

# The Ethics of “Smart Drugs”: Moral Judgments About Healthy People’s Use of Cognitive-Enhancing Drugs

Christel Scheske and Simone Schnall  
*University of Cambridge*

What moral concerns are relevant when judging the use of cognitive-enhancing (CE) drugs by healthy people? University students evaluated competitive fairness, distributive fairness, peer pressure, naturalness, and dosage form. Participants condemned CE drug use when there were long-term negative effects on health and when CE drug use was seen to provide an unfair advantage in an exam situation to someone while others were not taking the drugs. Further, participants judged CE drug use more harshly if the drugs were artificial rather than natural and if they were in the form of an injection rather than a pill, suggesting that moral intuitions relating to purity also influence opinions on CE drugs.

Cognitive-enhancing (CE) drugs were originally developed to treat cognitive disabilities such as narcolepsy, Alzheimer’s disease, or attention deficit hyperactivity disorder (Husain & Mehta, 2011; Maher, 2008). Increasingly, however, healthy individuals use CE drugs such as modafinil (e.g., Provigil<sup>®</sup>) and methylphenidate (e.g., Ritalin<sup>®</sup>) to improve cognitive functions including attention and working memory (Husain & Mehta, 2011; Maher, 2008; Sahakian & Morein-Zamir, 2007). For example, in a study of 119 U.S. colleges, up to 25% of healthy students reported CE drug use (McCabe, Knight, Teter, & Wechsler, 2005). Survey results (Maher, 2008; Sahakian & Morein-Zamir, 2007), as well as debates in the relevant literature (e.g., Greely et al., 2008; Harris & Chatterjee, 2009; Mehlman, 2004), show that views on CE drugs<sup>1</sup> are highly polarized, with some noting the potential benefits of enhancing cognitive ability to both individuals and society, whereas others warning of the dangers. The present research aimed to explore the factors underlying judgments about healthy individuals’ use of CE drugs.

Discussions relating to neuroethics, and in parallel to doping in competitive sports, have identified several factors playing a role in people’s judgments about the

acceptability of chemically enhancing people’s natural abilities. A key consideration is *health*, because little is known about possible negative side effects of CE drugs, especially in the long term (Chatterjee, 2004, 2006; Harris & Chatterjee, 2009; Maher, 2008; Sahakian & Morein-Zamir, 2007). Second, *distributive fairness* describes the concern that people with resources have an unfair competitive advantage over those without (Cacic, 2009; Greely et al., 2008; Maher, 2008; Sahakian & Morein-Zamir, 2007). Third, *competitive fairness* relates to normative beliefs about the appropriateness of having to take the drugs in order to remain competitive (Greely et al., 2008; Maher, 2008; Petróczy & Aidman, 2008, 2009; Wiefferink, Detmar, Coumans, Vogels, & Paulussen, 2008). Fourth, discussions of biotechnological advances have questioned the *naturalness* of new technologies, namely, whether they are derived from artificial or “natural” sources (Kass, 2003; Sagoff, 2001; Watts, 2000). Fifth, related to naturalness is *dosage form* (Sahakian & Morein-Zamir, 2007), that is, the manner in which drugs are administered (e.g., pill or injection).

Although some of these concerns (e.g., health), are highly appropriate, other concerns (e.g., naturalness or dosage form) are more difficult to explain. Such seemingly “irrational” considerations, however, are in line with recent moral psychological theory. Moving away from rationalist approaches (Kohlberg, 1969; Turiel, 1983), moral psychologists have started to emphasize the contribution of emotions and other nonrational

<sup>1</sup>For the remainder of this article, “CE drugs” and “CE drug use” refer to CE drug use by healthy individuals.

Correspondence should be sent to Simone Schnall, Department of Psychology, University of Cambridge, Downing Street, Cambridge CB2 3EB, United Kingdom. E-mail: [ss877@cam.ac.uk](mailto:ss877@cam.ac.uk)

processes to moral judgment (Haidt, 2001). In his social intuitionist model, Haidt argues that people often make quick, automatic moral judgments, even if they cannot provide a valid reason for why something is wrong. Thus, such judgments are based primarily on moral intuitions and involve affective evaluations of situations and events (Haidt, 2001; Haidt & Björklund, 2008). Similarly, Maio and Olson (1998) suggested in their values-as-truisms hypothesis that people’s values often lack cognitive support and instead are primarily guided by emotion.

We believe that, on some level, people consider CE drugs a moral issue that elicits emotional responses. Thus, people might not only care about objectively problematic aspects of CE drugs but also consider issues that have no rational basis. In other words, some concerns related to CE drugs are justified, but others might follow intuitions, and in that sense be akin to “moral dumbfounding” effects (Haidt, 2001), for which people simply state that a behavior is wrong in the absence of any supporting evidence.

