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Title: Self-Regulation Strategies Improve Self-Discipline in Adolescents: Benefits of Mental Contrasting and Implementation Intentions

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Abstract: Background: Adolescents struggle with goals that require sustained self-discipline. Research on adults indicates that goal commitment is enhanced by mental contrasting, a strategy involving the cognitive elaboration of a desired future with relevant obstacles. Implementation intentions, which identify the action one will take when a goal-relevant opportunity arises, represent a strategy shown to increase goal attainment when commitment is high.

Aims: This study tests the effect of mental contrasting combined with implementation intentions on successful goal implementation in adolescents.

Sample: Sixty-six high school adolescents in the United States preparing to take the PSAT, a standardized, college entrance examination.

Method: Participants were randomly assigned to condition. In the intervention condition, participants completed a written mental contrasting and implementation intention exercise, and in the placebo control condition, participants wrote a practice essay for the writing section of the PSAT. Books containing practice PSAT questions were sent home to all participants and collected several months later.

Results: Participants in the intervention condition completed 63% more PSAT practice questions over the summer than did participants in the control condition.

Conclusions: The current investigation suggests that the direct instruction of self-regulatory strategies is possible. Teachers might easily incorporate techniques such as mental contrasting and making implementation intentions into existing classroom instruction.

Running head: IMPROVING SELF-DISCIPLINE IN ADOLESCENTS

Self-Regulation Strategies Improve Self-Discipline in Adolescents:  
Benefits of Mental Contrasting and Implementation Intentions

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### Abstract

**Background:** Adolescents struggle with goals that require sustained self-discipline. Research on adults indicates that goal commitment is enhanced by mental contrasting, a strategy involving the cognitive elaboration of a desired future with relevant obstacles. Implementation intentions, which identify the action one will take when a goal-relevant opportunity arises, represent a strategy shown to increase goal attainment when commitment is high.

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Self-Regulation Strategies Improve Self-Discipline in Adolescents:  
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Research on goal pursuit has long distinguished between aspects of *goal-setting*, such as goal choice and commitment, and aspects of *goal-striving*, such as goal enactment and shielding (Lewin, Dembo, Festinger, & Sears, 1944; see also Atkinson, 1957; Carver & Scheier, 1999; Heckhausen & Gollwitzer, 1987; Locke & Latham, 1990; Oettingen & Gollwitzer, 2001; Shah & Kruglanski, 2002). Successful goal attainment requires sufficient commitment to goals (i.e., the *goal-setting* phase of goal pursuit; Gollwitzer, 1999). It also requires the planning and enactment of appropriate goal-oriented behaviors during the subsequent goal-striving phase, or what have been called the *implemental phase* and *action phase* of goal pursuit, respectively (Gollwitzer, 1999).

*Mental contrasting*, the contrasting of fantasies about a desired future with reflections about its impeding reality, is a strategy that leads to strong commitment in adults (Oettingen, 2000; Oettingen, Pak, & Schnetter, 2001). Strong goal commitment is necessary but not sufficient to attain goals. Numerous problems can thwart goal pursuit (e.g., missed opportunities to act, distraction, bad habits, the difficulty or unpleasantness of required action, etc.) Supplementing a goal to which an individual feels committed with an *implementation intention*, a plan that details when, where, and how the individual will take action, makes goal realization more probable (Gollwitzer, 1999; Sheeran, Webb, & Gollwitzer, 2005).

In this paper, we observe the effects of an intervention that prompts both mental contrasting (to ensure goal commitment) and the subsequent formation of implementation intentions (to ensure goal realization) on “real-world” adolescent self-regulation.

*Mental Contrasting as a Self-Regulatory Strategy of Goal Setting*

The model of fantasy realization (Oettingen 1999, 2000; Oettingen, Pak, & Schnetter, 2001) delineates three different routes to commit to goals: indulging, dwelling, and mental contrasting. Indulging entails fantasizing about a positive future without consideration of the negative reality standing in the way of realizing this desired future (Oettingen & Mayer, 2002). Dwelling entails reflecting on the negative reality without elaboration of the desired future. Finally, mental contrasting entails conjoint mental elaboration of the desired future and the present negative reality, thereby making both simultaneously accessible. As in mental contrasting the positive future is elaborated first and the negative reality is viewed as “standing in the way” of realizing the positive future, thereby emphasizing a necessity to act to attain the desired future. When perceived chances of successfully realizing the positive future (expectations of success) are high, mental contrasting energizes the individual to take action thus leading to stronger goal commitments than indulging and dwelling.

