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Stoeber, J., & Hotham, S. (2016). Perfectionism and attitudes toward cognitive enhancers ("smart drugs"). *Personality and Individual Differences*, 88, 170-174. doi: 10.1016/j.paid.2015.09.011

Perfectionism and Attitudes Toward Cognitive Enhancers  
("Smart Drugs")

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### Abstract

Perfectionism is a personality disposition characterized by exceedingly high standards of performance and pressure to be perfect which may incline students to take cognitive enhancers (“smart drugs”) to boost their academic performance. So far, however, no study has investigated the relationships of multidimensional perfectionism and attitudes toward cognitive enhancers. The present study investigated these relationships in 272 university students examining different dimensions of perfectionism. Results showed that socially prescribed perfectionism, perfectionist concerns and doubts, and perceived parental pressure to be perfect showed positive correlations with attitudes favoring the use of cognitive enhancers. In contrast, self-oriented perfectionism, perfectionist personal standards, and organization showed negative correlations. The findings suggest that perfectionism may play a role as both a risk factor for and a protective factor against using cognitive enhancers depending on what dimensions of perfectionism are regarded.

*Keywords:* perfectionism; attitudes; pharmacological cognitive performance enhancement; smart drugs; morality; cheating; social pressure; health and safety

### 1. Introduction

Perfectionism is a personality disposition characterized by exceedingly high standards of performance (Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991). Students with perfectionist personal standards have higher aspirations at university: not only do they think they should get better grades in exams than students who do not have such high standards; they also value grades that are not top of the class less than other students (Bieling, Israeli, Smith, & Antony, 2003; Brown et al., 1999). Surveys show that more and more students use cognitive enhancers (or “smart drugs”) to help them focus when preparing for exams and when taking exams (Naeem, 2014). Cognitive enhancers are prescription drugs like Ritalin®, Adderall®, and Provigil® that were developed for the treatment of cognitive decline (e.g., dementia in elderly people) or cognitive disturbance in younger people (e.g., attention deficit hyperactivity disorder, ADHD), but can also be used to enhance cognitive performance (e.g., concentration, memory function) in healthy individuals. Because perfectionist students have higher academic standards than non-perfectionist students, it is conceivable that they have more positive attitudes toward cognitive enhancers and are more tempted to use them than non-perfectionist students. So far, however, no study has investigated the relationships between perfectionism and attitudes toward

cognitive enhancers. The present research represents the first such investigation.

### 1.1. Multidimensional perfectionism

When investigating perfectionism, it is important to take into account that perfectionism is best conceptualized as a multidimensional personality disposition. The two most influential and widely researched models of multidimensional perfectionism are Frost et al.'s (1990) and Hewitt and Flett's (1991). Frost et al.'s (1990) model differentiates six dimensions: personal standards, concern over mistakes, doubts about actions, parental expectations, parental criticism, and organization. In this, personal standards reflect perfectionists' exceedingly high standards of performance. Concern over mistakes reflects perfectionists' concern about making mistakes and the negative consequences that mistakes have for their self-evaluation, whereas doubts about actions reflect a tendency toward indecisiveness related to a fear of not doing the right thing. In contrast, parental expectations and parental criticism refer to perfectionists' perceptions that their parents expect them to be perfect and are critical if they fail to meet these expectations. Finally, organization refers to perfectionist tendencies to be organized and value order and neatness. Factor analytic studies investigating the dimensionality of Frost et al.'s model, however, consistently found fewer than six dimensions (Purdon, Antony, & Swinson, 1999; Cox, Enns, & Clara, 2002) with the majority of studies suggesting that four dimensions—combining concern over mistakes and doubts about actions to one dimension, and parental expectations and parental criticism to one dimension—best capture the dimensionality of the model (Harvey, Pallant, & Harvey, 2004; Stöber, 1998; Stumpf & Parker, 2000).

In comparison, Hewitt and Flett's (1991) model differentiates three dimensions of perfectionism: self-oriented, other-oriented, and socially prescribed. Self-oriented perfectionism reflects beliefs that striving for perfection and being perfect are personally important. In contrast, other-oriented perfectionism reflects beliefs that it is important for others to strive for perfection and be perfect. Finally, socially prescribed perfectionism reflects beliefs that striving for perfection and being perfect are important to others. Socially prescribed perfectionists believe that others expect them to be perfect, and that others will be highly critical of them if they fail to meet these expectations.