In particular, concerns about the naturalness of CE drugs may follow a moral intuition rather than defensible reasons. A widespread belief is that natural products are healthier than artificial ones (Britten, 1994; Britten, Ukoumunne, & Boulton, 2002; Giveon, 2004; Nuffield Council on Bioethics, 1999; Sagoff, 2001; Verhoog, Matze, van Bueren, & Baars, 2003). For example, Giveon (2004) found that more than half of respondents believed that “natural” drugs have no negative side-effects “because they are natural” (p. 10). The concern for naturalness may relate to people’s desire to keep the body pure and clean. Feelings of disgust serve an adaptive function in this context, because they protect the body from potential contamination, and people often report disgust at violations of the sanctity of the human body (Rozin, Haidt, & McCauley, 2008). Disgust, however, is not just a response to offensive objects but also to offensive behaviors, namely, moral transgressions (Rozin et al., 1999, 2008), and physical and moral disgust can become conflated. For example, inductions of physical disgust make people’s moral judgments more severe (Eskine, Kacinik, & Prinz, 2011; Horberg, Oveis, Keltner, & Cohen, 2009; Schnall, Haidt, Clore, & Jordan, 2008; Ugazio, Lamm, & Singer, 2012), whereas inductions of physical purity make moral judgments less severe (Schnall, Benton, & Harvey, 2008).

Similarly, nonrational intuitions may be behind concerns about how CE drugs are administered, because perceived efficacy and overall preferences differ across dosage forms (Vallance, 2006). For instance, drug attributes such as color (de Craen, Roos, de Vries, & Kleijnen, 1996) or whether drugs are tablets or capsules (Hussain, 1972) influence people’s perception of drug

efficacy. Further, a drug’s route of administration<sup>2</sup> matters: Although patients prefer orally administered drugs over injections (Atkinson et al., 2004; Fallowfield et al., 2006), the latter are perceived as more effective. Such effects might be due to the fact that injections, although invasive and unpleasant, might be seen as a more significant treatment compared to other dosage forms; related concerns might play a role when people consider the extent to which it is acceptable to chemically alter healthy people’s natural abilities.

## THE CURRENT RESEARCH

Discussions of CE drug use have been largely theoretical, and limited to academic circles, but it is unknown what the general public thinks of such drugs, and in particular people for whom they may be highly salient. We conducted two studies to determine whether moral concerns about CE drugs reflect opinions in the scientific literature. Further, we were interested in people’s “gut feelings” about CE drugs, based on the social intuitionist model of moral judgment (Haidt, 2001). We surveyed students at a very competitive British university, where CE drug use is a highly relevant topic.

The first study explored whether health, distributive and competitive fairness, naturalness, and dosage form are concerns when making judgments about the use of CE drugs by healthy people. Extremity of the moral transgression was varied with respect to specific moral concerns, and we expected that if a given concern was relevant, moral judgments would vary accordingly. More specifically, we expected participants to judge the use of CE drugs as more wrong if involving negative side effects on health, if they created distributive and competitive unfairness, if originating from an unnatural source, and for invasive dosage forms.

## STUDY 1

### Method

#### *Participants*

Fifty-one students (44 undergraduates; seven graduates) from the University of Cambridge (25 female;  $M$  age = 20.56 years,  $SD$  = 2.26) participated. One participant’s data were excluded due to failure to follow instructions.

<sup>2</sup>We use the term “dosage form” to refer to both dosage form and route of administration.

### Procedure

Students were approached on campus and asked to complete a brief survey.

### Materials

Following a brief definition of cognitive-enhancing drugs, participants received questions in the following format: “What do you think of healthy people using cognitive-enhancing drugs to increase mental performance if [insert moral concern]?” Participants gave their answers on a 10-point scale (adopted from Schnall et al., 2008), labeled from 0 (*perfectly OK*) to 3 (*somewhat wrong*) to 6 (*very wrong*) to 9 (*extremely wrong*). Participants first made a global judgment of CE drug use that consisted only of the baseline question. Then, for each of the five moral concerns, three questions varied the extremity of the situation. Each participant answered all 16 questions.

*Health:* No negative side effects on health; temporary negative side effects on health; long-term negative side effects on health.

*Distributive Fairness:* Most people could afford to buy the drugs; only some people could afford to buy the drugs; only very few people could afford to buy the drugs.

*Competitive Fairness:* The question specified a healthy person on a university course taking CE drugs to enhance exam performance, although the situation varied: most of the other people in that course were taking the drugs, some of the other people in that course were taking the drugs, or none of the other people in that course were taking the drugs.

*Dosage Form:* Drug as additive to tea or coffee; drug as pill; drug as injection.

