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Perceptions on Transforming the True Self

Abstract

This paper surveys perceptions of the changeability of the true self. By asking about a hypothetical pill, we explore the extent to which people believe that various traits can be altered, and in what way. Our hypotheses are: 1) that people believe, in general, it is more difficult, or impossible, to make changes to traits associated with one's true self, as opposed to those less closely associated with identity; 2) that traits associated with morality, specifically, will be seen as most strongly associated with the self and perceived as the most difficult to change; and 3) that positive changes, or improvements, are perceived as easier to make and less identity altering than negative changes. We find morality to be both most attributed to identity and perceived as the hardest type of trait to change. Positive changes do seem to be perceived as easier and more associated with the self. General claims about self-attribution and ease of change across trait category are not able to be made. Implications for identity and drug use are discussed.

Key Words: true self, efficacy, identity, valence, trait

Introduction

What makes you, *you?* Is it your distinct personality? Your memories? What some might call a "soul"? The concept of an inner, authentic "self" is referred to in literature as old as Shakepeare's *To Thine Own Self Be True* monologue by Polonius (Shakespeare, n.d. line 564), by Locke who argued for the importance of memory in psychological identity (Locke, 1690), and now on modern day blogs seeking to "Help You Find your True Self" (Pool, 2012). For any individual the "self" plays into the very language we use to discuss our own persons, our own *selves*. And yet it seems there is something different between the "self" we reference in casual discussion and what one might refer to as the "true" or "authentic" self. The self we refer to in causal conversation is used as a tool for identification: one might reference their current physical appearance, name or job when describing who they are to others. We make clear that we are talking about one's own body or identity, not anyone else's. Yet who is the individual in the absence of outside comparisons? What is it that defines who someone is at their "core," or their

"essence?" The concept can seem elusive and hard to precisely define, leading psychologists to attempt to do exactly that. This question and work on the authentic or "true" self has seen a surge of academic interest in recent years. This paper focuses on the perceived components of the self and the possibility of change. While research has explored whether individuals would *like* to change certain aspects of themselves (Riis et al, 2008), this paper seeks to explore to what degree people believe the self *can* be altered. Are some aspects perceived as more changeable than others? How difficult do people believe it would be to enact such a transformation, and what would the perceived consequences be for the individual?

The True Self

In trying to define the true or authentic self, it has been described as something that is one's "core" or inner layer (Johnson, Robinson and Mitchell, 2004), or as something that is essential to one's sense of identity (Sani, 2010) and it continues to be explored in new ways. From what the true self consists of (Strohminger & Nichols, 2014; Newman, Bloom and Knobe, 2013), to the role it plays in decision making and meaning in life (Schlegel 2009, Iyer and Jetten, 2011), to the benefits of its expression (Bargh, McKenna, and Fitzsimons, 2002) and whether or not we desire to change it (Riis, Simmons and Goodwin, 2008), the seemingly ambiguous subject is undergoing extensive investigation.

Current discussions involving what makes up someone's identity discuss a degree of sameness, speaking to the unchanging nature of one's self (Unger, 1990; Olson 2003) or its continuity over time (Iyer et al, 2011, Sani 2010). Individuals have been shown to desire a consistent and stable self-identity in regards to relationships and dialect (Swann, Stein-Seroussi, and Giesler 1992). Such continuity often becomes a defining aspect of identity over time, of the 'true' self. So one must ask: what happens to identity when certain aspects of one's self,

potentially tied to identity, do change? As Olson puts it in his personal identity chapter of *Science Fiction and Philosophy*, "What sorts of adventures is it possible, in the broadest sense of the word 'possible,' for you to survive, and what sort of event would necessarily bring your existence to an end?" (Olson, 2003). That is, thinking beyond death of a physical body, what does it take for a past or future version of a person to be the same as the current version?

For while consistency is desirable (Swann et al., 1992) and perceptions of consistency have been shown to improve subjective well-being (Suh, 2002), traits associated with the self are known to change o some extent; any parent of a teen, for example, could tell you how opinions, desires, and ways of self-identifying seem to change almost by the day in young adulthood. Grown adults may experience the slow incorporation of a facet into one's identity over time (as with the incorporation of having AIDS into one's identity in Baumgartner, 2007) or feel as if parts of them have changed at big life stages, such as when one becomes a parent or goes through trauma. Sometimes individuals in question are said to be "an entirely different person" after certain changes. Yet are they *really* considered a different person? If not, what remains the same, preserving their identity? Burke (2006) notes the difficultly in discussing the theoretical mechanisms of identity, explaining "such mechanisms must account for both the stability and change of identities over time."

So what type of changes could lead to a perceived change in identity? To answer this, we must consider what it is individuals consider most important to identity, what it is that – if altered – would be perceived as affecting one's true self. One way to consider this is in regards to cognitive/behavioral traits associated with an individual. We can break traits into broad categories, such as memories, morality, or desires. Categorically, then, we consider the perceived importance each has in relation to identity. Recent work has shown traits of a moral nature, more

than even memory, to be most attributed to the true, authentic self (Strohminger and Nichols, 2014). Strohminger and Nichols explored the importance of various mental faculties to identity through changes to the mind or soul through hypothetical surgery, pill use, soul-switching, reincarnation, and aging. Each condition asked about how various mental and behavioral traits would or would not be affected by such changes. Differences were found between distinct types of mental faculties including morality, personality, desires, and memories. Of direct importance to this paper, in their "silver bullet" study subjects rated how much a person would change after taking a pill that selectively removed one of 62 cognitive/behavioral traits. Using that paradigm, this paper seeks to investigate perceived identity change through hypothetical trait change. Of course, it is worth noting that it is possible for traits to change without changing identity. One could imagine a friend changing her hair color without fundamentally altering her identity, or if she suddenly acquired a taste for brussel sprouts, one would not claim her true self had changed. Rather, it is the traits which are seen as essential to identity that might affect perceived identity. We seek to further investigate how difficult individuals perceive it would be to make such changes to the self via trait changes.

Overview of Current Research

The current work outlines a study of perceptions on aspects of one's true self and the ability to alter it. Participants are asked about the effects they would expect from a hypothetical pill, "designed to alter different aspects of a person's mental functioning." They are asked about "what effect [the pill] would have on someone who took [it]." By asking about the results of altering individual traits, we explore the extent to which people believe that traits can be altered, if at all, in what way and what the effect would be on one's identity. We propose the following hypotheses:

H1: People believe it is more difficult, or impossible, to make changes to traits attributed to one's true self, as opposed to those less closely associated with identity.

We predict this to be demonstrated in two ways. First, we test this on the basis of categories of traits one might attribute to the true self. We predict there will be differences in changeability dependent upon the type of trait (morality, memory, preferences, or personality). Based on work showing morality to be the most essential component of the self (Strohminger and Nichols, 2014), we also predict that morality will be the most difficult to change, as expressed by various capabilities of a hypothetical pill.

H2: Traits associated with morality will be seen as most strongly associated with the self and perceived as the most difficult to change.

Second, we predict an effect of the type of change on beliefs about the ability to alter traits and the self. Considering findings that people believe the true self to be fundamentally good (Newman et al. 2013), it is possible improvements are perceived differently than decrements. That is, an alteration resulting in a "better" self (more moral, better memory, etc.) could be seen as reverting to the "natural" state of the true self, as opposed to a fundamental change away from what is perceived as typical for the self, or a negative change.

H3: Positive changes, or those increasing one's "goodness" are perceived as easier to make and less identity altering than negative changes.

Method

200 American participants (mean age 30; 39.5% female) were recruited for an online study and run via Amazon's Mechanical Turk. Participants were presented with a survey consisting of six overarching questions broken down by 16 different traits. Each question asked about the effects of a hypothetical drug designed to alter certain aspects of one's mental functioning. The aspects in question included traits attributed to morality, preferences, personality, and memory (see below). Individual traits were selected to be representative of each

category. The basis for the traits came from Strohminger and Nichols' (2014) study. Traits selected for the Morality category were those consistently rated as high on the moral scale, while traits chosen for the Personality category include those least associated with morality. Traits listed for Memory include multiple kinds of memory, such as knowledge and emotionally charged, episodic memories. Categorizations were not shown to participants.

- Morality
  - Kindness toward others
  - Ability to feel empathy
  - Dishonesty
  - Racism
- Preferences
  - Appreciation for music
  - Love of sports
  - Enjoyment of movies
  - Liking to read
- Personality
  - Adventurousness
  - Creativity
  - Sense of humor
  - Shyness
- Memory
  - Forgetfulness
  - Recall of traumatic memories
  - Ability to remember fond memories
  - Mathematical knowledge

Traits were randomly presented and direction ("increasing" or "decreasing" the prevalence of the trait) and Valence of change (improvement or decrement) were balanced within subjects. Participants could respond on a sliding scale from 0 to 100 for each trait (See Appendix, Figure 1). Six over-arching questions investigated the pill's predicted: efficacy, necessary dosage, and lasting ability, as well as the effect on the subject (how "different" one would be), connection to brain chemistry, and effect on the true, "deep down" self (see Table 1). The "Brain Chemistry" question is present to control for the possibility that people believe certain traits are simply not at

all related to the brain, and therefore that a pill targeting the brain would have no effect, regardless of the nature of the true self or valence of change.