A number of studies have compared the two models of perfectionism (e.g., Frost, Heimberg, Holt, Mattia, & Neubauer, 1993). They found that concerns and doubts (concern over mistakes, doubts about actions), parental pressure (parental expectations, parental criticism), and socially prescribed perfectionism represent dimensions of perfectionism reflecting maladaptive

evaluation concerns that are associated with feelings, cognitions, and behaviors indicative of psychological maladjustment (e.g., avoidant coping, negative affect). In comparison, personal standards, organization, self-oriented perfectionism, and other-oriented perfectionism represent dimensions of perfectionism reflecting positive strivings that are often associated with feelings, cognitions, and behaviors indicative of psychological adjustment (e.g., active coping, positive affect), particularly when the overlap with the maladaptive evaluative concerns dimensions of perfectionism is statistically controlled for and unique relationships are regarded (see Stoeber & Otto, 2006, for a review). Consequently, it can be expected that the different perfectionism dimensions also show different relationships with attitudes toward cognitive enhancers.

### 1.2. Multidimensional perfectionism and attitudes toward performance-enhancing drugs

Whereas there are no studies on perfectionism and attitudes toward cognitive enhancers, one study investigated perfectionism and use of psychostimulants (Low & Gendaszek, 2002). The study found that perfectionism was not associated with self-reported use of psychostimulants in undergraduate students. The study, however, did not differentiate between prescription (e.g., Adderall®) and non-prescription drugs (e.g., cocaine). Moreover, it only examined overall perfectionism, combining all dimensions of Frost et al.'s (1990) model into an overall perfectionism score. Because different perfectionism dimensions have shown different relationship with psychological adjustment and maladjustment (Stoeber & Otto, 2006), it is difficult to interpret Low and Gendaszek's (2002) null finding.

Furthermore, there are three studies that investigated perfectionism and positive attitudes toward performance enhancing drugs in sport or "doping" (Bahrami, Yousefi, Kaviani, & Ariapooran, 2014; Madigan, Stoeber, & Passfield, in press; Zucchetti, Candela, & Villosio, 2015). In all three studies, the Performance Enhancement Attitude Scale (Petróczi & Aidman, 2009) was used to measure positive attitudes toward doping. Zucchetti et al. (2015) examined a mixed sample of athletes and found perfectionism to predict positive attitudes toward doping. Unfortunately, the study used a multidimensional measure of perfectionism, but combined all dimensions to form an overall perfectionism score and thus did not investigate whether the different dimensions showed different relationships with attitudes toward doping. This was different in the other two studies. Bahrami et al. (2014) examined bodybuilders and found perfectionist personal standards and concern over mistakes to show positive correlations with positive attitudes toward doping, but not external pressure to be perfect (parental pressure, coach pressure). Madigan et al. (in press) examined junior athletes. They found parental pressure to be

perfect to show a positive correlation with positive attitudes toward doping whereas perfectionist strivings, perfectionist concerns, and coach pressure showed nonsignificant correlations when bivariate correlations were regarded. However, when multiple regressions were conducted controlling for the overlap between the perfectionism dimensions, perfectionist strivings showed a negative relationship with positive attitudes toward doping.

It is unclear how to explain the contradictory findings of Bahrami et al. (2014) and Madigan et al. (in press) because the two studies examined samples that are difficult to compare (bodybuilders, junior athletes). Moreover, only Madigan et al. (in press) conducted analyses investigating the unique relationships of the different perfectionism dimensions by statistically controlling for the overlap between the dimensions. Finally, it is unclear how indicative these findings are for research on perfectionism and cognitive enhancers in students because perfectionism may show different relationships in sport versus academia (Dunn, Gotwals, & Causgrove Dunn, 2005). Furthermore, doping in sport is illegal whereas taking prescription drugs as cognitive enhancers is not. Hence, the findings on perfectionism and attitudes toward doping may not generalize to attitudes toward cognitive enhancers.

### 1.3. The present study

Against this background, the aim of the present study was to provide a first investigation of how multidimensional perfectionism is related to attitudes toward cognitive enhancers. Following the relevant literature (Schelle, Faulmüller, Caviola, & Hewstone, 2014), we explored the relationships of the four dimensions of Frost et al.'s (1990) model of perfectionism and the three dimensions of Hewitt and Flett's (1991) model with positive attitudes, moral acceptability, perceptions of misuse, perceived pressure, and authenticity as well as health and safety concerns and pro-regulation attitudes regarding cognitive enhancers. As this was the first study on perfectionism and attitudes toward cognitive enhancers (and the contradictory findings from research on perfectionism and attitudes toward doping provided little guidance), we were cautious in making specific predictions except that we expected the dimensions of the two models of perfectionism to show different relationships with attitudes toward cognitive enhancers. Hence, the study was largely exploratory.