*Naturalness:* Drugs sold by organic whole foods store; drugs sold by supermarket; drugs sold in pharmacies.

### Results

On the global item, participants judged the use of CE drugs to be between “somewhat” and “very” wrong ( $M = 4.54$ ,  $SD = 2.67$ ), suggesting a generally negative view toward CE drug use. We then analyzed each of the five concerns with repeated-measures analyses of variance (ANOVAs), with extremity as repeated factor (see Table 1 for means). Bonferroni post hoc tests followed up on significant main effects.

#### Health

Judgments involving health consequences varied depending on extremity,  $F(2, 98) = 52.20$ ,  $p < .001$ ,  $\eta_p^2 = .52$ . There was a linear trend,  $F(1, 49) = 62.27$ ,  $p < .001$ ,  $\eta_p^2 = .56$ , with CE drug use considered most wrong if involving long-term negative side effects, less wrong with temporary negative side effects, and least wrong with no negative side effects. Of interest, however, the mean for the latter item indicated that even in the absence of any negative health effects, CE drug use was judged somewhat wrong rather than being perfectly acceptable.

#### Distributive Fairness

Judgments involving distributive fairness differed as a function of extremity,  $F(2, 98) = 47.17$ ,  $p < .001$ ,  $\eta_p^2 = .49$ . CE drug use was rated most wrong if very few people could afford them, less wrong if some people could afford them, and least wrong if most people could afford them, illustrated by a linear trend,  $F(1, 49) = 54.50$ ,  $p < .001$ ,  $\eta_p^2 = .53$ .

#### Competitive Fairness

Judgments for the competitive fairness of CE drugs were influenced by extremity,  $F(2, 98) = 26.66$ ,  $p < .001$ ,

TABLE 1  
Mean Moral Judgments for CE Drug Use Concerns, Study 1

|                       |                                   | <i>M</i>            | <i>SD</i> |                        |                           | <i>M</i>          | <i>SD</i> |
|-----------------------|-----------------------------------|---------------------|-----------|------------------------|---------------------------|-------------------|-----------|
| Health                | No negative side-effects          | 4.00 <sub>a</sub>   | 3.02      | Dosage form            | Additive to tea or coffee | 4.72 <sub>a</sub> | 2.84      |
|                       | Temporary negative side-effects   | 5.44 <sub>b</sub>   | 2.53      |                        | Pill                      | 4.78 <sub>a</sub> | 2.92      |
|                       | Long-term negative side-effects   | 7.30 <sub>a,b</sub> | 2.29      |                        | Injection                 | 5.56 <sub>b</sub> | 2.68      |
| Distributive fairness | Most people could afford          | 4.26 <sub>a</sub>   | 2.85      | Naturalness            | Organic whole foods store | 4.80 <sub>a</sub> | 2.95      |
|                       | Some people could afford          | 5.90 <sub>b</sub>   | 2.47      |                        | Supermarket               | 4.56 <sub>a</sub> | 2.92      |
|                       | Only very few people could afford | 6.52 <sub>a,b</sub> | 2.25      |                        | Pharmacies                | 4.50 <sub>a</sub> | 2.87      |
| Competitive fairness  | No others were taking in exam     | 7.18 <sub>a</sub>   | 2.25      | Overall moral judgment |                           | 4.54              | 2.67      |
|                       | Some others were taking in exam   | 6.56 <sub>b</sub>   | 2.58      |                        |                           |                   |           |
|                       | Most others were taking in exam   | 5.46 <sub>a,b</sub> | 2.71      |                        |                           |                   |           |

Note.  $N = 50$  for each item. Scores ranged from 0 to 9, with the following intermittent labels: 0 (*perfectly OK*), 3 (*somewhat wrong*), 6 (*very wrong*), and 9 (*extremely wrong*). Means with differing subscripts within the three items related to each concern differ significantly at the  $p < .05$  level, using pairwise Bonferroni comparisons.

$\eta_p^2 = .35$ . A linear trend indicated that the use of CE drugs for an exam was considered most wrong if no other people were taking them, less wrong if some other people were taking them, and least wrong if most other people were taking them,  $F(1, 49) = 34.83$ ,  $p < .001$ ,  $\eta_p^2 = .42$ .

### *Dosage Form*

Participants also cared about the dosage form through which CE drugs are administered,  $F(2, 98) = 19.43$ ,  $p < .001$ ,  $\eta_p^2 = .28$ . Follow-up comparisons showed that although there was no significant difference between judgments of CE drugs when added to tea or coffee compared to a pill, injections were rated more negatively than those two dosage forms ( $ps < .001$ ).

### *Naturalness*

Source of the drugs, whether natural or not, did not matter,  $F(2, 98) = 2.15$ ,  $p = .12$ ,  $\eta_p^2 = .04$ .