The model of fantasy realization is supported by evidence from experimental studies in various domains (Oettingen, 2000; Oettingen, Pak, & Schnetter, 2001; Oettingen, Hönig, & Gollwitzer, 2000). In the academic and professional domains, for example, experiments involved improving in math (Oettingen et al., 2001; Study 4), studying abroad (Oettingen et al., 2001, Study 2), combining work and family life (Oettingen, 2000), acquiring a second language (Oettingen, Hönig, & Gollwitzer, 2000), and developing one’s professional skills (Oettingen, Mayer, Thorpe, Janetzke, & Lorenz, 2005). In the interpersonal domain, experiments have focused on solving interpersonal conflicts (Oettingen et al., 2001, Studies 1 and 2), on getting to know an attractive stranger (Oettingen, 2000, Study 1), and on successfully seeking help (Oettingen, Mayer, Stephens, & Brinkmann, 2009). In the health domain, experiments have addressed smoking cessation (Oettingen, Mayer, & Thorpe, 2009)

and coping with acute stressors (Oettingen et al., in press).

*Forming If-Then Plans as a Self-Regulatory Strategy of Goal Implementation*

Gollwitzer (1999) suggested a self-regulatory strategy of goal implementation that consists of making if-then plans (i.e., forming implementation intentions). Whereas mere goals (or goal intentions) have the format of “I intend to achieve x!” whereby x may specify a desired outcome or behavior, implementation intentions take the form of “And if situation y occurs, then I will perform the goal-directed behavior z!” For example, an individual may have the goal intention to lose weight and may furnish this goal with an implementation intention, such as “If I am dining at a restaurant and the waiter asks for my order, then I will ask for a salad.” In the presence of the critical situation, the intended goal-directed behavior is initiated immediately (Gollwitzer & Brandstätter, 1997), effortlessly (Brandstätter, Lengfelder, & Gollwitzer, 2001) and without conscious intent (Bayer, Achtziger, Gollwitzer, & Moskowitz, in press). By identifying critical opportunities and appropriate goal-directed actions in advance, these plans help individuals overcome many common challenges to successful goal attainment (summaries by Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). These challenges, broadly construed, involve *getting started* and *staying on track*.

*Getting started* involves recognizing and seizing opportunities to act, as well as overcoming any reluctance to act (due, for example, to the unpleasantness of the act). People who furnish their goals with implementation intentions act on their goals more reliably during inconvenient times such as holidays or busy days (Gollwitzer & Brandstätter, 1997; Oettingen, Hönig, & Gollwitzer, 2000, Studies 2 and 3), when goal-directed actions are unpleasant (e.g., performing regular breast examinations, Orbell, Hodgkins, & Sheeran, 1997; cervical cancer

screenings, Sheeran & Orbell, 2000; resumption of functional activity after joint replacement surgery, Orbell & Sheeran, 2000) and when goal-directed actions are easy to forget (e.g., regular intake of vitamin pills, Sheeran & Orbell, 1999; signing of worksheets in a test battery, Chasteen, Park, & Schwarz, 2001). Implementation intentions also protect ongoing goal-directed activity from getting derailed (i.e., *staying on track*). For instance, implementation intentions help individuals control intrusive thoughts and feelings (Gollwitzer & Schaal, 1998), and they shield goal striving from detrimental self-states (e.g., ego-depletion; Webb & Sheeran, 2003) and adverse situational influences (e.g., a loss-framed negotiation setting; Trötschel & Gollwitzer, 2007).

#### *The Effectiveness of Mental Contrasting and Implementation Intentions among Adolescents*

Adolescents are known to struggle with the pursuit of goals that require sustained, long-term self-regulation (Pintrich & Zusho, 2002; Reyna & Farley, 2006). In particular, adolescents are challenged with academic responsibilities which, in the short-term, are not necessarily immediately gratifying. Indeed, even adolescents who do well in school report being neither happy nor intrinsically motivated while they study; rather, most adolescents study in order to achieve long-term goals, including getting good marks (Wong & Csikszentmihalyi, 1991). Self-discipline predicts academic achievement among adolescents, including performance on standardized tests, independently of IQ (Duckworth & Seligman, 2005). Unfortunately, many adolescents do not employ adaptive self-regulatory strategies and thus fail to capitalize on their intellectual potential.

The current study sought to determine the benefits of mental contrasting and implementation intentions for goal striving among college-bound high school sophomores

preparing to take the PSAT the following fall. Preparation for the PSAT requires self-directed studying and practice-test taking throughout the summer, a generally unstructured and largely unsupervised time for adolescents. While many studies have shown both mental contrasting and implementation intention strategies to increase goal attainment among adult participants, the current investigation examines possible benefits of integrating these strategies to help adolescents complete practice PSAT problems during the summer before junior year.