## 2. Method

### 2.1. Participants

A sample of 272 students (35 men, 237 women) at the University of Kent was recruited via the School of Psychology's Research Participation Scheme. Mean age of students was 20.2 years

( $SD = 4.2$ ). Students volunteered to participate for a £50 raffle (~US \$77) or extra course credit. Participants completed all measures online using the School's Qualtrics® platform, which required to respond to all questions to prevent missing data.

## 2.2. Measures

### 2.2.1. *Multidimensional perfectionism*

To measure the four dimensions of Frost et al.'s (1990) model, we used the 35-item Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) capturing personal standards (e.g., "I have extremely high goals"), concern over mistakes ("If I fail at work/school, I am a failure as a person"), doubts about actions ("I usually have doubts about the simple everyday things that I do"), parental expectations ("My parents wanted me to be the best at everything"), parental criticism ("As a child, I was punished for doing things less than perfect"), and organization ("Organization is very important to me"). Participants were asked to what degree they agreed with each statement and responded on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Following Stumpf and Parker (2000), we combined concern over mistakes and doubts about actions to "concerns and doubts," and parental expectations and parental criticism to "parental pressure."

To measure the three dimensions of Hewitt and Flett's (1991) model, we used the 45-item Multidimensional Perfectionism Scale (Hewitt & Flett, 2004) capturing self-oriented perfectionism (e.g., "I demand nothing less than perfection of myself"), other-oriented perfectionism ("If I ask someone to do something, I expect it to be done flawlessly"), and socially prescribed perfectionism ("People expect nothing less than perfection from me"). Participants were asked to what degree they agreed with each statement, and responded on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

### 2.2.2. *Attitudes toward cognitive enhancers*

To measure positive attitudes toward cognitive enhancers, we adapted the 17-item Performance Enhancement Attitude Scale (Petróczi & Aidman, 2009) by changing the item content from attitudes toward doping in sport to attitudes toward cognitive enhancers. Moreover, we added an instruction explaining to participants what cognitive enhancers are (see Supplementary Material A, Section 1 for instructions, items, and response scale).

To measure the moral acceptability of using cognitive enhancers, we used the 3-item measure from Dubljević, Sattler, and Racine (2013). Participants were asked how they personally evaluated the morality of using cognitive enhancers to enhance studying performance

without any medical necessity (a) before an examination, (b) during an examination, and (c) in general for university students, and responded on a scale from 1 (*absolutely not moral*) to 7 (*absolutely moral*).

To measure perceptions of misuse, we used a vignette adapted from Dodge, Williams, Marzell, and Turrisi (2012) describing a student who takes cognitive enhancers preparing for an exam because he/she finds it difficult to focus when studying for the exam, and then achieves better exam results than expected. Participants were asked whether they thought taking cognitive enhancers was cheating (Item 1) or necessary (Item 2) (see Supplementary Material A, Section 2 for details, items, and response scale).

To measure perceived pressure to take cognitive enhancers differentiating societal pressure and peer pressure, we used two vignettes from Fitz, Nadler, Manogaran, Chong, and Reiner (2014) asking participants first to imagine they were a paralegal showing moderate performance at work and only receiving a small bonus (Vignette 1: “soft societal pressure”), and then imagine the same scenario with the additional information that colleagues at work have been using cognitive enhancers to boost their performance and received a full bonus (Vignette 2: “soft peer pressure”). Each vignette was followed by three items asking participants if they would feel pressured to use cognitive enhancers (see Supplementary Material A, Section 3 for vignettes, items, and response scales).

To measure perceived authenticity, we adapted the enhanced-success vignette from Fitz et al. (2014) describing an employee who has been falling behind at work, starts taking cognitive enhancers to finish his/her work in time, and eventually receives a glowing performance review. The vignette was followed by two items asking participants whether they thought the employee’s performance was authentic (i.e., a true or accurate representation of his/her ability) and he/she was worthy of promotion (see Supplementary Material A, Section 4 for vignette, items, and response scales).

To measure perceived health and safety concerns, we used a 3-item measure from Scheske and Schnall (2012). Participants were asked what they thought of healthy students using cognitive enhancers to increase mental performance if there are (a) no negative side effects on health, (b) temporary negative side effects on health, and (c) long-term negative side effects on health, and responded on a scale from 0 (*perfectly OK*) to 10 (*extremely wrong*).

To measure positive attitudes toward regulation of cognitive enhancers (pro-regulation attitudes), we used the 3-item measure from Sweeney (2010) asking participants to what extent

they agreed that a university policy should exist to prevent the use of stimulant drugs, promote student safety, and allow a fair academic standard for students (see Supplementary Material A, Section 5 for items and response scale).