### Discussion

People overall disapproved of CE drug use, as shown by the results of the global judgment item. This was also reflected in the answers to the more specific moral scenarios: Average moral judgments never came close to indicating CE drug use to be “perfectly OK.”

Study 1 confirmed that students at a highly competitive university are concerned with the health, distributive fairness, and competitive fairness moral aspects of CE drug use. For the health concern, the least severe moral judgments were made for the scenario with no negative side effects on health, more severe for temporary side effects, and most severe for long-term negative side effects of CE drugs. This last item showed the highest mean condemnation across all items in the survey. Further, the fewer people could afford CE drugs (i.e., increasing distributive unfairness), the more wrong CE drug use was judged to be. Participants also met increased competitive unfairness with increasing condemnation: CE drug use was rated to be more wrong if there were fewer other people in an exam situation taking the drugs than in a situation where most others were taking the drugs.

In addition to the aforementioned concerns, which can be considered serious factors that require careful rational analyses, we also found that seemingly irrelevant considerations play a role when assessing the acceptability of CE drug use: Injections were judged to be more wrong than pills, or additives to drinks, in line with earlier findings that injections are perceived as more powerful treatments (Atkinson et al., 2004; Fallowfield et al., 2006).

Unexpectedly, drug source did not matter: CE drugs from organic whole foods stores, supermarkets, or pharmacies were given equal moral ratings. Perhaps place of purchase did not reveal much about the drugs’ makeup, that is, did not create clear artificial versus natural distinctions. The operationalization for naturalness was therefore not ideal, and this and other questions were examined further in a follow-up study.

## STUDY 2

A second study aimed to replicate the findings from Study 1 regarding people’s concerns about health, competitive fairness, and distributive fairness and to elaborate on the effects of naturalness and dosage form. In addition, we differentiated between the concepts of competitive fairness and peer pressure, which in the first study were treated as a single construct. Competitive fairness relates to professional or academic goal attainment, whereas peer pressure results from people’s need to belong to a social group and causes them to conform to the explicit and implicit social norms of that group (Cialdini & Goldstein, 2004). The concern regarding CE drugs might therefore involve the fear that if many people in one’s social circle were taking the drugs, one would also have to take them to fit in.

As in Study 1, we expected that CE drug use would be judged as more wrong with negative side effects on health and if taking them resulted in competitive or distributive unfairness. We also explored whether competitive fairness and peer pressure would interact such that it would matter whether the other people taking the drugs (or not) were friends or competitors. Such an interaction would reveal the relative importance of competitive fairness and peer pressure for our population. Further, the measure of naturalness was altered to reflect more directly the difference between artificial and natural CE drugs. We further tested for an interaction between dosage form and naturalness, because both factors relate to the physical nature of the drug itself. Thus, with the addition of peer pressure, we examined six distinct moral concerns related to CE drug use: health, competitive fairness, distributive fairness, peer pressure, naturalness, and dosage form.

We also addressed another limitation of Study 1: It may have produced carryover effects because participants received all three variations of a question. Instead, Study 2 used a between-subjects design, and each participant received only one of 12 possible questions. Another possible confound was that the 10-point scale had featured the word “wrong” three times, which possibly caused a negative priming effect. The scale was therefore shortened and had no intermittent labels.

## Method

### Participants

Three hundred six students (245 undergraduates, 39 graduates, one “other”) from the University of Cambridge (157 female;  $M$  age = 20.74 years,  $SD$  = 2.26) participated.

### Procedure

Students were approached on campus and asked to complete a brief survey.

### Materials

The baseline question was, “What do you think of healthy people using cognitive-enhancing drugs in order to increase their mental performance if the drugs were [insert moral concern]?” For each of the six concerns, two variations of the baseline question manipulated extremity, resulting in 12 different conditions. Participants responded to questions using a 6-point scale, labeled 0 (*perfectly OK*) to 5 (*extremely wrong*).

**Health; distributive fairness.** The two most extreme items of Study 1 were retained.

**Competitive fairness and peer pressure.** We combined the items for competitive fairness and peer pressure, allowing testing for an interaction effect between the variables. The conditions varied whether other people took the drugs or not, and whether these were friends or competitors in an exam situation. Four items resulted, of which each participant answered only one: “What do you think of a healthy university student taking cognitive-enhancing drugs to enhance their exam performance if none of the other students in that course were taking the drugs?” “What do you think of a healthy university student taking cognitive-enhancing drugs to enhance their exam performance if all of the other students in that course were taking the drugs?” “What do you think of a healthy person using cognitive-enhancing drugs in order to increase their mental performance if all of their friends were taking the drugs?” and “What do you think of a healthy person using cognitive-enhancing drugs in order to increase their mental performance if none of their friends were taking the drugs?”