Six Overarching Questions:

"In this study, we will be asking you a series of questions about hypothetical drugs designed to alter different aspects of a person's mental functioning. While drugs of this nature do not necessarily exist, it is interesting to imagine how they would work, and what effect they would have on someone who took them."

Label	Question	Anchors Numeric Scale from 0 - 100
Deep Down	If each of the following qualities were altered in a person, has the person's true self (who they really are, deep down) changed, or is it still the same?	"True Self fundamentally the same" – "True Self fundamentally different"
Difference	Imagine that these drugs were both 100% effective and their effects were completely permanent. How different would someone be after taking each of these drugs?	"Not at all different" – "Completely different "
Efficacy	Imagine that scientists developed drugs that would have one of the following effects. How effective would you expect each of the following drugs to be? (That is, that the drug would do exactly what it claimed?) Give your response to each item by clicking and dragging the bar to the location of your choice."	"0% Effective" – "100% Effective"
Dosage	How strong (how high of a dosage) do you think a drug would have to be in order to alter each of these traits?	"Not at all strong/low dosage" – "Very Strong/high dosage"
Time	Imagine that scientists discovered that each these new drugs successfully works on patients for one day, but they have not tested longer intervals. Given this, how long would you predict the drug to last?	"Not a long time at all" – "A very long time"
Brain	Please indicate how much you agree that	"Disagree" – "Agree"

Chemistry	each of these changes could occur as a result of altering brain chemistry.

Table 1. Six over-arching questions in survey, accompanied by sliding scales from "0" to "100" next to 16 "increasing" or "decreasing" traits.

Results

Analysis of results is broken down by question type.

"Deep Down"

For the "Deep Down" question participants were asked, "If each of the following qualities were altered in a person, has the person's true self (who they really are, deep down) changed, or is it still the same?"

A higher score for this question indicates a more drastic perceived change of true self. An omnibus repeated measures ANOVA was run to test for effects of valence and trait category and a Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated in calculation of trait category, $\varepsilon = .807$, $p < .001$. Therefore, a Huynh-Feldt correction was used. The effect of trait category was significant = $F(2.436, 971.929) = 170.029$ $p < .001$, $\eta_p^2 = .299$ as was the effect of Valence $F(1, 399) = 8.787$ $p = .003$, $\eta_p^2 = .022$. This means that some trait categories were significantly different from each other, and that within trait categories responses were affected by valence. A Mauchley's test also indicated a violation of the assumption of sphericity for the interaction between trait category and valence $\varepsilon = .966$, $p = .001$. Therefore, a Huynh-Feldt correction was used. The interaction between valence and trait category was not significant $F(2.922, 1165.814) = 2.076$, $p = .103$, $\eta_p^2 = .055$ meaning that valence did not significantly affect comparisons between trait categories. Overall effects are illustrated in Figure 2. Simple effects tests were run to look at the individual effects of both trait category and valence. All tests were adjusted for multiple comparisons using Bonferroni.

Valence was significant only for Morality, with responses to questions of negative moral change ($M = 64.0007$ $SD = 30.2586$) being significantly higher (fundamentally changing the true

self more) than those of positive moral change (M = 59.928 SD = 29.5969, p = .002). Valence was not significant for questions of Memory (p = .055), Preferences (p = .084) or Personality (p = .840). This means that in regards to Morality, a negative change to one's morals is seen as causing greater fundamental change to the true self than a positive change; the type of change for other traits, however, is not significant to true self change.

All trait categories were significantly different from each other, with a change in Morality (M = 61.97, SD = 29.980) causing the greatest fundamental change, followed by Personality (M = 52.44, SD = 29.007, p < .001), Memory (M = 40.57, SD = 29.774, p < .001) and Preferences (M = 35.05, SD = 27.345, p < .001); (see Tables 3 and 4). All were adjusted for multiple comparisons with Bonferroni. All trait categories were significant from all other trait categories with a p < .001. This means that people perceive trait change to have a different effect on the true self based on the type of trait that it is; Morality seems to be considered the most closely tied to the true self (as is consistent with previous literature), followed by Personality and Memory, while Preferences seem to be the least closely tied to the true self.

Brief Discussion

The question of how much a trait change would fundamentally alter one's true self was posed to confirm previous literature asserting moral traits are more attributed to the true self than others, in addition to testing the perceived effects of direction of change. Negative changes are believed to cause a greater fundamental change to the true self, supporting Hypothesis 3 that positive changes are less identity altering than negative changes. Morality is believed to be most closely tied to the true self, consistent with previous literature.

"Difference"

For the "Difference" question, participants were asked, "Imagine that these drugs were both

100% effective and their effects were completely permanent. How different would someone be after taking each of these drugs?"

A higher score for this question indicates a belief that the individual is more different after the trait change has occurred. An omnibus repeated measures ANOVA was run to test for effects of valence and trait category and a Mauchly's Test of Sphericity indicated that the assumption of sphericity for trait category effects had been violated, $\varepsilon = .865$, $p < .001$. Therefore, a Huynh-Feldt correction was used. The effect of trait category was significant $F(2.615, 1043.186) = 200.639$ $p < .001$, $\eta_p^2 = .335$, as was the effect of Valence $F(1, 399) = 7.599$ $p = .006$, $\eta_p^2 = .019$. This means that some trait categories were significantly different from each other, and that within trait categories responses were affected by valence. A Mauchly's Test of Sphericity indicated that the assumption of sphericity had also been violated for the interaction between trait category and valence, $\varepsilon = .978$, $p < .018$. Therefore, a Huynh-Feldt correction was used. The interaction between trait category and valence was not significant $F(3, 1179) = .232$ $p = .872$, $\eta_p^2 = .001$ meaning that valence did not significantly affect comparisons between trait category. Simple effects tests were then run to look at the effects of both trait category and valence. All tests were adjusted for multiple comparisons using Bonferroni. Overall results are illustrated in Figure 3.

Valence was significant only for Morality ($p = .049$). Negative changes were predicted to make a person more different, with the mean for positive change ($M = 69.440$, $SD = 27.3328$) being significantly less than that for negative change ($M = 72.108$ $SD = 27.879$). Valence was not significant for questions of Memory ($p = .087$), Preferences ($p = .125$), or Personality ($p = .303$).This means that in regards to morality, a negative change to one's morals is seen as making a person more different than a positive change; the valence of change for other traits, however, is

not significant to how different a person would be. See (Table 6).

All trait categories were significantly different from all other trait categories with a $p < .001$ (See Table 6). A pill altering Morality ($M = 70.77$ $SD = 27.622$) was expected to make someone the most different, followed by a change of Personality ($M = 64.93$ $SD = 64.93$, $p < .001$), then Memory ($M = 56.82$, $SD = 27.622$ $p < .001$), and someone being the least different after a change in Preferences ($M = 44.07$, $SD = 27.467$, $p < .001$) (See table 7). This means that people perceive changes of trait to make someone more or less different based on the type of trait that it is; changes to morality are predicted to make someone the most different, while preferences are predicted to have the smallest effect on how different a person would be.

Brief Discussion

The question of difference targeted the question of which trait changes could change a person's identity was without directly referencing the "true self." As expected, results align with the "Deep Down" question and confirm previous literature; Morality is believed to cause the most difference, followed by Personality, then Memory, with changes in Preferences causing the person to be the least different. Again, positive changes are seen as less identity altering – making a person less different – than negative changes. This supports Hypothesis 3.

"Efficacy"

For the "Efficacy" question, participants were asked, "Imagine that scientists developed drugs that would have one of the following effects. How effective would you expect each of the following drugs to be? (That is, that the drug would do exactly what it claimed?) Give your response to each item by clicking and dragging the bar to the location of your choice."

A higher score for this question indicates a belief that the drug in question would be more effective at enacting the trait change. An omnibus repeated measures ANOVA was run to test for

an effect of valence and trait category and a Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated in calculation of trait category, $\varepsilon = .940$, $p < .001$. Therefore, a Huynh-Feldt correction was used. The effect of trait category was significant $F(2.842, 1133.977) = 52.676$ $p < .001$, $\eta_p^2 = .117$ as was the effect of Valence $F(1, 399) = 18.941$ $p < .001$, $\eta_p^2 = .045$. This means that some trait categories were significantly different from each other, and that within trait categories responses were affected by valence.

