, Cahill et al. (1994) found that giving people propranolol destroyed the typical memory enhancement of emotional experiences, impairing both recall and recognition of emotional memories relative to people who did not take propranolol (see also Cahill, Pham, & Setlow, 2000; Reist, Duff, Fujimoto, & Cahill, 2001; Roozendaal, Quirarte, & McGaugh, 1997). Taken together, this research suggests that propranolol can dampen memory for emotional material and raises an intriguing question: would propranolol dampen memories for a traumatic event?

In fact, recent studies suggest that if people take propranolol after a traumatic experience, they suffer fewer psychological after-effects. In one study, emergency room patients took propranolol or a placebo shortly after a traumatic experience; 1 month later, propranolol patients had fewer PTSD symptoms than placebo patients (Pitman et al., 2002). In another study, PTSD patients described their trauma in writing, and then took propranolol or a placebo. One week later, patients listened to a recording of their descriptions while instruments gathered data on their physiological stress responses. Propranolol patients showed lower stress responses than placebo patients (Brunet, Orr, Tremblay, Robertson, Nader, & Pitman, 2008). Although neither study measured changes in memory, we might speculate that one mechanism responsible for the reduction in PTSD symptoms is what Cahill et al. (1994) found: propranolol makes people remember less, and makes their emotional memories more like mundane memories.

As advances in neuroscience make access to memory dampening drugs more likely, some have raised both legal and ethical concerns about who should have access to them and in what circumstances (Kolber, 2008; President’s Council on Bioethics 2003). Moreover, for all the good memory dampening drugs might do to relieve suffering, we still do not know if people actually want to take these drugs, or even want the choice to take them.

*Correspondence to: Elizabeth F. Loftus, Psychology & Social Behavior, Criminology, Law & Society, Cognitive Sciences, School of Law, University of California, Irvine, 2393 Social Ecology II, Irvine, CA 92697-7080 USA. E-mail: eloftus@uci.edu

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But there are good reasons to expect that people would indeed want – at the very least – the choice to take a memory dampening drug. For one thing, we know that people often like to have choices. Simply being able to exercise a choice – rather than being constrained – can result in many positive psychological outcomes, including boosting feelings of control and motivation (Iyengar & Lepper, 1999; Szrek & Baron, 2007; cf. Iyengar & Lepper, 2000). Second, people tend to overestimate how badly they would feel after a hypothetical negative event, which may lead them to overestimate their need for a memory dampening drug. What leads people to overestimate? Research suggests that people do not always consider other factors in their lives that contribute to happiness – instead, they overemphasize the importance of the target event (Gilbert & Wilson, 2007). In one study, people who imagined suffering from kidney disease predicted they would feel quite negative – even though people who actually suffered from kidney disease reported feeling positive (Riis, Loewenstein, Baron, Jepson, Fagerlin, & Ubel, 2005). Taken together, these studies suggest that people would want to take the drug, or at least want the choice to take it.

On the other hand, there are also good reasons to expect that people would want to avoid a memory dampening drug. For instance, people tend to imagine glowing, positive futures (Szpunar, 2010; cf. Wilson & Ross, 2003). In one study, when people generated personally meaningful future events they were slower at generating negative events than positive events, and thought the negative events less likely (Newby-Clark & Ross, 2003). Put another way, positive future events might come to mind more easily – more fluently – and therefore feel truer, and more likely (see Alter & Oppenheimer, 2009 for a review; Sherman, Cialdini, Schwartzman, & Reynolds, 1985). Considered together, this research suggests that people may imagine a relatively positive posttrauma future, and decide they would not need nor want the drug.

To address these issues, we asked people to read a scenario about a vicious assault. We manipulated the circumstances of the assault so that people read about themselves experiencing one of two similar attacks occurring in two very different contexts. In the first version, people read that they were a restaurant manager attacked while returning from work late at night; in the second version, they read about the same attack but as a soldier returning to base late at night.