### 2.3. Data screening

Because multivariate outliers can distort the results of correlation analyses, we excluded four participants who showed a Mahalanobis distance larger than the critical value of  $\chi^2(16) = 39.25, p < .001$ . With this, the final sample comprised 268 participants. Next, we examined the data for possible gender differences by computing a MANOVA with gender as between-participants factor and the measures as dependent variables. The effect of gender was nonsignificant with  $F(15, 251) = 1.15, p = .308$ . Consequently, all analyses were collapsed across gender. Finally, we examined the reliability of the measures. All measures displayed satisfactory reliabilities (Cronbach's alphas  $\geq .70$ ) except societal pressure (alpha = .64; see Supplementary Material B). Still, we decided to retain societal pressure to be able to compare societal pressure and peer pressure.

## 3. Results

### 3.1. Frost et al.'s (1990) model

First, we examined the bivariate correlations of the four dimensions of Frost et al.'s (1990) model of perfectionism with attitudes toward cognitive enhancers (see Table 1). Whereas personal standards showed no significant correlations, concerns and doubts showed a positive correlation with positive attitudes toward cognitive enhancers, the perception that taking cognitive enhancers is cheating, and the inclination to succumb to societal and peer pressure to take cognitive enhancers. Parental pressure to be perfect also showed a positive correlation with positive attitudes toward cognitive enhancers, the perception that taking cognitive enhancers is cheating, and the inclination to succumb to societal pressure (but not peer pressure) to take cognitive enhancers. In addition, parental pressure showed a negative correlation with health and safety concerns. In contrast, organization showed a negative correlation with positive attitudes toward cognitive enhancers and a positive correlation with health and safety concerns. Moreover, it showed a negative correlation with the moral acceptability of using cognitive enhancers and a positive correlation with pro-regulation attitudes.

Because the four perfectionism dimensions showed significant intercorrelations ranging from  $r = -.14, p < .05$  (parental pressure, organization) to  $r = .57, p < .001$  (concerns and doubts, parental pressure), we computed partial correlations controlling for the dimensions'

intercorrelations to examine the unique relationships that the dimensions showed with attitudes toward cognitive enhancers (see again Table 1). Results showed that, once the overlap with the other perfectionism dimensions was controlled for, personal standards showed a negative correlation with the inclination to succumb to societal pressure to use cognitive enhancers. Concern and doubts continued to show positive correlations with societal and peer pressure, but ceased to show significant correlations with positive attitudes toward cognitive enhancers and the perception that taking cognitive enhancers is cheating. Parental pressure continued to show a positive correlation with positive attitudes and a negative correlation with health and safety concerns, but ceased to show significant correlations with societal pressure and the perception that taking cognitive enhancers is cheating. Instead, it showed a positive correlation with the perception that taking cognitive enhancers is necessary. Organization ceased to show significant correlations with positive attitudes and moral acceptability, but continued to show positive correlations with health and safety concerns and pro-regulation attitudes.

### 3.2. Hewitt and Flett's (1991) model

Next, we examined the bivariate correlations of the three dimensions of Hewitt and Flett's (1991) model of perfectionism with attitudes toward cognitive enhancers (see Table 2). Self-oriented perfectionism showed a negative correlation with positive attitudes toward cognitive enhancers, moral acceptability of cognitive enhancers, and the perception that taking cognitive enhancers is necessary. Moreover, it showed a positive correlation with health and safety concerns and pro-regulation attitudes, but also a positive correlation with the inclination to succumb to peer pressure to take cognitive enhancers. Whereas other-oriented perfectionism showed no significant correlations, socially prescribed showed a positive correlation with positive attitudes, the perception that taking cognitive enhancers is cheating, and the inclination to succumb to societal and peer pressure to take cognitive enhancers.

Because the three perfectionism dimensions showed significant intercorrelations ranging from  $r = .41, p < .001$  (self-oriented perfectionism, socially prescribed perfectionism) to  $r = .43, p < .001$  (self-oriented perfectionism, other-oriented perfectionism), we computed partial correlations to examine the unique relationships that the three dimensions showed with attitudes toward cognitive enhancers (see again Table 2). Results showed that self-oriented perfectionism displayed the same pattern of significant correlations when the overlap was controlled for as in the bivariate correlations confirming that the correlations represented unique relationships of self-oriented perfectionism. The same held for socially prescribed perfectionism with the notable

exception that, once the overlap with the other dimensions of perfectionism was controlled for, socially prescribed perfectionism continued to show a positive correlation with societal pressure, but ceased to show a significant correlation with peer pressure. Other-oriented continued to show no significant correlations.