In the repeated measures ANOVA, a Mauchly's Test of Sphericity indicated that the assumption of sphericity had also been violated for the test of trait category and valence interaction $\varepsilon = .981$, $p < .028$. Therefore, a Huynh-Feldt correction was used. The interaction between valence and trait category was significant $F(2.966, 1183.600) = 4.672$ $p = .003$, $\eta_p^2 = .012$. This indicates that the trait categories were affected by valence, but that the effect between categories was not necessarily the same. Overall effects are illustrated in Figure 4. Next simple effects tests were run to look at the effects of both trait category and valence. All tests were adjusted for multiple comparisons using Bonferroni.

Valence was significant for Morality ($p = .026$), Preferences ($p < .001$) and Personality ($p = .001$); valence was not significant for Memory ($p = .456$). A pill to make negative changes was predicted to be less effective than one to make positive ones: the mean for a positive change in Morality ($M = 41.40$ $SD = 29.175$) was significantly higher than a negative change ($M = 37.18$ $SD = 30.139$, $p = .026$) and the mean for a positive change in Preferences ($M = 43.44$ $SD = 29.334$) was significantly higher than for a negative change (33.822 $SD = 27.4975$, $p < .001$); and the mean for positive change in Personality ($M = 51.76$ $SD = 29.079$) was also significantly higher than for negative change (46.30 $SD = 31.058$, $p = .001$) (See Table 9). This means that for the categories of Morality, Preferences and Personality there is a perception that a hypothetical

pill would be more effective at making positive changes than at making negative changes; there is no expected difference in type of change for Memory.

When the change was positive, predictions were as follows:

A pill to positively change Preferences (M 43.44 SD 29.334) would be less effective than one to change Memory (M 50.92 SD 28.766, $p < .001$) or Personality (M 51.76 SD 29.079, $p < .001$). The pill would also be less effective at changing Morality (M 41.40 SD 29.175) than it would be for Memory ($p < .001$) or Personality ($p < .001$). Expected effectiveness of Preferences and Morality was not significantly different ($p = 1.000$), nor was the expected effectiveness of Memory significantly different from Personality ($p = 1.000$) (See Tables 9 and 10). To put it more simply: the pill would be less effective at positively changing Preferences and Morality than at changing Memory and Personality.

When the change was negative, the predictions were as follows:

There was no significant difference in expected efficacy for traits associated with Preference (M = 33.822, SD = 27.4975) and traits associated with Morality (M = 27.18 SD = 30.139, $p = 1.000$). The predicted efficacy of negative changes to Preference was significantly lower than Memory (49.45 SD = 31.542, $p < .001$) and Personality (M = 46.30 SD = 31.058, $p < .001$). A pill to change Morality was seen as less effective than one to change Memory ($p < .001$) or Personality ($p < .001$). There was no significant difference between predicted effectiveness at changing Memory traits and Personality traits ($p = .273$). This shows that people predict a pill would be less effective at negatively changing Preferences and Morality and more effective at negatively changing Memory and Personality (See Tables 9 and 10).

Brief Discussion

The logic behind including a question of efficacy was that if a trait or category is seen as particularly difficult to change, then a pill endeavoring to do so would be less effective. The pill is believed to be less effective at making negative changes, indicating that such changes may be seen as harder to make; this would support Hypothesis 3 that positive changes are seen as easier to make. The pill is predicted to be less effective at changing morality, which supports Hypothesis 2 that morality would be seen as harder to change, and the more general Hypothesis 1 that traits attributed to the true self are seen as harder to change. Predicted efficacy of other traits does not necessarily support Hypothesis 1; despite preferences being least attributed with the self, changes to preferences are predicted to be less effective than changes to personality than personality and memory. Possible reasons for this include a context-dependent understanding of preferences, to be discussed later.

"Dosage"

For the "Dosage" question, participants were asked: "How strong (how high of a dosage) do you think a drug would have to be in order to alter each of these traits?"

A higher score therefore indicates that the trait would be more difficult to change, requiring a higher dose of the drug. An omnibus repeated measures ANOVA was run to test for the effects of valence and trait category. Mauchly's Test of sphericity indicated that the assumption of sphericity had been met. The effect of trait category was significant $F(3, 1197) = 12.639$ $p < .001$, $\eta_p^2 = .031$ as was the effect of valence $F(1, 399) = 61.321$ $p < .001$, $\eta_p^2 = .133$. This means that some trait categories were significantly different from each other, and that within traits valence had an effect on participants' responses. The interaction between valence and trait category, was also significant $F(3, 1197) = 1.926$ $p < .001$, $\eta_p^2 = .029$. This indicates that valence affected interactions between trait categories. Overall results are shown in Figure 4. Next

simple effects tests were run to look at the effects of both trait category and valence. All tests were adjusted for multiple comparisons using Bonferroni.

Valence was significant for Morality ($p < .001$), Memory ($p < .001$) and Personality ($p < .001$). The means for each of these three categories were significantly higher for positive changes than for negative ones, indicating a belief that positive changes would require a higher dose of drug than negative changes. No effect of valence was found for Preferences ($p = .780$); this is unsurprising, as what constitutes a positive or negative change in regards to one's preferences is less clear and objective than for a category such as morality. As such, what type of Preference change individuals see seems to be irrelevant to perceptions on required dosage (See Table 12). When the change was positive, predictions were as follows:

Morality ($M = 63.79$ $SD = 27.487$) would need a significantly higher dose than Preferences ($M= 53.99$ $SD = 27.627$, $p < .001$) or Personality ($M = 56.54$ $SD = 26.150$, $p < .001$), and Memory ($M = 63.62$ $SD = 26.582$) would also need a significantly higher dose than Preferences ($M= 53.99$ $SD = 27.627$, $p < .001$) and Personality ($M = 56.54$ $SD = 26.150$, $p < .001$). Memory and Morality were not significantly different ($p = 1.000$), and Preferences and Personality were not significantly different ($p = .565$). This means that, in addition to the results above indicating a higher average dosage for positive changes than negative changes, positive changes of Morality and Memory are believed to require a higher dosage than positive changes of Preferences and Personality (See Table 13).

When the change was negative predictions were as follows:

Personality ($M = 49.79$ SD 26.036) was predicted to require a smaller dose than Morality ($M = 63.62$ $SD = 28.941$, $p = .034$) and a marginally smaller dose than Preferences ($M = 53.57$ $SD = 28.702$, $p = .077$). Personality was not significantly different from Memory ($M = 51.72$ SD

= 28.941, p = 1.000), Memory was not significantly different from Morality (p = .768) or Preferences (p = 1.000), and the average for Preferences was not significantly different from Morality (p = 1.000) (see Table 13). We see that negative changes to Morality are expected to require a higher dose than negative changes to Personality, but otherwise dosage for negative change varies very little based on trait category.

Brief Discussion

Dosage, similar to Efficacy and Time, was intended to explore how easy people perceive it to be to change certain traits. Considering the idea of the true self being "deep down", "hidden" or "inner," the reasoning behind this question was that something "deep down" would require a stronger dose of a drug in order to be effective. The evidence that changes to Morality are seen as the least effective and requiring the highest dosage seems to indicate that it is the hardest type of trait to change. As morality was also believed to cause the greatest change to the true self, the result of this group of tests supports the hypothesis that morality is seen as more attributed to the true self and hardest to change. The effect of valence, however, is counter to predictions; a higher dose is believed necessary to make a positive change. It is possible that dosage and efficacy do not align as we expected regarding ease of trait change. It is also possible that there is a difference regarding improvement from a point of deficiency vs improvement from a neutral baseline. All questions in this survey ask about a person without a specified deficiency in any areas. It is common to consider drugs as a fix to a problem, but the use of drugs as cognitive enhancers for healthy individuals is a more recent phenomenon (Schwarz, 2012). Therefore while the instance of improving cognition via psycho-pharmaceuticals is not foreign, to do so from a place of current equilibrium may be expected to require a stronger drug or higher dose than to fix a problem.

"Time"

For this question participants were asked, "Imagine that scientists discovered that each these new drugs successfully works on patients for one day, but they have not tested longer intervals. Given this, how long would you predict the drug to last?"

A higher score for this question indicates that the change enacted by a hypothetical drug would last longer (or that it would not ware off as quickly). An omnibus repeated measures ANOVA was run to test for effects of trait category and valence. A Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated in calculation of trait category, $\varepsilon = .946$, $p < .001$. Therefore, a Huynh-Feldt correction was used. The effect of trait category was significant $F(2.860, 1141.087) = 8.606$ $p < .001$, $\eta_p^2 = .021$. This indicates that responses to this question varied based on the category of the trait. The effect of valence was insignificant $F(1,399) = 1.098$, $p = .295$, $\eta_p^2 = .003$, and the interaction of valence and trait category was insignificant, $F(3,1197) = 1.183$, $p = .315$, $\eta_p^2 = .003$. These two results indicate that, overall, there was no difference in positive and negative changes within trait categories and that the interactions between trait categories were not affected by valence. Overall results are displayed in Figure 6. Simple effect test were run regarding trait category to look at individual effects. All tests were adjusted for multiple comparisons using Bonferroni.