**Naturalness and dosage form.** For naturalness we distinguished between herbal and artificial, crossed with dosage form of drink additive and injection. Items were as follows: Drug is herbal extract administered using injection; drug is herbal extract contained in drink; drug

is created artificially and administered using injection; drugs is created artificially and contained in drink.

## Results

### Health

As expected, participants rated the use of CE drugs as significantly more wrong when involving long-term negative side effects, rather than no negative side effects,  $t(50) = 2.56$ ,  $p < .007$ ,  $r = .34$  (see Table 2 for means).

### Distributive Fairness

Unexpectedly, ratings did not differ between only few people, or most people being able to afford them,  $t(50) = 0.87$ ,  $p < .20$ ,  $r = .12$ .

### Competitive Fairness and Peer Pressure

A two-way ANOVA showed no significant main effects of either peer pressure,  $F(1, 100) = 2.54$ ,  $p = .11$ ,  $\eta_p^2 = .03$ , or competitive fairness,  $F(1, 100) = 0.04$ ,  $p = .85$ ,  $\eta_p^2 = .00$  (see Figure 1 for means). However, there was an interaction effect,  $F(1, 100) = 4.97$ ,  $p = .03$ ,  $\eta_p^2 = .05$ . A post hoc Bonferroni test showed that participants considered it more wrong for a person to take CE drugs when no other competitors were taking the drugs, compared to no other friends ( $p < .05$ ).

### Naturalness and Dosage Form

Significant main effects for both naturalness and dosage form emerged, as shown by a two-way independent ANOVA (see Figure 2 for means). CE drug use was considered more wrong if drugs were artificial rather than herbal,  $F(1, 94) = 7.75$ ,  $p = .006$ ,  $\eta_p^2 = .08$ , and if they were in the form of an injection rather than a drink,  $F(1, 94) = 4.93$ ,  $p = .03$ ,  $\eta_p^2 = .05$ . The two variables did not interact,  $F(1, 94) = 0.79$ ,  $p = .38$ ,  $\eta_p^2 = .01$ , suggesting that judgment of dosage form did not depend on the type of drug.

TABLE 2  
Mean Moral Judgments for CE Drug Use Concerns, Study 2

|                       |                                   | <i>N</i> | <i>M</i>          | <i>SD</i> |
|-----------------------|-----------------------------------|----------|-------------------|-----------|
| Health                | No negative side effects          | 26       | 2.73 <sub>a</sub> | 1.69      |
|                       | Long-term negative side effects   | 26       | 3.81 <sub>b</sub> | 1.33      |
| Distributive fairness | Only very few people could afford | 26       | 3.58 <sub>a</sub> | 1.50      |
|                       | Most people could afford          | 26       | 3.19 <sub>a</sub> | 1.70      |

*Note.* Scores ranged from 0 to 5, with the following endpoint labels: 0 (*perfectly OK*) and 5 (*extremely wrong*). Means with differing subscripts differed significantly at the  $p < .05$  level.

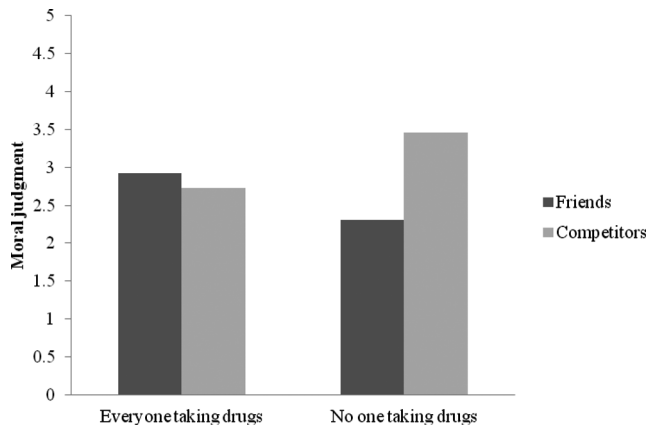


FIGURE 1 Mean moral judgments of competitive fairness and peer pressure, Study 2. *Note.* Scores ranged from 0 to 5, with the following endpoint labels: 0 (*perfectly OK*) and 5 (*extremely wrong*).