#### 4. Discussion

##### 4.1. The present findings

The aim of the present study was to provide a first investigation of the relationships that multidimensional perfectionism shows with attitudes toward cognitive enhancers (“smart drugs”). Examining a sample of university students and investigating the unique relationships of the different dimensions of perfectionism from two multidimensional models of perfectionism (Frost et al., 1990; Hewitt & Flett, 1991), the present study found perfectionism to show different relationships with attitudes toward cognitive enhancers depending on what dimension was examined. Focusing on the partial correlations (taking the overlap of the perfectionism dimensions within the models into account), socially prescribed perfectionism, perfectionist concerns and doubts, and parental pressure to be perfect showed positive correlations with positive attitudes toward cognitive enhancers, perceptions that taking cognitive enhancers is necessary, and both societal and peer pressure to take cognitive enhancers. Moreover, they showed negative correlations with health and safety concerns. With this, the findings suggest that these perfectionism dimensions represent risk factors for the use of cognitive enhancers because they are associated with attitudes that should increase the likelihood of taking cognitive enhancers. The only exception in this pattern was that socially prescribed perfectionism showed a positive correlation with perceptions that taking cognitive enhancers is cheating, which should decrease the likelihood of taking cognitive enhancers (Dodge et al., 2012).

In contrast, self-oriented perfectionism, perfectionist personal standards, and organization showed negative correlations with positive attitudes toward cognitive enhancers, moral acceptability of using cognitive enhancers, and perceptions that taking cognitive enhancers is necessary. Moreover, they showed positive correlations with health and safety concerns and pro-regulation attitudes. With this, the findings suggest that these perfectionism dimensions represent protective factors against the use of cognitive enhancers because they are associated with attitudes that should decrease the likelihood of taking cognitive enhancers. The only exception in this pattern was that self-oriented perfectionism showed a positive correlation with peer pressure to take cognitive enhancers which should increase the likelihood of taking cognitive enhancers

(Fitz et al., 2014). Whereas this correlation seems counterintuitive (why should *self*-oriented perfectionism show a positive correlation with peer-pressure?), the correlation makes sense if we recall how peer pressure was measured. Participants were presented with a vignette in which the protagonist (not taking cognitive enhancers) showed moderate performance whereas his/her colleagues (taking cognitive enhancers) showed superior performance. As self-oriented perfectionistic strivings have been associated with hypercompetitiveness (“having to be the best”) (Flett & Hewitt, 2014), this may explain why self-oriented perfectionists would feel pressure to take cognitive enhancers if their peers took cognitive enhancers, because else they would not be competitive.

Finally, it was noteworthy that other-oriented perfectionism—expecting perfection from others—did not show any significant correlations with attitudes toward cognitive enhancers. As to why we can only speculate, but one possibility is that other-oriented perfectionists are individualistic, have a positive self-regard, and feel superior to others (Stoeber, 2014, in press). Consequently, they may not be interested in, or feel pressured to use, cognitive enhancers.

#### 4.2. Limitations and future studies

Our study had a number of limitations. First, the study was largely exploratory, and future studies need to replicate the findings. Second, the sample was predominantly female (87%). Whereas this is representative of British university students in psychology (Deevybee, 2012), future studies should reinvestigate our findings examining student samples with a greater proportion of men to confirm that the findings generalize to male students. Third, the study used vignettes representing participants with hypothetical scenarios to measure attitudes. Even though this method is frequently used in attitude research (Schoenberg, & Ravdal, 2000) and has shown validity in emotion research (Robinson & Clore, 2001), the findings should be interpreted with caution particularly as the size of the relationships between perfectionism and attitudes toward cognitive enhancers was rather small (cf. Cohen, 1992) and the measure of societal pressure showed an unsatisfactory reliability. Finally, it is important to note that the present study investigated attitudes toward cognitive enhancers, not the use of cognitive enhancers. Future studies may therefore profit from expanding on the present study by including measures assessing the actual use of (or intention to use) cognitive enhancers.

#### 4.3. Conclusions

The present study is the first to examine the relationships between multidimensional perfectionism and attitudes toward cognitive enhancers (“smart drugs”). Dovetailing with recent

findings that perfectionism shows both positive and negative relationships with positive attitudes toward doping in athletes (Madigan et al., in press), the present study found that some dimensions of perfectionism showed positive correlations with attitudes favoring the use of cognitive enhancers whereas other dimensions showed negative correlations. The findings suggest that perfectionism may play a role as both a risk factor for and a protective factor against using cognitive enhancers depending on what dimensions of perfectionism are regarded.