While generally valence was not significant, for one category, Preferences, positive traits ($M = 31.12$, $SD = 24.507$) were predicted to last significantly longer than negative changes ($M = 29.36$, $SD = 23.947$, $p = .021$). In regards to trait categories, Preferences ($M = 30.74$, $SD = 24.253$) were predicted to last for a significantly shorter period of time than Memory ($M = 34.95$, $SD = 25.801$, $p < .001$) or Personality ($M = 33.32$, $SD = 25.176$, $p = .022$). There was no significant difference between Preferences and Morality ($M = 31.38$, $SD = 25.736$ $p = 1.000$),

nor was there a difference between Morality and Memory (p = 1.000), Morality and Personality (p = .166) or Memory and Personality (p = .583) (See Tables 15 and 16). This means that changes to Memory and Personality are predicted to last longer than changes to Morality and Preferences. As the original intent of this question was to add another measure of difficulty of change, it would seem here that Memory and Personality are more easily changed with a pill than Morality and Preferences.

Brief Discussion

The question of "Time" (how long the effects of a pill would last) was created to explore the perceived permanence of the effect. The logic behind the question was that the more easily altered a trait is, likely the longer the effects would last. Time had similar results as dosage, with Morality and Preferences seemingly being harder to change by having effects last for a shorter period of time.

"Brain Chemistry"

For this question, participants were asked, "Please indicate how much you agree that each of these changes could occur as a result of altering brain chemistry."

A higher score meant that participants agreed more with the above statement, indicating a belief that the given traits were more closely related to brain chemistry. An omnibus repeated measures ANOVA was run to determine the effects of valence and trait category, and a Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated in calculation of trait category, $\varepsilon = .942$, $p < .001$. Therefore, a Huynh-Feldt correction was used. The effect of trait category was significant $F(2.847, 1136.037) = 75.293$ $p < .001$, $\eta_p^2 = .159$., while the effect of valence was not significant $F(1, 399) = .203$ $p < .653$, $\eta_p^2 = .001$. This means that some trait categories were significantly different from each other, but that overall there was

not a notable difference of valence within each trait category. The Mauchly's Test of Sphericity also indicated that the assumption of sphericity had been violated for the test of valence and trait category interaction, ε= .896, p < .001. Therefore, a Huynh-Feldt correction was used. The interaction between valence and trait category was significant F(2.708, 1080.428) = 5.080 p = .002 η_p^2 = .013. This means that valence affected comparisons between trait categories, but the effect was small. Simple effect tests were run regarding trait category to look at individual effects. All tests were adjusted for multiple comparisons using Bonferroni. Overall results are displayed in Figure 7. Despite no general effect of Valence on responses, negative changes to Memory (M = 63.53, SD = 29.1741) were believed to be significantly more associated with Brain Chemistry than positive changes (M = 59.310, SD = 30.3882, p = .006).

When the change was positive results were as follows:

The average mean for Preference traits (M = 46.160, SD = 31.0256, p <.001) was significantly lower than for Memory traits (M = 59.310, SD = 30.3882, p <.001), Personality traits (M = 60.83, SD = 29.871, p <.001), and Morality traits (M = 54.992, SD = 32.6030, p < .001). Morality traits (M = 54.992, SD = 32.6030) were marginally lower than the average for Memory traits (p= .052) and significantly lower than Personality traits (p < .001). Memory and Personality traits were not significantly different (p = 1.000). This indicates that positive changes in Preference traits are understood as being least able to be altered by brain chemistry, followed by positive changes to Morality traits. Positive changes to Memory and Personality traits are most associated with brain chemistry (See Tables 18 and 19).

When the change was negative, the results were as follows:

All trait categories were significantly different. Memory (M = 63.530, SD = 29.1741) had significantly higher association with brain chemistry than Personality (M = 58.24, SD = 30.806,

p <.001), Morality (M = 54.005, SD = 32.6454, p < .001), or Preferences (M = 44.050, SD = 30.8107, p < .001). The average for Personality traits was significantly higher than for Morality (p = .005) and Preferences (p < .001), and Morality was significantly higher than Preferences (p <.001). That is to say, negative changes for Preferences are seen as the least affected by changes to brain chemistry, followed by Morality, then Personality and finally Memory (See Tables 18 and 19).

Brief Discussion

The question of association with brain chemistry was created to measure whether certain traits were seen as simply "too complicated" to be affected be a biological intervention such as a pill. The expectation was that alterability by brain chemistry relates to alterability by a pill. It is expected that efficacy would be tied to brain chemistry as well. These results show that for both positive and negative changes, perceived association with brain chemistry varies by type of trait. We see that Morality and Preferences are understood to be the least able to be altered via brain chemistry, consistent with the Efficacy question. It would seem that Preferences and Morality are seen as concepts too complicated to only be effects of brain chemistry, or arise from somewhere other than the brain. We expected this type of effect for morality, consistently seen as most closely associated with the true self, but not preferences. It is possible participants thought preferences too complicated a process or, perhaps too context dependent to be changed merely by brain chemistry. While this question was intended to inquire about general individual preferences, such as generally liking rap music or disliking reading, it is possible individuals interpreted a more context dependent approach, and therefore discounted the involvement of cognitive processes. Neither Morality nor Preferences averaged a score at or near zero, so both are believed to be related to brain chemistry to some degree, even if less so than other categories.

Discussion and Future Directions

Direction of Change

We see that for the question of Efficacy pills for negative changes are believed to be less effective. On both the questions of Difference and Deep Down "True Self" change negative changes to one's morality are seen as making someone more different or fundamentally changing them more. Based on these results, in addition to the stronger association of Morality with true self than any other trait, we support Hypothesis 3 that positive changes are seen as "easier" to make and less identity altering. Such effects are in line with recent literature by Tobia (2015) suggesting that the direction of change is important in establishing change to the true self. Alternatively, higher dosages are believed necessary to enact a *positive* change. Possible reasons for this have been discussed, including the effect of improvement from a neutral state.

Morality

On average it was predicted that a pill to change morality would: 1) be less effective than one changing memories or personality traits, 2) result in someone being "more different" than if any other kind of trait were changed, 3) require a higher dosage of a pill than necessary to change Personality traits and Preferences, and 4) if changed, result in someone's true "deep down" self being the most different. Based on these outcomes, traits pertaining to one's Morality seem to be the most attributable to the true self and the hardest to change, supporting Hypothesis 2.

Preferences

A perhaps surprising result is the apparent similarity between Preferences and Morality. Morality is believe to be the most attributed to the true self and to cause the greatest identity change, while preferences are seen as being the least associated with the true self and least likely

to cause identity change. Yet, Morality and Preferences are not significantly different in predicated efficacy, required dosage, or expected duration of effects. Preferences are also seen as the least affected by brain chemistry. It is possible participants believe preferences are too context dependent too be affected by a pill, that how much they enjoy movies or music or reading depends on the specific stimulus and not on their mind. The traits in question included enjoyment of sports, movies, reading and music; of course many factors affect enjoyment of these things, including company, mood, and environment. This question was intended to get at the way general preferences would change, but participants may have thought on the micro terms of which movie, book etc. was involved. It is also possible participants believe preferences to be something almost entirely related to their own free will and choices (mistakenly, as seen in work by Bargh and Ferguson, 2000), rather than as overall predispositions. In this case, a pill is seen as less effective not due to identity-attribution, but a different understanding of the brain process preferences involve.

Personality & Memory

Personality was believed to be the most attributable to the self following Morality traits, having the second highest mean for "how different a person would be" and "if, deep down, the true self had changed" and changes to Memory were predicted to require the highest dose. Yet a pill to change both Personality and Memory was seen as being more effective, with Personality requiring lower dosages, and Memory lasting longer than Preferences and Morality. That is to say, not one category of traits seems to be both hardest to change and most attributed to the self in the same way as morality. We therefore have some support for Hypothesis 2, but weaker support for Hypothesis 1. Consistent with prior research, we have evidence that individuals associate morality more than other attributes to the true self, and also that morality seems to be

considered the most difficult to change. Overarching claims about the true self and changeability are difficult to make, however, due to the varied outcomes of other trait categories. Perhaps morality is the only type of trait associated with the self strongly enough to be seen as more difficult to change as a result of its true self attribution. These mixed results may also be in part due to the limited number of traits used for each category; Strohminger and Nichols' (2014) study, on which the traits were based, found more consistent results of categories with identity attribution, but used a much larger sample of traits and blind coded for each category. This study was limited to four traits per category due to length concerns (the average time to complete this study was 7 minutes 36 seconds, but some individuals did take up to 17 minutes) and so could have benefited from additional trials or studies.