We also manipulated the base rate of PTSD, telling some of our subjects that only 4% of people go on to develop PTSD after a traumatic experience, telling others that the figure was 40%, and telling still others nothing about the base rate of PTSD. Because the relevant literature is mixed, we had no specific prediction about the effects of this manipulation. On the one hand, research leads us to speculate that base rate information may influence people’s attitudes to memory dampening drugs. Typically, people believe that others are more at risk for developing certain medical conditions than they themselves are (Hansen, Raynor, & Wolkenstein, 1991; Perloff & Fetzer, 1986; Weinstein, 1984, 1987, see Weinstein, 1989 for a review). Therefore, it is possible that feeding people base rate information could counteract their sense of invincibility. In other words, it could lead people to be more concerned that they might develop PTSD and be more positively disposed towards a memory dampening drug (see Menon, Raghubir, & Agrawal, 2008). On the other hand, some research suggests that base rates often do not affect people’s attitudes – instead, people overlook base rate information, focusing on idiosyncratic aspects of an event (Bar-Hillel, 1980; Tversky & Kahneman, 1974; cf. Ginosar & Trope, 1987; Koehler, 1996). Therefore, it is possible that feeding people base rate information might have no influence on their disposition towards a memory dampening drug.

In the study below, we asked a sample of people in the United States (US) and New Zealand (NZ) to read the assault scenarios and then tell us if they wanted the choice to receive a memory dampening drug, and (assuming they had a choice) if they would actually want to take it. We expected that people’s responses might vary by country, reflecting the fact that Americans are more comfortable with the idea of taking medication. For instance, people in the US medicate themselves more than people in any other Organization for Economic Cooperation and Development (OECD) nation, spending $121 per person annually on over-the-counter drugs – more than three times as much as people in NZ, who spend $40 (OECD Health Data, 2009). When it comes to prescription drugs, the US again comes out on top, spending $878 USD per person per year (OECD Health Data, 2009). By contrast, people in NZ rank 23/24, spending $241 USD per person per year. The comparison is especially noteworthy, given that the US and NZ are the only OECD countries permitting direct to consumer prescription drug advertising (Mintzes et al., 2002).

**METHOD**

**Design**

We used a 2 (context: restaurant or military) × 3 (base rate: 4%, 40% or no information) × 2 (country: US or NZ) between-subjects design. The first factor was context. In the restaurant condition, people read a version of the assault scenario that described a restaurant manager returning from work late at night. In the military condition, people read a version of the assault scenario describing the same attack happening to a soldier returning to base late at night.

The second factor was base rate. People read either that 4%, or 40% of people go on to develop PTSD; in the ‘no information’ version of the scenario, there was no mention of how often people develop PTSD.

**Subjects**

A total of 997 people from the community completed the survey; there were 518 women (52%), 463 men (46%) (16 people did not report gender); they ranged in age from 18 to 80 (M = 28.2, SD = 13.7). Of the 997 subjects, there were 650 Americans and 347 New Zealanders.1

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1Note that although cell sizes were uneven, for all effects we report, the $F_{max}$ test showed acceptable ratios of cell variances (Tabachnik & Fidell, 2007).
**Procedure**

We distributed the survey in various parts of southern California, and Wellington, NZ. People who agreed to take part completed the survey immediately, and returned it to one of the experimenters. Each scenario was approximately 100 words long, and varied only in line with the manipulations described above. For example, people in the restaurant condition read:

> You are a restaurant manager who has just finished work late at night, and you put the night’s takings in your backpack so you can deposit them into the restaurant’s bank account in the morning. Your journey home takes you through a poorly lit park. While in the park, a man appears in front of you, and stabs you in the stomach. As you fall to the ground, he kicks you hard in the ribs, steals the money and runs off. Although you are badly shaken by the viciousness of the assault, you are able to get to the nearest hospital.

People in the military condition read:

> You are a soldier on a peacekeeping mission in Afghanistan who has just finished patrolling late at night, and you put the night’s supplies in your pack. Your journey to the base takes you through dark terrain. While on your way to the base, a man appears in front of you, and stabs you in the stomach. As you fall to the ground, he kicks you hard in the ribs, steals the supplies and your gun and runs off. Although you are badly shaken by the viciousness of the assault, you are able to get to the nearest base, where there is a hospital.

Before reading each scenario, people read a paragraph describing a drug used to diminish the possible after-effects of trauma. Although we did not mention propranolol by name, we based our description of the drug and its effects on subsequent recall from the scientific literature (Brunet et al., 2008; Cahill et al., 1994; Pitman et al., 2002). The paragraphs changed only in respect to the base rate condition. For example, the 4% version read:

> Scientific studies have shown that on average, 4% of people who experience a traumatic event will develop PTSD. Some of the debilitating symptoms of PTSD include recurrent and intrusive distressing recollections of the event, irritability or outbursts of anger and an exaggerated startle response. Recently, research has shown that if a person who has had a traumatic experience is given a certain drug within a few hours of that experience, the drug can ‘dampen’ the memory of that event and minimize the effects of PTSD. In other words, the drug will lessen the emotion associated with the event, and diminish factual content for the event, without causing the complete erasure of the event.