## Method

### *Participants*

Participants were sixty-six 10<sup>th</sup> graders from a socioeconomically and ethnically diverse urban public school in the Northeast. Admission to this high school is selective and based on evidence of prior academic achievement. Nearly all students attend 2- or 4-year colleges upon graduation and therefore general motivation to do well on the PSAT test is high.

Approximately 12% of students at this school are low-income as indicated by eligibility for federally subsidized free- or reduced-price lunch. Participants were randomly assigned and were blind to either an intervention or control condition. Of 107 students in the 10<sup>th</sup> grade at this school, 91 provided written parent and child consent. On the day of the experiment, a field trip prevented 22 students from participating; the remaining 69 participants were in class. Of 37 students randomly assigned to the intervention group, 2 did not return their PSAT books at the conclusion of the study. Of 32 students in the control group, 1 did not return the PSAT book at the conclusion of the study. These three participants were excluded from all analyses. Participants averaged 16.07 years of age ( $SD = .33$ ). Thirty-five participants were Caucasian,

23 were African-American, 5 were Asian, 2 were Latino, and 1 was Native American; 49% were female.

### *Measures and Procedure*

In May, participants completed an assignment during English class to help them “practice for the writing section of the PSAT.” The control and experimental writing packets were identical for the first pages: To measure expectations of success and incentive valence, all participants answered questions about the likelihood and importance of completing PSAT preparation workbooks that they knew would be given to them at the start of summer vacation. Specifically, to measure expectations of success, participants answered “How likely do you think it is that you will complete all 10 practice tests in the PSAT workbook?” using a 7-point Likert scale where 1 = *not at all likely* and 7 = *very likely* and to measure incentive valence, we asked “How important is it to you to complete all 10 practice tests in the PSAT workbook?” using a 7-point Likert scale where 1 = *not at all important* and 7 = *very important*. All participants then wrote down two positive outcomes they associated with completing all the practice tests in the workbook (e.g., “I would feel good about myself”) and two obstacles of present reality (e.g., “I’m too busy”) that could interfere with this task.

On the final pages of the control packet, participants wrote a short essay about an influential person or event in their life. In contrast, the final pages of the intervention packet asked students to rewrite the first previously stated positive outcome associated with completing the practice questions, to elaborate on this outcome in writing after imagining it “as vividly as possible,” and then to do the same imagining and written elaboration for the first obstacle. The same steps were repeated for the second positive outcome and obstacle. The intervention packet then directed students to rewrite both obstacles and propose a specific

solution for each one, completing two if-then plans (i.e., implementation intentions) in the form: “If [obstacle], then I will [solution].” Finally, participants completed a third if-then implementation intention specifying where and when they intended to complete the workbook that summer.

In July participants were mailed Barron’s 12<sup>th</sup> edition of *How to Prepare for the PSAT*. These workbooks were collected in October immediately after participants completed their PSAT. Two research assistants blind to condition counted the number of test questions completed in each book. In cases where coders disagreed, books were re-examined until a consensus was reached<sup>1</sup>. Upon returning their book, participants were asked whether they had taken a PSAT preparation course over the summer and were paid \$10. PSAT test scores for sophomore year (administered seven months prior to the experiment) and junior year as well as demographic information and sophomore year final GPA were collected from school records.

## Results

### *Participants Were Successfully Randomized*

The intervention group ( $M = 4.68$ ,  $SD = 1.62$ ) and control group ( $M = 4.46$ ,  $SD = 1.74$ ) did not differ on stated incentive valence (importance) of workbook completion,  $t(64) = 0.53$ ,  $p = .60$ ,  $d = 0.13$ . Likewise, the intervention group ( $M = 4.87$ ,  $SD = 1.69$ ) and control group ( $M = 4.43$ ,  $SD = 1.84$ ) did not differ in expectations of success (perceived likelihood) of workbook completion,  $t(64) = 1.02$ ,  $p = .31$ ,  $d = 0.32$ . The validity of these two single-item measures of incentive valence and perceived likelihood was verified by their predictive association with the number of PSAT practice questions completed,  $r = .21$ ,  $p = .09$  and  $r = .20$ ,  $p = .10$ , respectively. Students assigned to the control group had slightly higher GPAs ( $M = 89.75$ ,  $SD = 4.26$ ) than students in the experimental group ( $M = 87.97$ ,  $SD = 5.79$ ), but this difference was

not significant,  $t(64) = 1.41, p = .17, d = .35$ . According to College Board estimates, participants in both groups scored in the top 10% of college-bound sophomores for the state of Pennsylvania,  $M = 172.42, SD = 18.38$  for the intervention group and  $M = 171.09, SD = 23.16$  for the control group,  $t(64) = 0.26, p = .80, d = .06$ . Similarly, chi-square tests revealed no significant group differences in gender,  $\chi^2(1, N = 66) = 2.24, p = .14, phi = .18$ , or race,  $\chi^2(4, N = 66) = 7.95, p = .10, phi = .35$ .