Overall, individual traits were not consistently higher or lower across categories. The only individual trait that potentially stands out from others is "racism;" a pill is expected to be least effective on racism, require the highest dose, and it is less associated with Brain Chemistry than other moral traits. Further analysis must be done to determine if these differences are statistically significant; if so, racism's uniqueness may be due to its forefront in recent media and the widely accepted concept that it is a learned prejudice (Wright, 2012), which likely strongly suggests to participants that it should not be attributed to the brain. We did not see any categories or questions resulting in average answers close to "0" or 100," indicating that none of the proposed changes are seen as impossible, nor are they seen as expressly easy/obvious either. As such, a claim can be made that no part of one's self, among those sampled here, is seen as impossible to change. However, certain changes are indeed believed to be *harder* to make than others.

Implications

While the goal of this study was to measure perceptions of identity, it inherently also measures intuitions about drugs and medication. Drugs do exist which alter many of the traits listed here: in non-clinical populations, Ritalin has been shown to improve problem solving skills and attention (Gazzaniga 2005), the drug donepezil has been approved by the FDA to treat memory loss, antidepressants such as selective serotonin reuptake inhibitors have been shown to decrease negative affect (Knutson et al 1998), and it is commonly known that alcohol use decreases inhibitions. Therefore, intuitions about hypothetical drugs used to treat traits such as adventurousness, memory recall, or enjoyment of activities are perceptions about drugs that exist. Knowing how effective people perceive such drugs to be likely impacts reactions of patients receiving such medication, their intent to seek treatment in the first place, and perception of others taking it. Considering the potential value of the placebo effect (Brown, 1998), patient belief in efficacy could prove very important for effective interventions.

The belief in drug efficacy could have contrasting effects, however, on intent to seek treatment: if patients do not believe a pill is effective, they may consider it a waste of time and therefore not take it. Alternatively, it has been shown that people are reluctant to take drugs seen as altering one's identity (Riis et al, 2008), so a drug that effectively alters what people consider core to their identity, might also decrease treatment seeking for fear that it *will* work. While both may cause barriers for different reasons, knowing the cause can help health workers to address the potential issues and perhaps change patients' minds. It is somewhat surprising that people predict drugs altering the most fundamental aspects of the self (eg. morality) to also be the least effective. This could be merely a desire, a sentiment of, "I don't want this to work" and so they claim it will not work, or experience since there is no real "morality pill" on the market participants can draw from as an example (though there have been arguments for and against

oxytocin and serotonin as such, Crocket, 2014). Either way, the sentiment seems to be that one *could* alter core aspects of one's identity, but it would take quite a bit of drugs, depending on the trait in question.

Considering the potential of changing morals in relation to identity, harmful behavior or morals could have implications legally and philosophically; if a person is found guilty of a crime which, previously, those close to him did not think him capable, is redemption possible if he is now a different person? What does that say about his ability to be redeemed? On the other hand, friends and juries or judges could conclude – especially considering the fundamentally "good" view of the true self – that the propensity to commit crime was not who he "truly" was, that it is unlikely he is capable of truly losing his fundamentally "good" self, and so just needs to return to his "good" state. As positive moral changes are shown here to be believed as easier and more in line with the self, one would expect the general sentiment towards a criminal to be optimistic hope for improvement. If so, such sentiments would be important to the debate over whether correctional facilities should be used as mere punishments or primarily as rehabilitation centers.

Future Directions

Future work could consider how these beliefs about changes to the self might differ based on the subject, such as in-group/out-group effects, children vs. adults or how people view celebrities vs. "normal" people when certain aspects of their selves change. Considering the bias people have of their own memory stability over time (Kornell, 2012), it is likely predictions about changeability of others' memory and traits are different from predictions about one's own memory and traits. Learning about in-group/out-group and self/other effects could help inform predictions of how judgment is passed on others. Whether or not someone can really change, whether in the context of a personal relationship or a stranger we see on TV, is something we

make judgments about every day. Should we punish others, should we trust them? Is whether we do based on perceived similarity to our own true selves? We may find a source of unconscious bias if there are patterns of belief about ability to change that are different for self, in-group, celebrities, and others. Such a bias would be fairly harmless in the context of making judgments about reality TV stars, but could have dramatic consequences for other relationships. Age could also be worth exploring. If people were asked about the identity of children changing in these ways would their answers remain the same? Considering we know morals change at least somewhat over one's lifetime (Armon and Dawson, 1997), we certainly gain new memories as we age, and preferences change as well (most people like different things when they are 8 years old than when they are 30 years old), would change to such traits be perceived as any easier to make, any more in line with the true self when done on children? Investigating such questions could reveal intuitions about perceived identity formation and its flexibility across the life span, and influence the way we deal with strong childhood expressions of identity, such as when a child expresses their experience of being transgender or wishes to be called by a different name.

If memory and personality are believed to be more easily changed than other traits (as with the Efficacy question), then expectations regarding school performance base upon one's memory or personality – such as ability to remember lessons, or extraverted social behavior – are optimistic. The fact that these traits are seen as alterable is good news for children who start out struggling in school. As Carol Dweck (2006) discusses in her book *Mindset*, having a growth mindset (that perception that certain traits can change/improve) is important to all kinds of success. This study, however, also only tests intuitions regarding medication. It does not inquire about the perceived efficacy of other methods of improvement. Considering the rapid increase of psychiatric medication, and perhaps overmedication, of school children for conditions such as

ADHD (LeFever, Dawson, and Morrow, 1999), one would hope that medication is not perceived as the only effective way to change these traits.

Limitations

Limitations of this study include the lack of a survey of participants' background regarding drugs that may alter brain chemistry, which could affect their responses based on experience. It is likely individuals who have taken psychiatric drugs would respond based on personal experience of whether they felt they had changed, rather than with general views of identity and others. This could be a particularly salient example of the difference between the beliefs about the self vs. the other. Traits chosen were also but a sample of those that could be included in the specified categories, and were perhaps not perfectly representative. The study could also have benefited from directly asking the question we were investigating: Do you believe it is possible to change one's identity, who one truly is deep down? Do you believe this is possible using certain kinds of drugs? It would help us evaluate if our questions were getting at the questions we truly hoped to ask and see if participants were consistent in their responses. Additionally, there were further sample questions we wanted to include but excluded for brevity sake. As such, further investigations could include a question on potential side-effects of a drug that would cause the changes listed: what happens to the self after the changes listed? If being in touch with the self has beneficial side effects (on happiness and meaning in life), would altering the self have negative side effects? Such questions could give insight into the types of fears associated with changing one's identity and why people believe it is difficult to do so. Future work could also include questions about whether such a drug would be masking or revealing parts of the true self in attempts to alter it. Responses could confirm reasoning behind the valence effect and perhaps explain the unexpected results of "Dosage."

Appendix

Survey Questions

In this study, we will be asking you a series of questions about hypothetical drugs designed to alter different aspects of a person's mental functioning. While drugs of this nature do not necessarily exist, it is interesting to imagine how they would work, and what effect they would have on someone who took them.

Imagine that scientists developed drugs that would have one of the following effects. How effective would you expect each of the following drugs to be? (That is, that the drug would do exactly what it claimed?)

Give your response to each item by clicking and dragging the bar to the location of your choice.

The drug...