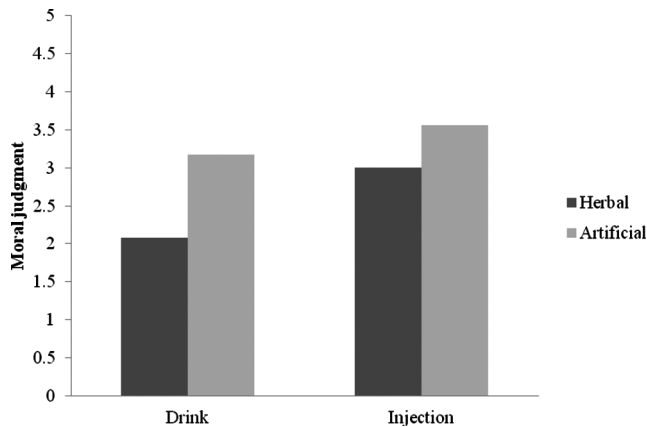


FIGURE 2 Mean moral judgments of naturalness and dosage form, Study 2. *Note.* Scores ranged from 0 to 5, with the following endpoint labels: 0 (*perfectly OK*) to 5 (*extremely wrong*).

## Discussion

Consistent with the results from Study 1, concerns for health were again found to matter to participants, with the highest condemnation for assumed long-term health risks. This supports our expectation that health is an important factor in people’s moral judgments of CE drug use (see also Maher, 2008). Of interest, however, distributive fairness did not matter, contrary to the results of Study 1. One possible reason for this is that the format of Study 1 might have led participants to give socially desirable responses and indicate greater concerns for justice when explicitly contrasting people who can afford certain drugs with people who cannot. In contrast, Study 2 did not allow such a comparison because each participant only received one format of the question.

The results of combining competitive fairness and peer pressure suggested that if no others were using

CE drugs in a given context, it was considered more wrong if the individual using them did so in a competitive situation compared to in a context with friends. Thus, university students in our sample were especially concerned about the unfair advantage a drug might confer to an individual in an exam situation where other students do not use such drugs, which is in line with suggestions in the literature (e.g., Cacic, 2009).

Further, as expected, dosage form and naturalness were both relevant: Participants considered CE drug use to be more wrong if the drugs were artificial rather than herbal (see also Britten, 1994; Britten et al., 2002; Giveon, 2004). Dosage form was also found to be relevant, with the more invasive form, an injection, condemned more strongly than the less invasive form (see also Atkinson et al., 2004; Fallowfield et al., 2006). Findings from these latter two concerns suggest that in addition to objectively valid concerns, condemnation of CE drugs also involves moral intuitions (Haidt, 2001) that are more difficult to justify on completely rational grounds.

## GENERAL DISCUSSION

Findings from two studies demonstrated that a number of factors matter to university students’ opinion on the use of CE drugs. Across all the factors we tested, it is noteworthy that even when aggregate responses were near the middle of our moral judgment scales, they always leaned toward the negative, and people never came close to judging CE drug use as being “perfectly OK.” But not all factors mattered equally; among the most important concerns were dangers to health, and the competitive advantage provided to an individual using the drugs in examination situations in which other people do not use them. Given that our participants were students at a highly competitive university, it comes as no surprise that the thought of some students performing better due to CE drugs would be highly disconcerting. These findings are consistent with the issues raised in the scientific discussions of CE drug use (e.g., Cacic, 2009; Greely et al., 2008).

In contrast to the scientific discourse, however, distributive fairness—in other words, equal access to the drugs—was less of a concern to participants in our sample. Students considered unequal access problematic only when this issue was made very salient in the survey, in which case their responses might have reflected a hesitation to openly endorse unfair access. Further, the relative lack of concern for distributive fairness might be due to the fact that many participants in our sample may have come from a privileged socioeconomic background for which access issues appear less relevant.

Somewhat surprisingly, given the discussion in the literature (Maher, 2008), peer pressure was not found to be a central relevant moral concern to our participants. We should caution that our sample sizes were limited, so with greater samples we might have obtained a statistically significant effect. Nevertheless, when examining effect sizes, the magnitude of effect was comparatively small for peer pressure, relative to other concerns, such as health.

As noted earlier, we believe that judgments about CE drugs are on a fundamental level moral judgments and, as such, can be influenced by valid, rational considerations, but also by rather emotional, and possibly irrational, considerations (Haidt, 2001). For example, although it is difficult to provide a rational argument for why it should matter whether CE drugs were derived from a natural or synthetic source, it did matter to our participants: In Study 2, participants rated the use of herbal CE drugs as less wrong than the use of artificial CE drugs. This is consistent with research showing that people believe that natural drugs have fewer negative side effects than artificial drugs (Britten, 1994; Britten et al., 2002; Giveon, 2004). Although concerns of naturalness are difficult to explain based on objective evidence, they might reflect people's propensity to guard the purity of the body (Rozin et al., 2008; Schnall et al., 2008), and artificial substances appear to be perceived as more dangerous contaminants than natural substances. Indeed, so many people consume large amounts of coffee on a daily basis, presumably at least in part to become more cognitively alert, that coffee is the second most commonly traded commodity in the world, surpassed only by crude oil (Trade Commodities, 2011). Thus, mild cognitive enhancement derived from plant sources is very much part of daily life but is usually not met with strong moral objection.