*Workbook Completion was Higher in the Intervention Group*

Control group participants completed an average of 127 ( $SD = 139.20$ ) practice questions in their workbooks, compared to 207 questions ( $SD = 234.24$ ) completed by students in the intervention group,  $t(64) = 1.44, p = .15, d = .36$ . About 16% of students in the intervention group and 34% of students in the control group participated in a summer PSAT preparation course,  $\chi^2(1, N = 66) = 2.83, p = .09, phi = .21$ . Several students told us that their summer PSAT course instructor encouraged them to complete practice questions in the workbook we had provided. There was also a trend towards girls doing more questions than boys,  $t(64) = 0.85, p = 0.40, d = .22$ . We therefore controlled for gender and PSAT prep course participation in a simultaneous multiple regression model predicting completed practice questions from condition. As expected, when controlling for prep course participation and gender, participants in the intervention condition completed significantly more practice questions than their counterparts in the control group,  $\beta = .27, p = .04$ . To test the effect of condition on practice questions when controlling for incentive valence and expectations of success prior to our manipulation, we added to the above model the covariates of sophomore year PSAT scores and perceived importance and likelihood of completing questions. Condition explained almost as much variance as in the prior model,  $\beta = .23, p = .06$

Compliance coding provided further evidence for the effect of the intervention.

Specifically, the number of words used to elaborate the second positive outcome associated with completing the practice questions and the second obstacle predicted the number of practice questions completed by participants in the intervention condition,  $r = .31, p = .09$  and  $r = .40, p = .02$ , respectively.

*Evidence that Increased Practice Mediated the Effect of the Intervention on PSAT Scores*

We hypothesized that assignment to the intervention in May would increase PSAT scores the following October by increasing the number of practice questions completed during the intervening summer. MacKinnon, Fairchild, and Fritz (2007) have pointed out that such a mediation (i.e., condition  $\rightarrow$  practice questions completed during the summer  $\rightarrow$  improvements in PSAT scores from sophomore to junior year) may be present without a significant relationship between the antecedent and outcome variables, particularly in the case of complete mediation. The two essential steps to test in a mediating relationship are the paths from the antecedent to the mediator (condition  $\rightarrow$  practice questions) and from the mediator to the outcome (practice questions  $\rightarrow$  improvements in PSAT scores).

In a simultaneous multiple regression model predicting practice questions, the effect of condition was confirmed ( $\beta = .27, p = .03$ ) when controlling for participation in a PSAT prep course ( $\beta = .32, p = .01$ ), gender ( $\beta = -.16, p = .19$ ) and sophomore year PSAT scores ( $\beta = .22, p = .07$ ). Likewise, in a simultaneous multiple regression model predicting junior year PSAT scores, the effect of practice questions was confirmed ( $\beta = .14, p = .01$ ) when controlling for participation in a PSAT prep course ( $\beta = .09, p = .11$ ), gender ( $\beta = -.03, p = .52$ ) and sophomore year PSAT scores ( $\beta = .89, p < .001$ ). Thus, whereas a hierarchical multiple regression predicting junior year PSAT scores indicated there was no significant direct effect

of the intervention ( $\beta = -.02, p = .71$ ) when controlling for sophomore year PSAT scores ( $\beta = -.92, p < .001$ ), participation in a PSAT prep course ( $\beta = .12, p = .03$ ), and gender ( $\beta = -.05, p = .42$ ), there was nevertheless evidence for an indirect effect mediated by practice test questions, Sobel (1982) test,  $z = 1.69, p = .09$ .