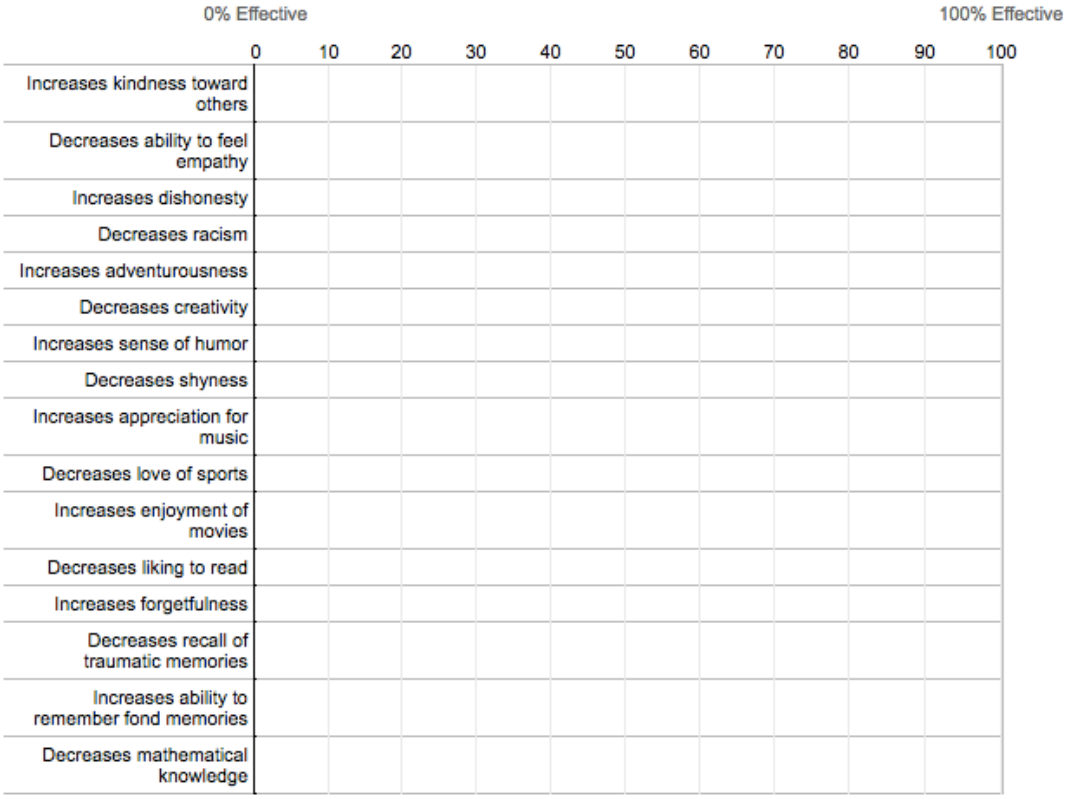

Figure 1. Sample of sliding scales given for each of 16 traits changes, in each overall question. Example is first question given on the survey. Order of all traits and direction of change were balanced within participants.

Deep Down

Category	Trait	Mean	SD
Morality	Empathy	63.55	28.824
	Racism	62.81	31.674
	Kindness	62.04	29.776
	Dishonesty	59.48	29.643
Personality	Shyness	54.53	30.665
	Creativity	53.91	28.364
	Humor	51.54	29.239
	Adventurousness	49.79	27.642
Memory	Traumatic Memory Recall	44.23	30.663
	Fond Memory Recall	43	29.259
	Forgetfulness	40.69	30.175
	Knowledge of Mathematics	34.34	28.179
Preferences	Appreciation for Music	39.09	27.977
	Liking to Read	36.1	27.159
	Love of Sports	34.07	27.232
	Enjoyment of Movies	30.94	26.549

Table 2. Average "Deep Down" responses broken down by trait. Changes to Morality were seen to cause the greatest change to the true self, while Preferences would have the smallest effect on the true self.

Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	59.928	29.5969
Negative		64.007	30.2586
Overall		61.97	29.980
Positive	Memory	39.045	29.6463
Negative		42.088	29.8607
Overall		40.57	29.774
Positive	Personality	52.57	28.820
Negative		52.32	29.229
Overall		52.44	29.007
Positive	Preferences	33.970	27.5780
Negative		36.127	27.1012
Overall		35.05	27.345

Table 3. Average "Deep Down" responses per category broken down by valence. Negative moral changes were seen to more fundamentally change the true self than positive changes. Overall Morality had the greatest effect on true self, while preferences had the smallest effect.

Trait Category	Trait Category	p-value
Morality	Memory	.000
	Preferences	.000
	Personality	.000
Memory	Morality	.000
	Preferences	.000
	Personality	.000
Preferences	Morality	.000
	Memory	.000
	Personality	.000
Personality	Morality	.000
	Memory	.000
	Preferences	.000

Table 4. Interactions between trait categories in regards to effect on fundamental, true self. All categories were significantly different.

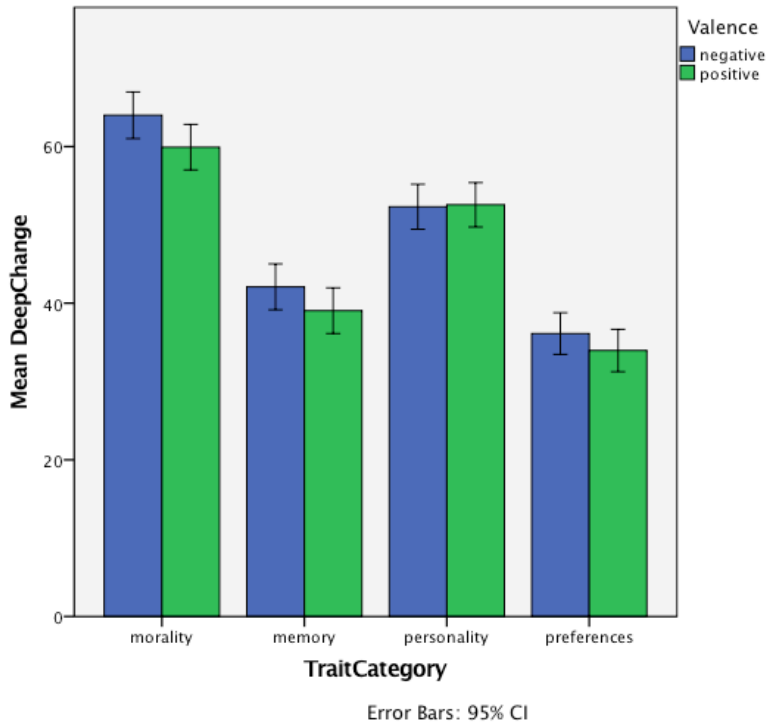

Figure 2. Graphical representation of average "Deep Down" responses, broken down by category and type of change. Morality has the largest effect, and Preferences has the smallest effect.

Difference

Category	Trait	Mean	SD
Morality	Kindness	72.68	26.137
	Racism	71.22	28.501
	Empathy	70.3	27.92
	Dishonesty	68.89	27.944
Personality	Shyness	67.96	28.337
	Humor	65.6	27.138
	Creativity	63.81	27.173
	Adventurousness	62.35	26.12
Memory	Traumatic Memory Recall	60.16	28.122
	Forgetfulness	58.78	27.618
	Fond Memory Recall	58.67	27.289
	Knowledge of Mathematics	49.66	28.798
Preferences	Appreciation for Music	48.32	28.11
	Love of Sports	44.1	26.889
	Liking to Read	43.95	26.752
	Enjoyment of Movies	39.91	27.65

Table 5. Average "Difference" responses broken down by trait. Changes to Morality were seen to cause the greatest difference in identity, while Preferences would have the smallest effect.

Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	69.440	27.3328
Negative		72.108	27.8790
Overall		70.77	27.622
Positive	Memory	55.475	27.5335
Negative		58.165	28.8629
Overall		56.82	28.220
Positive	Preferences	43.055	27.4700
Negative		45.080	27.4603
Overall		44.07	27.467
Positive	Personality	64.25	26.459
Negative		65.60	28.003
Overall		64.93	27.233

Table 6. Average "Difference" responses per category broken down by valence. Negative moral changes were seen to cause the greatest difference. Overall Morality had the greatest effect on true self, while preferences had the least.

Trait Category	Trait Category	p-value
Morality	Memory	.000
	Preferences	.000
	Personality	.000
Memory	Morality	.000
	Preferences	.000
	Personality	.000
Preferences	Morality	.000
	Memory	.000
	Personality	.000
Personality	Morality	.000
	Memory	.000
	Preferences	.000
Morality	Memory	.000
	Preferences	.000
	Personality	.000

Table 7. Interactions between trait categories in regards how Different a person would be. All categories were significantly different.

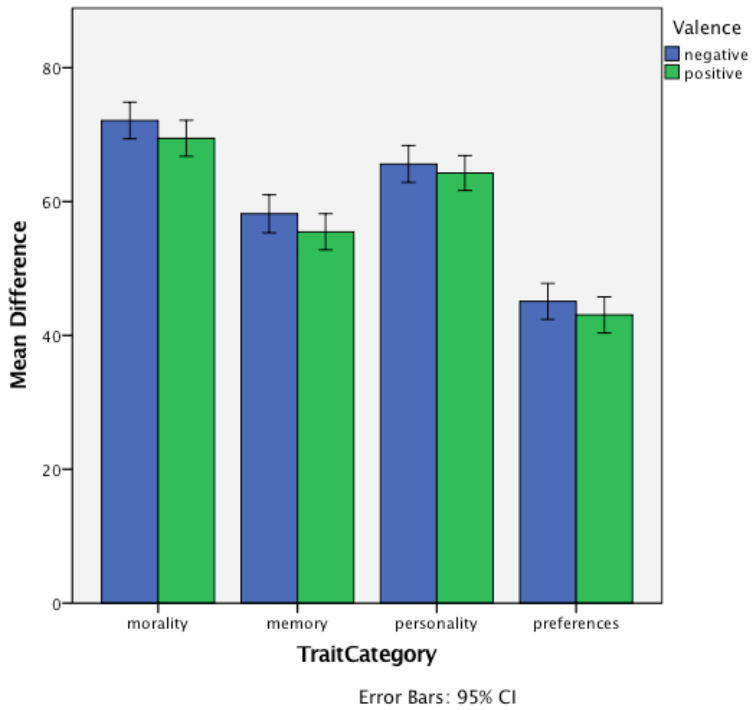

Figure 3. Graphical representation of average "Difference" responses, broken down by category and type of change. Morality has the largest effect, and Preferences the smallest effect.