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Table 1

*Frost et al.'s (1990) Model of Perfectionism and Attitudes Toward Cognitive Enhancers (CEs)*

|                            | Bivariate correlations |        |         |        | Partial correlations |        |        |       |
|----------------------------|------------------------|--------|---------|--------|----------------------|--------|--------|-------|
|                            | PS                     | CD     | PP      | O      | PS                   | CD     | PP     | O     |
| Attitudes toward CEs       |                        |        |         |        |                      |        |        |       |
| Positive attitudes         | -.04                   | .14*   | .26***  | -.17** | -.11                 | .06    | .21*** | -.08  |
| Moral acceptability        | -.11                   | -.04   | .04     | -.16*  | -.05                 | -.04   | .06    | -.11  |
| Perceptions of misuse      |                        |        |         |        |                      |        |        |       |
| Taking CEs is cheating     | .09                    | .18**  | .15*    | -.03   | .01                  | .10    | .05    | -.03  |
| Taking CEs is necessary    | -.10                   | .07    | .10     | -.11   | -.07                 | -.10   | .16**  | -.04  |
| Pressure to take CEs       |                        |        |         |        |                      |        |        |       |
| Societal pressure          | -.03                   | .21*** | .18**   | -.11   | -.15*                | .20**  | .07    | -.04  |
| Peer pressure              | .04                    | .20*** | .09     | .04    | -.10                 | .20*** | -.01   | .07   |
| Authenticity               | -.10                   | -.03   | .04     | -.11   | -.08                 | -.01   | .05    | -.07  |
| Health and safety concerns | -.07                   | .04    | -.20*** | .24*** | .03                  | .01    | -.16** | .19** |
| Pro-regulation attitudes   | .11                    | .06    | .04     | .14*   | .04                  | .01    | .02    | .12*  |

*Note.*  $N = 268$ . PS = personal standards, CD = concerns and doubts (concern over mistakes and doubts about actions), PP = parental pressure (parental expectations and parental criticism), O = organization (cf. Stumpf & Parker, 2000).

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

Table 2

*Hewitt and Flett's (1991) Model of Perfectionism and Attitudes Toward Cognitive Enhancers (CEs)*

|                            | Bivariate correlations |      |       | Partial correlations |      |        |
|----------------------------|------------------------|------|-------|----------------------|------|--------|
|                            | SOP                    | OOP  | SPP   | SOP                  | OOP  | SPP    |
| Attitudes toward CEs       |                        |      |       |                      |      |        |
| Positive attitudes         | -.13*                  | .06  | .17** | -.23***              | .06  | .23*** |
| Moral acceptability        | -.16**                 | .00  | -.05  | -.17**               | .07  | .00    |
| Perceptions of misuse      |                        |      |       |                      |      |        |
| Taking CEs is cheating     | .12                    | .08  | .17** | .05                  | -.01 | .13*   |
| Taking CEs is necessary    | -.20**                 | -.04 | .00   | -.21***              | .03  | .08    |
| Pressure to take CEs       |                        |      |       |                      |      |        |
| Societal pressure          | .07                    | .05  | .16** | .01                  | -.02 | .15*   |
| Peer pressure              | .18**                  | .07  | .13*  | .14*                 | -.02 | .06    |
| Authenticity               | .08                    | .04  | .01   | -.11                 | .08  | .02    |
| Health and safety concerns | .18**                  | -.05 | -.06  | .25***               | -.11 | -.11   |
| Pro-regulation attitudes   | .16**                  | .01  | .09   | .15*                 | -.07 | .05    |

*Note.*  $N = 268$ . SOP = self-oriented perfectionism, OOP = other-oriented perfectionism, SPP = socially prescribed perfectionism.

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

## Supplementary Material A

**1. Cognitive Enhancement Attitude Scale (CEAS)**

## 1.1. Instructions

The following items are designed to measure attitudes people have towards the use of “cognitive enhancers.”

Cognitive enhancers are prescription drugs like Ritalin®, Adderall®, and Provigil® that were developed for the treatment of cognitive decline (e.g., dementia in elderly people) or cognitive disturbance in younger people (e.g., attention deficit hyperactivity disorder, ADHD), but can also be used to enhance cognitive performance (e.g., concentration, memory function) in healthy individuals.