One possible explanation for this pattern of findings is that whereas the intervention boosted PSAT scores by increasing practice questions completed over the summer, the placebo control assignment (i.e., drafting a practice essay for the writing portion of the PSAT exam) inadvertently boosted PSAT scores via a different mechanism (e.g., increased motivation to seek outside assistance with test preparation). MacKinnon et al. (2007) terms such a scenario *inconsistent mediation*, in which “at least one mediated effect has a different sign than other mediated or direct effects in the model... an overall X to Y relation may be nonsignificant, yet mediation exists” (p. 602). In particular, we speculated that control group participants elected to enroll in PSAT classes at twice the rate of intervention group participants either because the latter group was more successful in preparing for the PSAT on their own or that the act of writing a practice essay in the control condition increased motivation to seek formal assistance in PSAT preparation. A binary logistic regression model controlling for gender, sophomore year PSAT scores, and the number of PSAT practice questions completed revealed that, indeed, intervention group participants were 78% less likely than control group participants to enroll in a PSAT prep course,  $B = -1.50, OR = 0.22, p = .04$ . As noted above, participation in a prep course in turn marginally predicted higher junior year PSAT scores ( $\beta = .09, p = .11$ ) when controlling for gender, sophomore year PSAT scores, and the number of PSAT practice questions completed. The mediated path of Condition  $\rightarrow$  prep course participation  $\rightarrow$  PSAT scores did not, however, reach statistical significance,  $z = 1.27, p = .20$ . See Figure 1.

## Discussion

In summary, the use of mental contrasting (to ensure goal commitment) with implementation intentions (to facilitate goal implementation) increased completion of PSAT practice questions by 63% over the 3 months prior to taking the test in junior year. These results suggest that mental contrasting with subsequent forming of implementation intentions can be an effective self-regulation strategy for adolescents as well as adults. The results are particularly impressive given the brevity of the intervention, the length of time elapsing between the intervention and task conclusion, and the many temptations posed to participants (summer vacation). In light of recent findings suggesting that a major reason for adolescents falling short of their intellectual potential is a lack of self-discipline (Duckworth & Seligman, 2005), effective interventions geared at helping students to exercise self-discipline acquire pivotal importance.

Mediation analyses suggest that the intervention indirectly increased PSAT scores from sophomore to junior year by increasing the number of practice problems completed. However, this positive effect was countered by an unanticipated negative effect on elective participation in a formal PSAT preparation course. One possibility is that students in the intervention condition were less likely to enroll in a PSAT preparation course because they were more successful in preparing on their own. Alternatively, the placebo control condition of writing a practice PSAT essay may have increased motivation to prepare formally, particularly since our intervention took place the first year that the College Board included scores on the writing section in the calculation of the total PSAT score. Future studies should anticipate the possibility that increasing self-regulated goal striving may simultaneously decrease an individual's reliance on other individuals to accomplish a valued goal.

The current investigation faced other limitations. First, we did not obtain measures of goal commitment before, during, or after the three-month period in which participants were completing practice PSAT questions. Future studies should include a manipulation check to confirm the hypothesized mechanism of the mental contrasting component of the intervention (i.e., increased goal commitment). Second, because the intervention tested in this study combined mental contrasting with implementation intentions, the relative impact of each component on studying could not be assessed. Since implementation intentions are not effective in the absence of goal commitment (Sheeran, Webb, & Gollwitzer, 2005), we expect that both components of the intervention were necessary to its effectiveness. Future studies are needed using multiple intervention conditions to tease apart the independent and interactive effects of these strategies on behavior. Finally, a question we did not address in the current study was the extent to which the skills of mental contrasting and making implementation intentions generalized to other tasks beyond studying for the PSAT (for the health domain, Stadler, Oettingen, & Gollwitzer, in press). The domain-specificity of skill acquisition is well-known (Thorndike, 1901), but whether this principle also applies to basic self-regulatory strategies is untested. To assess such transfer, future studies should directly assess the acquisition of self-regulatory strategies in one domain (e.g., academic) on behavior change in other domains, such as physical exercise, healthy eating, and prosocial interaction.

The current investigation suggests that the direct instruction of self-regulatory strategies is possible. Indeed, teachers might easily incorporate techniques such as mental contrasting and making implementation intentions into existing curricula. For instance, when assigning long-term projects, students can be asked to discuss the benefits of completing an excellent project as well as the obstacles that are likely to hinder progress. A few additional minutes of

classroom time might be devoted to writing down where, when, and how students expect to complete the various components of the project. These simple strategies can lead to significant improvements in student performance.

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Footnote

<sup>1</sup>Because the distribution of completed practice questions was skewed right for both the experimental and control groups, we used a square root transformation of practice questions to approximate a normal distribution. This transformed variable was used in statistical analyses but, for ease of interpretation, untransformed values were used to report means.

Figure Captions

*Figure 1.* Mediation model for the effect of intervention condition on junior year PSAT scores

Figure 1