Along similar lines, both studies made clear that dosage form is a relevant moral concern. Participants regarded the administration of CE drugs via an injection to be more wrong than via a drink, in line with research on patient preferences for certain dosage forms (Atkinson et al., 2004; Fallowfield et al., 2006). One possible explanation for this finding is that injections, as opposed to dosage forms such as pills, may invoke disgust because they involve penetration of the body's protective envelope, which is a violation of the purity ethic (Rozin et al., 2008).

Overall, the current findings point to the role of moral intuitions when deciding about the ethics of real-life dilemmas. They contribute to the ongoing debate about the place of CE drugs in society by comparing between academic discussion and moral attitudes in a student population—a segment of the population with much to gain or lose with changes in CE drug use policy. Some cognitive neuroscientists argue that

“mentally competent adults should be able to engage in cognitive enhancement using drugs” (Greely et al., 2008, p. 703), assuming the development of safe drugs, and appropriate laws to ensure fairness and minimize coercion. Indeed, we found that in our participants, health was a primary concern, and hence it is possible that the legalization of CE drugs with negligible side effects could be met with few ethical objections. However, we also found that several other concerns contributed in important ways to participants' condemnation of CE drugs. Although some factors, such as naturalness or dosage form, might be considered objectively less relevant, the fact that they do matter to people warrants closer examination. Our findings illuminate the complexity of concerns—whether based on rational considerations, or on gut feelings and intuitions—that may need to be taken into account in public policy decisions regulating the use of CE drugs. Thus, our findings, together with the existing discussions in the media and in academic circles, suggest that the question of whether society should endorse or prohibit the development and use of drug-based methods of cognitive enhancement is a moral one, and is likely to continue to stir emotion, and controversy.

#### ACKNOWLEDGMENT

This research was supported by First Grant RES-061-25-0119 from the Economic and Social Research Council to Simone Schnall.

#### REFERENCES

- Atkinson, M. J., Sinha, A., Hass, S. L., Colman, S. S., Kumar, R. N., Brod, M., & Rowland, C. R. (2004). Validation of a general measure of treatment satisfaction, the Treatment Satisfaction Questionnaire for Medication (TSQM), using a national panel study of chronic disease. *Health and Quality of Life Outcomes*, 2.
- Britten, N. (1994). Patients' ideas about medicines: A qualitative study in a general practice population. *British Journal of General Practice*, 44, 465–468.
- Britten, N., Ukoumunne, O. C., & Boulton, M. G. (2002). Patients' attitudes to medicines and expectations for prescriptions. *Health Expectations*, 5, 256–269.
- Cacic, V. (2009). Smart drugs for cognitive enhancement: Ethical and pragmatic considerations in the era of cosmetic neurology. *Journal of Medical Ethics*, 35, 611–615.
- Chatterjee, A. (2004). Cosmetic neurology: The controversy over enhancing movement, mentation, and mood. *Neurology*, 63, 968–974.
- Chatterjee, A. (2006). The promise and predicament of cosmetic neurology. *Journal of Medical Ethics*, 32, 110–113.
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, 55, 591–621.
- de Craen, A. J., Roos, P. J., de Vries, A. L., & Kleijnen, J. (1996). Effect of color of drugs: Systematic review of perceived effect of