The 40% version replaced 4% with 40%, and people who read the version with no information read a modified opening sentence: scientific studies have shown that people who experience a traumatic event can develop PTSD.

Our primary dependent measures were people’s responses to two questions: in Question 1 [Q1], people reported the extent to which they would want access to a memory dampening drug, and in Question 2 [Q2], they reported how likely they would be to actually take the drug if it were made available. They made their responses on a 5-point Likert type scale, with anchors 1 = definitely no to 5 = definitely yes. We also asked people for demographic information such as sex, age and whether or not they had ever witnessed or experienced a traumatic event.

**RESULTS AND DISCUSSION**

Our primary interest in this study was to examine whether people wanted access to memory dampening drugs and whether they would actually want to take these drugs. We were also interested in whether the context of trauma (whether people read about themselves being attacked as a restaurant manager or a soldier), country of residence and perceived prevalence of PTSD would affect people’s attitudes to the drug. Below we focus on two key findings: the extent to which people wanted the choice to take the drug, and if they themselves would take the drug. Because we found that base rate information had no effect on our findings, we omitted this factor from the analyses below.

**Who should have access to the memory dampening drug?**

To examine people’s attitudes about who should have access to the memory dampening drug, we took their responses to Q1 and classified them first according to whether they were from the US or NZ and then by the context in which the assault occurred. We display those results in Figure 1.

Figure 1 shows three important findings. First, regardless of where people lived or the hypothetical context in which they read they were attacked, they showed only modest desire to have access to the drug. Second, depending on what country they lived in, the context in which people were attacked mattered: Americans showed more support for their right to access the drug if they were the soldier than if they were the restaurant manager; by contrast, New Zealanders showed similar support for their right to access the drug when they were either the restaurant manager or the soldier. Third, when they adopted the soldier’s point of view, Americans showed greater support for their right to access the drug if they were the soldier than if they were the restaurant manager, whereas New Zealanders showed greater support for their right to access the drug than did New Zealanders.

Statistical support for these findings can be seen in a 2 (context: restaurant or military) × 2 (country: US or NZ) analysis of variance (ANOVA) which showed a Context × Country interaction, $F(1,996) = 4.23, p = .04, f = .06$. Follow-up t-tests showed that for Americans, the context mattered: the ‘military’ subjects showed a greater and more strongly that they should have the choice to take the drug than did the ‘restaurant’ subjects, $t(993) = 2.78, p = .01$, Cohen’s $d = .18$. For New Zealanders, context did not matter, $t(993) = .52, p = .62$. When we focused on just the military subjects, we found that Americans agreed more strongly that they should have access to the drug than did New Zealanders, $t(993) = 2.43, p = .02, d = .15$.

We also examined whether people who had experienced a traumatic event would be more inclined to want access to the memory dampening drug. Would these people have similar
attitudes about who should have access to the drug? To assess this, we analyzed the Q1 responses of the 334 people who said they had experienced a traumatic event. When we reran the ANOVA adding traumatic experience (yes, no) as a factor, we found the same pattern of results. That is, there was no effect for trauma, \( F < 1 \), but there was a Context × Country interaction, \( F(1,971) = 4.21, p = .04, \) \( f = .06 \). Although our conclusions should be taken as speculative because of the violation of random assignment, they suggest that experiencing a traumatic event did not affect people’s attitudes about having access to the drug.

Who would want to take the memory dampening drug?

Did the effects we found for who should have access to the drug translate into similar effects when people were asked whether they themselves would want to take the drug? The answer is no. As Figure 2 shows, we found no effects for where people lived or the context in which they were attacked. Instead, we found that across these factors, people tended to reject the drug when given the choice to take it. In other words, there was no effect for country, \( F < 1 \), no effect for context, \( F(1,995) = 1.27, p = .26 \) and no interaction, \( F < 1 \). Unsurprisingly, the more people agreed that they should have the choice about taking the memory dampening drug, the more they agreed that they would exercise that choice. Put another way, there was a positive correlation between people’s responses about having the choice of the drug and their responses about whether they would take the drug, \( r(994) = .42, p < .01 \).