Efficacy

Category	Trait	Mean	SD
Memory	Forgetfulness	60.16	29.407
	Traumatic Memory Recall	51.81	28.463
	Fond Memory Recall	47.02	28.367
	Knowledge of Mathematics	41.73	31.495
Personality	Shyness	51.43	30.258
	Adventurousness	51.18	28.482
	Creativity	50.89	30.797
	Humor	42.61	30.476
Morality	Empathy	48.81	28.711
	Kindness	44.79	29.112
	Dishonesty	39.55	29.719
	Racism	24.01	25.186
Preferences	Appreciation for Music	41.91	29.767
	Enjoyment of Movies	41.74	29.345
	Liking to Read	38.69	28.429
	Love of Sports	32.18	26.767

Table 8. Average "Efficacy" responses broken down by trait. A pill to change Memory was expected to be the most effective while one to change Preferences and Morality would be the least effective. A pill to change "Racism" is predicted to be the least effective of the moral changes.

Efficacy			
Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	41.40	29.175
Negative		37.18	30.139
Overall		39.29	29.717
Positive	Memory	50.92	28.766
Negative		49.45	31.542
Overall		50.18	30.176
Positive	Preferences	43.44	29.334
Negative		33.822	27.4975
Overall		38.63	28.817
Positive	Personality	51.76	29.079
Negative		46.30	31.058
Overall		49.03	30.190

Table 9. Average "Efficacy" responses per category broken down by valence. Positive changes were predicted to be more effective than negative changes for Morality, Preferences, and Personality.

Valence	Trait Category	Trait Category	p-value
Positive	Morality	Memory	.000
		Preferences	1.000
		Personality	.000
	Memory	Morality	.000
		Preferences	.000
		Personality	1.000
	Preferences	Morality	1.000
		Memory	.000
		Personality	.000
	Personality	Morality	.000
		Memory	1.000
		Preferences	.000
Negative	Morality	Memory	.000
		Preferences	.193
		Personality	.000
	Memory	Morality	.000
		Preferences	.000
		Personality	.273
	Preferences	Morality	.193
		Memory	.000
		Personality	.000
	Personality	Morality	.000
		Memory	.273
		Preferences	.000

Table 10. Interactions between trait categories in regards how effective the pill would be. Changes to Personality and Memory were predicted to be significantly more effective than changes to Morality or Preferences. No significant difference was found between Memory and Personality or between Morality and Preferences.

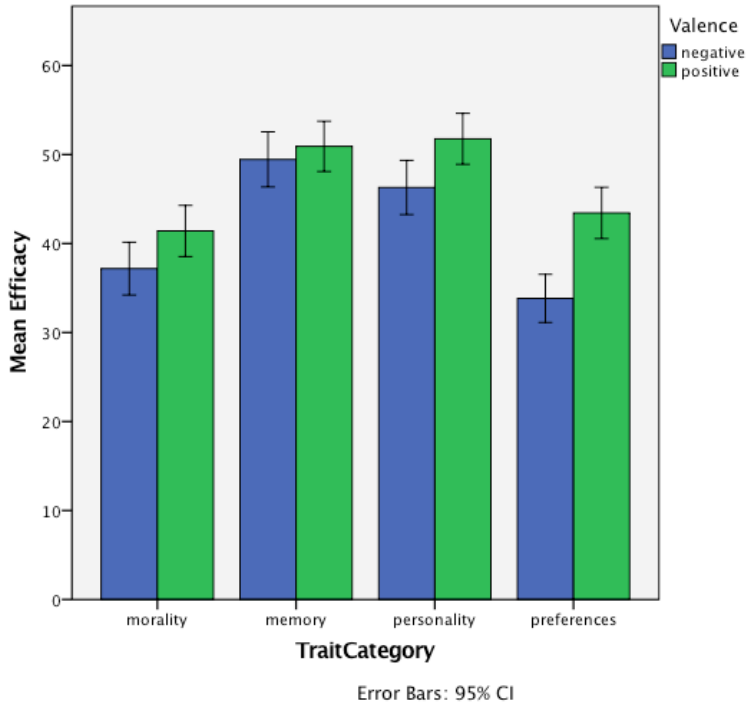

Figure 4. Graphical representation of average "Efficacy" responses, broken down by category and type of change. Changes to Personality and Memory were predicted to be significantly more effective than changes to Morality or Preferences. Positive changes were predicted to be more effective for Preferences, Personality, and Morality.

Dosage

Category	Trait	Mean	SD
Morality	Racism	67.65	31.418
	Empathy	57.03	25.153
	Dishonesty	55.78	28.821
	Kindness	55.32	26.905
Memory	Knowledge of Mathematics	61.8	29.566
	Fond Memory Recall	59.7	27.856
	Traumatic Memory Recall	57.69	27.865
	Forgetfulness	51.49	27.431
Preferences	Love of Sports	55.78	28.335
	Appreciation for Music	53.99	28.805
	Liking to Read	53.73	27.637
	Enjoyment of Movies	51.63	27.879
Personality	Creativity	54.25	26.084
	Humor	53.43	26.766
	Shyness	53.24	26.898
	Adventurousness	51.73	25.542

Table 11. Average "Dosage" responses broken down by trait. Morality and Memory were predicted to require a higher dose than Personality and Preferences. Racism is expected to require the highest dose of all traits.

Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	63.79	27.487
Negative		54.1	28.845
Overall		58.94	28.571
Positive	Memory	63.62	26.582
Negative		51.72	28.941
Overall		57.67	28.401
Positive	Preferences	53.99	27.627
Negative		53.57	28.702
Overall		53.78	28.153
Positive	Personality	56.54	26.15
Negative		49.79	26.036
Overall		53.16	26.294

Table 12. Average "Dosage" response per category broken down by valence. Positive changes were predicted to require a stronger dosage than negative changes for Morality, Memory, and Personality.

Valence	Trait Category	Trait Category	p-value
Positive	Morality	Memory	1.000
		Preferences	.000
		Personality	.000
	Memory	Morality	1.000
		Preferences	.000
		Personality	.000
	Preferences	Morality	.000
		Memory	.000
		Personality	.565
	Personality	Morality	.000
		Memory	.000
		Preferences	.565
Negative	Morality	Memory	.768
		Preferences	1.000
		Personality	.034
	Memory	Morality	.768
		Preferences	1.000
		Personality	1.000
	Preferences	Morality	1.000
		Memory	1.000
		Personality	.077
	Personality	Morality	.034
		Memory	1.000
		Preferences	.077

Table 13. Interactions between trait categories in regards how high of a dose each change would need. Memory and Morality were predicted to need significantly higher doses than changes to Personality or Preferences for positive changes; only Morality and Personality were different for negative changes.

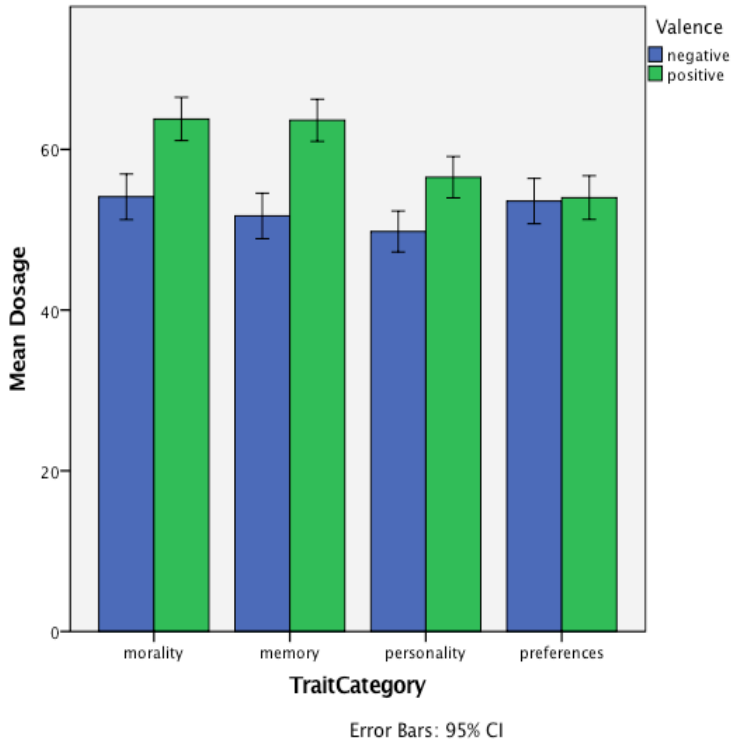

Figure 5. Graphical representation of average "Dosage" response, broken down by category and type of change. Memory and Morality were predicted to need significantly higher doses than changes to Personality or Preferences for positive changes; negative changes were similar across categories.