- drugs and their effectiveness. *British Medical Journal*, 313, 1624–1626.
- Eskine, K. J., Kacirik, N. A., & Prinz, J. J. (2011). A bad taste in the mouth: Gustatory disgust influences moral judgment. *Psychological Science*, 22, 295–299.
- Fallowfield, L., Atkins, L., Catt, S., Cox, A., Coxon, C., Langridge, C., ... Price, M. (2006). Patients' preference for administration of endocrine treatment by injection or tablets: Results from a study of women with breast cancer. *Annals of Oncology*, 17, 205–210.
- Giveon, S. (2004). Are people who use “natural drugs” aware of their potentially harmful side-effects and reporting to family physician? *Patient Education and Counseling*, 53, 5–11.
- Greely, H., Sahakian, B., Harris, J., Kessler, R. C., Gazzaniga, M., Campbell, P., & Farah, M. J. (2008). Towards responsible use of cognitive-enhancing drugs by the healthy. *Nature*, 456, 702–705.
- Haidt, J. (2001). The emotional dog and its rational tail: A social intuitionist approach to moral judgment. *Psychological Review*, 108, 814–834.
- Haidt, J., & Björklund, F. (2008). Social intuitionists answer six questions about moral psychology. In W. Sinnott-Armstrong (Ed.), *Moral psychology, Volume 2: The cognitive science of morality: Intuition and diversity* (pp. 181–217). Cambridge, MA: MIT Press.
- Harris, J., & Chatterjee, A. (2009). Is it acceptable for people to take methylphenidate to enhance performance? YES and NO. *British Medical Journal*, 338, 1532–1533.
- Horberg, E. J., Oveis, C., Keltner, D., & Cohen, A. B. (2009). Disgust and the moralization of purity. *Journal of Personality and Social Psychology*, 97, 963–976.
- Husain, M., & Mehta, M. A. (2011). Cognitive enhancement by drugs in health and disease. *Trends in Cognitive Sciences*, 15, 28–36.
- Hussain, M. Z. (1972). Effect of shape of medication in treatment of anxiety states. *British Journal of Psychiatry*, 120, 507–509.
- Kass, L. R. (2003). *Beyond therapy: Biotechnology and the pursuit of happiness*. President's Council on Bioethics. New York, NY: Harper Collins.
- Kohlberg, L. (1969). Stage and sequence: The cognitive-developmental approach to socialization. In D. A. Goslin (Ed.), *Handbook for socialization theory and research* (pp. 347–480). Chicago, IL: Rand McNally.
- Maher, B. (2008). Poll results: Look who's doping. *Nature*, 452, 674–675.
- Maio, G. R., & Olson, J. M. (1998). Values as truisms: Evidence and implications. *Journal of Personality and Social Psychology*, 74, 294–311.
- McCabe, S. E., Knight, J. R., Teter, C. J., & Wechsler, H. (2005). Non-medical use of prescription stimulants among US college students: Prevalence and correlates from a national survey. *Addiction*, 99, 96–106.
- Mehlman, M. J. (2004). Cognition-enhancing drugs. *The Milbank Quarterly*, 82, 483–506.
- Nuffield Council on Bioethics. (1999). *Genetically modified crops: The ethical and social issues*. London, England: Author.
- Petróczi, A., & Aidman, E. (2008). Psychological drivers in doping: The life-cycle model of performance enhancement. *Substance Abuse Treatment, Prevention, and Policy*, 3.
- Petróczi, A., & Aidman, E. (2009). Measuring explicit attitude toward doping: Review of the psychometric properties of the Performance Enhancement Attitude Scale. *Psychology of Sport and Exercise*, 10, 390–396.
- Rozin, P., Haidt, J., & McCauley, C. R. (1999). Disgust: The body and soul emotion. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 429–445). Chichester, England: Wiley.
- Rozin, P., Haidt, J., & McCauley, C. R. (2008). Disgust. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions*, 3rd ed., (pp. 757–776). New York, NY: Guilford.
- Sagoff, M. (2001). Genetic engineering and the concept of the natural. In A. Eaglesham, S. G. Pueppke, & R. W. Hardy (Eds.), *NABC Report 13: Genetically modified food and the consumer* (pp. 127–140). Ithaca, NY: National Agricultural Biotechnology Council.
- Sahakian, B., & Morein-Zamir, S. (2007). Professor's little helper. *Nature*, 450, 1157–1159.
- Schnall, S., Benton, J., & Harvey, S. (2008). With a clean conscience: Cleanliness reduces severity of moral judgments. *Psychological Science*, 19, 1219–1222.
- Schnall, S., Haidt, J., Clore, G. L., & Jordan, A. H. (2008). Disgust as embodied moral judgment. *Personality and Social Psychology Bulletin*, 34, 1096–1109.
- Trade Commodities. (2011). *The most common commodities to trade*. Retrieved from <http://www.tradecommodities.co.uk/commodities/>
- Turiel, E. (1983). *The development of social knowledge: Morality and convention*. Cambridge, England: Cambridge University Press.
- Ugazio, G., Lamm, C., & Singer, T. (2012). The role of emotions for moral judgments depends on the type of emotion and moral scenario. *Emotion*, 12, 579–590.
- Vallance, A. K. (2006). Something out of nothing: The placebo effect. *Advances in Psychiatric Treatment*, 12, 287–296.
- Verhoog, H., Matze, M., van Bueren, E. L., & Baars, T. (2003). The role of the concept of the natural (naturalness) in organic farming. *Journal of Agricultural and Environmental Ethics*, 16, 29–49.
- Watts, F. (2000). Approaches to bioethics. In F. Watts (Ed.), *Christians and bioethics* (pp. 1–12). London, England: Society for Promoting Christian Knowledge.
- Wiefferink, C. H., Detmar, S. B., Coumans, B., Vogels, T., & Paulussen, T. G. (2008). Social psychological determinants of the use of performance-enhancing drugs by gym users. *Health Education Research*, 23, 70–80.