The present study does NOT investigate attitudes towards illegal drugs like cocaine or “speed” that can also enhance cognitive performance. Throughout this questionnaire, the term “cognitive enhancers” always refers to prescription drugs used to enhance cognitive performance. Please read each statement and decide whether you agree or disagree and to what extent. If you strongly disagree, choose 1; if you strongly agree, choose 6; if you feel somewhere in between, choose any one of the numbers between 1 and 6.

## 1.2. Items

1. A wider use of cognitive enhancers would be beneficial for university studies.
2. Taking cognitive enhancers is necessary to achieve the best academic performance.
3. The risks related to taking cognitive enhancers are exaggerated.
4. Cognitive enhancers give the motivation to study at the highest level.
5. Students should not feel guilty about taking cognitive enhancers.
6. Students are pressured to take cognitive enhancers.
7. Health problems related to studying until late at night are just as bad as from using cognitive enhancers.
8. The media blow the issue of students’ using cognitive enhancers out of proportion.
9. Media should talk less about cognitive enhancers.
10. The use of cognitive enhancers is defensible because students have no career choices if they do not get good grades.
11. Students, who use cognitive enhancers, use them because they help them in academic situations.
12. Cognitive enhancers help to overcome boredom during studying.

13. Taking cognitive enhancers is an unavoidable part of academic life.

14. Students often lose time due to illness or tiredness, and cognitive enhancers can help to make up for the lost time.

15. Taking cognitive enhancers is not cheating since everyone does it.

16. Only the quality of academic performance should matter, not the way students achieve it.

17. There is no difference between taking cognitive enhancers, using past exam papers, and getting additional help from tutors that are all used to enhance academic performance.

*Note.* Items adapted from the Performance Enhancement Attitude Scale (Petróczi & Aidman, 2009).

## 2. Perceptions of Misuse

It is exam time. Sam wants to do well on his/her exams but is concerned that his/her grades may be low. He/she does not have much time and is worried that he/she will have trouble focusing on his/her work when studying.

Last night Sam went to the library and had trouble focusing. Sam's friend Chris has a prescription for Adderall® pills. Sam decides to ask Chris for a few of the Adderall® pills because Sam has heard the pills help people focus. Sam takes the pills and several days later, receives his/her grades. They are higher than expected.

Item 1. Sam is a cheater for using Adderall®.

Item 2. Taking Adderall® was necessary for Sam to do well.

Participants responded to the items on a scale from  $-2$  (*strongly disagree*) to  $2$  (*strongly agree*).

*Note.* Vignette and items adapted from Dubljević, Sattler, and Racine (2013).

## 3. Pressure

### 3.1. Soft societal pressure

Imagine that you are a paralegal at a large law firm. As part of your job, you are required to retain large amounts of information—your ability to remember details is a key skill. You have been doing only moderately well at work, and as a result last year you received a smaller bonus than you had hoped.

You read a magazine article describing a new pill that improves memory. The pill strengthens neural pathways by altering the levels of several neurotransmitter systems in the

brain. The result is a substantial improvement in memory. The pill does not put knowledge into the brain, but rather makes it easier to retain information; one pill per day is enough to enhance one's ability to remember things for the next 24 hours, and the expense of its daily use adds up to roughly the cost of your daily cup of coffee. The pill has been shown to be safe; as a result, it has been approved for use by normal, healthy adults.

As performance reviews are only a few months off, you consider whether to make use of this cognitive enhancement technology.

Item 1. Given the situation, how likely would you be to use the pill?

Item 2. Please indicate the extent to which you agree with the following statement: "Given the situation, I would feel pressured to use the pill."

Item 3. How bothered would you be by the pressure to use the pill?

Participants responded to Item 1 on a scale from 1 (*highly unlikely*) to 9 (*highly likely*), to Item 2 on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*), and to Item 3 on a scale from 1 (*not at all bothered*) to 9 (*strongly bothered*).

### 3.2. Soft peer pressure

Now imagine the same scenario but with some additional information (**boldfaced**).

Imagine that you are a paralegal at a large law firm. As part of your job, you are required to retain large amounts of information—your ability to remember details is a key skill. You have been doing only moderately well at work and as a result last year you received a smaller bonus than you had hoped.

You read a magazine article describing a new pill that improves memory. The pill strengthens neural pathways by altering the levels of several neurotransmitter systems in the brain. The result is a substantial improvement in memory. The pill does not put knowledge into the brain, but rather makes it easier to retain information; one pill per day is enough to enhance one's ability to remember things for the next 24 hours, and the expense of its daily use adds up to roughly the cost of your daily cup of coffee. The pill has been shown to be safe; as a result, it has been approved for use by normal, healthy adults.