Time

Category	Trait	Mean	SD
Memory	Forgetfulness	36.19	25.276
	Traumatic Memory Recall	35.91	25.805
	Fond Memory Recall	35.89	26.51
	Knowledge of Mathematics	31.82	25.537
Personality	Adventurousness	34.88	24.753
	Shyness	33.34	25.13
	Creativity	32.5	24.849
	Humor	32.21	26.054
Morality	Empathy	33.9	24.35
	Kindness	31.93	26.08
	Racism	30.07	27.559
	Dishonesty	29.62	24.803
Preferences	Liking to Read	32.8	25.362
	Appreciation for Music	31.06	23.897
	Enjoyment of Movies	30.5	24.723
	Love of Sports	28.6	22.959

Table 14. Average "Time" responses broken down by trait. Expected duration of effects was similar across traits.

Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	31.67	26.318
Negative		31.09	25.169
Overall		31.38	25.736
Positive	Memory	35.11	26.752
Negative		34.80	24.847
Overall		34.95	25.801
Positive	Preferences	32.12	24.507
Negative		29.36	23.947
Overall		30.74	24.253
Positive	Personality	33.21	25.429
Negative		33.25	24.952
Overall		33.23	25.176

Table 15. Average "Time" response per category broken down by valence. Memory and Personality are predicted to have longer lasting effects than Morality and Preferences.

Trait Category	Trait Category	p-value
Morality	Memory	.001
	Preferences	1.000
	Personality	.166
Memory	Morality	.001
	Preferences	.000
	Personality	.583
Preferences	Morality	1.000
	Memory	.000
	Personality	.022
Personality	Morality	.166
	Memory	.583
	Preferences	.022

Table 16. Interactions between trait categories in how long effects would predictably last. Memory would last significantly longer than Morality or Preferences, and Personality would last significantly longer than preferences.

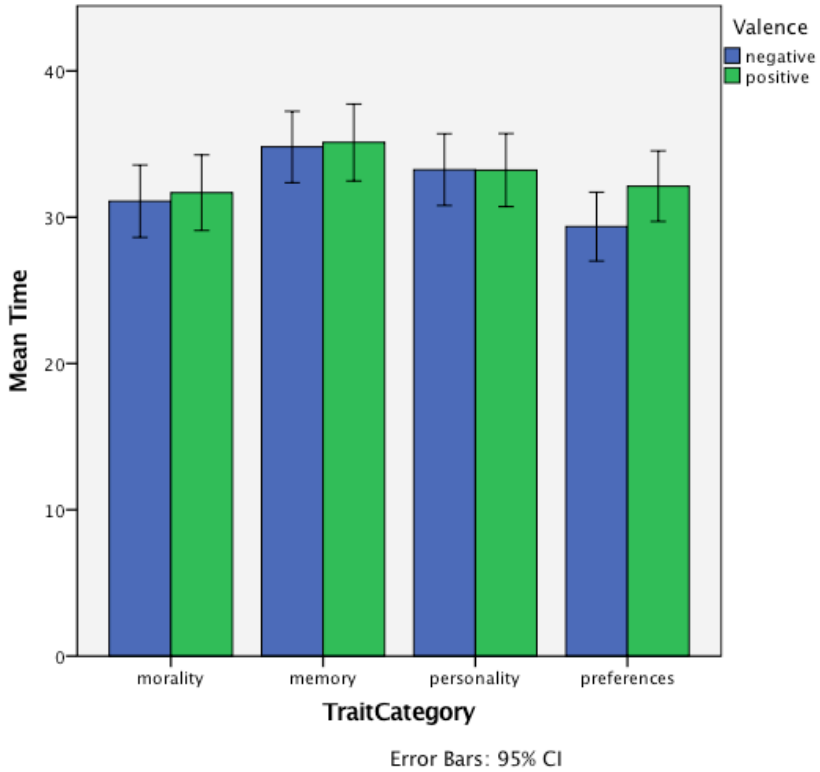

Figure 6. Graphical representation of average "Time" response, broken down by category and valence. Valence did not have a significant effect on responses other than for Preferences, nor did valence interact significantly with trait category. Memory would last significantly longer than Morality or Preferences, and Personality would last significantly longer than preferences.

Brain Chemistry

Category	Trait	Mean	SD
Memory	Forgetfulness	68.22	26.695
	Traumatic Memory Recall	66.48	27.063
	Fond Memory Recall	63.21	28.083
	Knowledge of Mathematics	47.78	32.859
Morality	Empathy	66.42	27.622
	Kindness	57.14	31.694
	Dishonesty	55.15	31.473
	Racism	39.29	33.589
Personality	Shyness	63.07	29.625
	Creativity	62.99	29.723
	Adventurousness	59.34	29.919
	Humor	52.73	31.163
Preferences	Appreciation for Music	47.68	31.231
	Enjoyment of Movies	46.79	30.847
	Liking to Read	44.77	30.489
	Love of Sports	41.18	30.924

Table 17. Average "Brain Chemistry" responses broken down by trait. Preferences are least associated with Brain Chemistry. Within trait categories, Knowledge-memory appears to be less associated with Brain Chemistry than other types of memory, and Racism appears to be less associated with Brain Chemistry than other moral traits.

Valence	Trait Category	Mean	Std. Deviation
Positive	Morality	54.992	32.603
Negative		54.005	32.6454
Overall		54.5	32.608
Positive	Memory	59.31	30.3882
Negative		63.53	29.1741
Overall		61.42	29.843
Positive	Preferences	46.16	31.0256
Negative		44.05	30.8107
Overall		45.11	30.917
Positive	Personality	60.83	29.871
Negative		58.24	30.806
Overall		59.53	30.35

Table 18. Average "Brain Chemistry" responses per category broken down by valence. Preferences were predicted to be least alterable by altering brain chemistry. Valence of was only significant for Memory traits, with negative changes seen as being more easily altered by brain chemistry.

Valence	Trait Category	Trait Category	p-value
Positive	Morality	Memory	.052
		Preferences	.000
		Personality	.002
	Memory	Morality	.052
		Preferences	.000
		Personality	1.000
	Preferences	Morality	.000
		Memory	.000
		Personality	.000
	Personality	Morality	.002
		Memory	1.000
		Preferences	.000
Negative	Morality	Memory	.000
		Preferences	.000
		Personality	.032
	Memory	Morality	.000
		Preferences	.000
		Personality	.003
	Preferences	Morality	.000
		Memory	.000
		Personality	.000
	Personality	Morality	.032
		Memory	.003
		Preferences	.000

Table 19. Interactions between trait categories in regards to how changeable each would be by altering brain chemistry. All categories are significantly different for negative changes; Memory and Personality are predicted to be the most alterable by brain chemistry for positive changes.

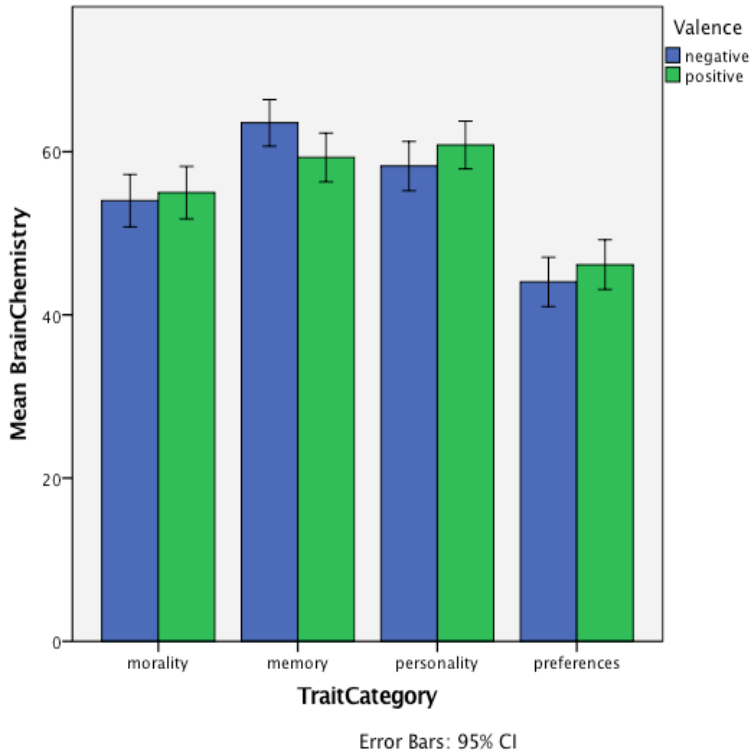

Figure 7. Graphical representation of average "Brain Chemistry" responses, broken down by category and type of change. Memory and Personality are predicted to be the most alterable by brain chemistry for positive changes. Memory is predicted to e the most alterable for negative changes.

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