Again we wondered if people who had experienced a traumatic event would have different attitudes towards taking the memory dampening drug. One possibility is that people who had experienced a traumatic event would have greater awareness of its distressing after-effects and be more inclined to want the drug. To address this possibility, we reran the ANOVA adding traumatic experience as a factor, and found that in fact, people who had experienced trauma were less inclined to take the drug (\( M = 2.10, SD = 1.29 \)) than people who had not experienced trauma (\( M = 2.29, SD = 1.25 \)). The remaining pattern of results was the same.

In other words, a 2 (context: restaurant or military) × 2 (country: US or NZ) × 2 (trauma: yes, no) ANOVA showed no effect for context, \( F < 1 \), no effect for country, \( F(1,970) = 1.03, p = .31 \), but an effect for trauma, \( F(1,970) = 5.03, p = .02, f = .07 \). This pattern of results held only for those people who had experienced a traumatic event. People who had witnessed a traumatic event showed a similar – although not significant – pattern of responding, all \( F \)'s <1.
Finally, we analyzed the data to determine if age or gender were related to people’s opinions about wanting access to the memory dampening drug or exercising that choice. There was no relationship between age and choice, \( r(974) = .05, p = .14 \); or age and taking the drug, \( r(973) = .02, p = .50 \). Men (\( M = 3.34, SD = 1.50 \)) and women (\( M = 3.50, SD = 1.41 \)) had similar views on access to the drug \( r(979) = 1.72, p = .09, d = .11 \), but men (\( M = 2.11, SD = 1.28 \)) were less inclined than women (\( M = 2.32, SD = 1.25 \)) to exercise their choice to take the drug \( r(978) = 2.55, p = .01, d = .16 \).

The primary purpose of this research was to examine people’s attitudes about memory dampening drugs. Taken together, these data suggest that people generally rejected the memory dampening drug. In fact, only 54% of people said they agreed with having the choice to take the drug (rating four or five on the scale), and an even smaller percentage of people agreed that they would exercise that choice (18%). This less than enthusiastic support for the memory dampening drug fits with the research suggesting that people readily generate rosy futures in their minds, more fluently imagining positive events and outcomes than negative ones (Newby-Clause & Ross, 2003).

Nonetheless, it is possible that people did indeed think they would experience significantly bad consequences after the assault, including severe PTSD (Gilbert & Wilson, 2007; Riis et al., 2005) – yet they rejected the dampening drug anyway. Why?

One possibility is that such a pattern of results might well reflect general discomfort about tinkering with our memories, as depicted in movies such as ‘Eternal Sunshine of the Spotless Mind’.

In other words, memory dampening drugs may threaten people’s sense of their identities. If memories comprise who we are, then does tinkering with our memories change who we are (James 1890/1950; Neisser, 1988; Wilson & Ross, 2003)? Perhaps our subjects considered this notion.

In addition, we asked people to make a decision about the drug without knowing if they would ever develop the negative psychological consequences that would have warranted their taking the drug; that is, we asked them if they would take the drug as a preventative measure. Of course, it is not as though the notion of preventative drugs is novel – people around the world receive immunizations to ward off common and rare diseases. Still, perhaps people would respond differently to a scenario where therapeutic intervention occurred once people had already developed PTSD, an approach that is gaining increasing empirical support (e.g. Brunet et al., 2008; Schiller, Monfils, Raio, Johnson, LeDoux, & Phelps, 2010). It is also possible that when people considered the memory dampening drug, they decided it would be wiser to pursue conventional treatments for PTSD symptoms first before turning to something new whose risks are unknown.

Another possibility is that people did not judge the assault scenario we asked them to read to be a sufficiently significant trauma; that is, perhaps they would reserve the notion of ‘trauma’ for rape, fires and mass murder – a kind of dose-

2We thank an anonymous reviewer for this notion.

response model of PTSD. Of course, people’s notions of the relative impact of comparatively minor and major trauma are misplaced, as the evidence arguing against a dose-

response model of trauma reactions suggests (see McNally, 2003a).