**You subsequently learn that some of your co-workers have been using the very same memory improvement method, and as a result they exceeded their performance goals this past year, receiving a full bonus.**

As performance reviews are only a few months off, you consider whether to make use of this cognitive enhancement technology.

Item 1. Given the situation, how likely would you be to use the pill?

Item 2. Please indicate the extent to which you agree with the following statement: “Given the situation, I would feel pressured to use the pill.”

Item 3. How bothered would you be by the pressure to use the pill?

Participants responded to Item 1 on a scale from 1 (*highly unlikely*) to 9 (*highly likely*), to Item 2 on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*), and to Item 3 on a scale from 1 (*not at all bothered*) to 9 (*strongly bothered*).

*Note.* Vignettes and items adapted from Dodge, Williams, Marzell, and Turrisi (2012).

#### 4. Authenticity

Alex is a normal, healthy, 27 year-old employee at a software company. He/she is aware that he/she is being considered for promotion, and he/she has just been assigned a new project. The job is quite complicated, and it is very useful for him/her to be able to keep lots of information in his/her head and work through mental fatigue. Unfortunately, he/she has been struggling to get the job complete in his/her normal 8-hour day; it seems that unless he/she puts in 10 hours of hard work, he/she cannot get everything done. Alex carools to work, making it difficult for him/her to put in more than 8 hours per day.

During a lunch break he/she reads a magazine article about a cognitive enhancing pill. The article describes a pill that is both safe and effective, and must be used five days per week for four weeks to get the full effect. The cognitive-enhancing pill does not put information into the brain—it is not magic—but it does allow people to keep more information in their brains than they would otherwise. Alex decides to use the pill. After 4 weeks he/she is able to comfortably finish his/her work each day in 8 hours. The following month Alex receives a glowing performance review.

Item 1. To what degree do you think that Alex’s performance is “authentic” (i.e., a true or accurate representation of his/her ability)?

Item 2. How worthy do you think Alex is of promotion?

Participants responded to Item 1 on a scale from 1 (*not at all authentic*) to 9 (*completely authentic*), and to Item 2 on a scale from 1 (*highly unworthy*) to 9 (*highly worthy*).

*Note.* Vignette and items adapted from Fitz, Nadler, Manogaran, Chong, and Reiner (2014).

#### 5. Pro-Regulation Attitudes

Item 1. A university policy should exist preventing the use of stimulant drugs without a

prescription on campus.

Item 2. A university policy surrounding stimulants would promote student safety.

Item 3. A university policy surrounding stimulants would allow a fair academic standard for students.

Participants responded to the items on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*).

*Note.* Items from Sweeney (2010).

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## Supplementary Material B

Table

*Means, Standard Deviations, and Cronbach's Alphas*

|                                   | <i>M</i> | <i>SD</i> | $\alpha$ |
|-----------------------------------|----------|-----------|----------|
| Multidimensional perfectionism    |          |           |          |
| Frost et al.'s (1990) model       |          |           |          |
| Personal standards                | 3.33     | 0.73      | .82      |
| Concerns and doubts               | 2.90     | 0.80      | .91      |
| Parental pressure                 | 2.65     | 0.84      | .89      |
| Organization                      | 3.77     | 0.80      | .90      |
| Hewitt and Flett's (1991) model   |          |           |          |
| Self-oriented perfectionism       | 4.73     | 0.94      | .90      |
| Other-oriented perfectionism      | 3.87     | 0.70      | .77      |
| Socially prescribed perfectionism | 3.81     | 0.88      | .87      |
| Attitudes toward CEs              |          |           |          |
| Positive attitudes                | 2.86     | 0.83      | .91      |
| Moral acceptability               | 3.02     | 1.59      | .91      |
| Perceptions of misuse             |          |           |          |
| Taking CEs is cheating            | 3.01     | 1.16      | n/a      |
| Taking CEs is necessary           | 2.33     | 1.10      | n/a      |
| Pressure to take CEs              |          |           |          |
| Societal pressure                 | 4.63     | 1.77      | .64      |
| Peer pressure                     | 5.60     | 1.91      | .70      |
| Authenticity                      | 4.64     | 1.73      | .81      |
| Health and safety concerns        | 8.06     | 1.96      | .85      |
| Pro-regulation attitudes          | 3.66     | 0.82      | .79      |

*Note.*  $N = 268$ . CEs = cognitive enhancers. Concerns and doubts = concern over mistakes and doubts about actions, parental pressure = parental expectations and parental criticism (cf. Stumpf & Parker, 2000). Scores were computed by averaging item responses.  $\alpha$  = Cronbach's alpha. n/a =

not applicable (single item).

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