In many ways, people’s widespread rejection of the drug was surprising for several reasons. First, we live in an era where pharmaceutical advancements produce drugs that would have been viewed as miracles only decades ago, such as nanoparticles that act like small biochemical weapons, selectively destroying cancer cells (Murphy et al., 2008). At the same time, people are increasingly willing to seek out cosmetic treatments that selectively destroy eyebrow furrows. In this context, Chatterjee’s (Chatterjee, 2004, 2006) idea of cosmetic neurology reflects a public’s willingness to selectively destroy or minimize even minor flaws. On the face of it, then, it is interesting that people were not more favorable about a memory dampening drug. But as Riis, Simmons, and Goodwin (2008) showed, although people said they were willing to take drugs that improved their attention and concentration, they were less willing to take drugs that changed more social attributes – such as anxiety and motivation – that people saw as fundamental to their identities.

We also found that when Americans adopted the point of view of a soldier on a peacekeeping mission, they were more in favor of having access to the drug than when they adopted the point of view of a restaurant manager suffering a similar attack on the way home. By contrast, New Zealanders showed no such effects. In addition, people tended to reject the notion that they would take the drug themselves, regardless of the context in which the traumatic experience occurred, or where they were from.

The fact that Americans who adopted the soldier’s point of view were more supportive of their right to have access to a memory dampening drug may reflect factors such as the difference in how Americans and New Zealanders view the military. New Zealanders place little emphasis on the military, as revealed by the small percentage of gross domestic product (GDP) spent on it (1%) – a value smaller than its close neighbour Australia (2.4%) and significantly smaller than the US (4.06%) (Central Intelligence Agency (CIA World Fact Book, 2010); see also Elvy, 2008). In fact, a recent survey showed that half of New Zealanders were unwilling to increase spending on defense even though 84% of people agreed the military was ill-equipped to deal with an attack (Elvy, 2008).

The attitudes of Americans adopting the soldier’s point of view do not square with the ethical concerns raised by scholars and pundits: for example, although the President’s Council on Bioethics (2003) raised the idea that civilians who act in defensive public safety roles – police offers, firefighters and other ‘first responders’ – could have access to a memory dampening drug, they expressed reservations about extending the same options to soldiers – who, by definition, have both offensive and defensive roles (see also Henry, Fishman, & Youngman, 2007; Kolber, 2006). Whereas public safety personnel defend against the causes of trauma, soldiers also create trauma; a drug that dampens their emotional response to waging war might act to produce...
a ‘killing machine’. There is no evidence that American subjects shared this concern. Of course, we did not ask them to take on board specific ethical concerns in making their decisions – such an approach would be an interesting one, worthy of future study.

The finding that varying the base rate did not influence people’s attitudes towards the memory dampening drug fits with the idea that people tend to overlook information about base rates (e.g. Bar-Hillel, 1980; Tversky & Kahneman, 1974). In other words, when making their decision, people in our study may have relied on the context in which the trauma occurred rather than the prevalence of PTSD. Other research suggests that people pay attention to information about base rates only under certain conditions: for example, making event details seem less diagnostic or even unrelated to a judgment leads people to heed base rates (Ginosar & Trope, 1980; for a review see Koehler, 1996). Perhaps a manipulation that increased the salience of base rates would lead people to be more concerned about the possibility of getting PTSD and make them more disposed toward the drug.

How should we make sense of the fact that trauma victims were less inclined to take the drug? Such a pattern fits with the idea that trauma memories may serve various adaptive functions such as providing turning points in someone’s life and guiding behavior for future events (Krans, Naring, Becker & Holmes, 2009; Rasmussen & Berntsen, 2009). Our subjects may have experienced positive growth after a trauma or come across a situation where the trauma memory helped them – a different pattern of results may have emerged if we had asked people who were currently suffering from PTSD, or had recently experienced a trauma (see McNally, 2003b; Zoellner & Maercker, 2006; see also, Gilbert & Wilson, 2007).

What we do not know is whether a more concrete, detailed description of trauma-related distress, including intrusive memories, would give people a better sense of what it would be like to suffer from these symptoms and thus increase the likelihood that they would want to take the drug themselves. We also do not know if people think that memory dampening drugs would have significant consequences for the justice system. For example, would they consider testimony unreliable if given by someone who had taken a memory dampening drug, or would they be more willing to allow victims – rather than eyewitnesses – to have access to the drug? We are currently investigating these questions.

Nietzsche (1980) seemed to embrace the notion of forgetting when he said ‘Without forgetting, it is quite impossible to live at all’ (p. 10). The people in our study, on the other hand, eschewed the notion of forgetting.

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