Behavioral correlates of cheating: Environmental specificity and reward expectation

The Harvard community has made this article openly available. Please share how this access benefits you. Your story matters

Citation

Published Version
doi:10.1371/journal.pone.0186054

Citable link
http://nrs.harvard.edu/urn-3:HUL.InstRepos:34451661

Terms of Use
This article was downloaded from Harvard University’s DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA
Behavioral correlates of cheating: environmental specificity and reward expectation

Michael Isakov¹, Arnav Tripathy²

¹Lincoln-Sudbury Regional High School, Sudbury, Massachusetts, United States of America
²Department of Mathematics, Stanford University, Stanford, California, United States of America

Corresponding Author:

Michael Isakov¹

E-mail: michael.isakov.11@gmail.com (MI)
Abstract

Academic dishonesty has been and continues to be a major problem in America’s schools and universities. Such dishonesty is especially important in high schools, where grades earned directly impact the academic careers of students for many years to come. The rising pressure to get the best grades in school, get into the best college, and land the best paying job is a cycle that has made academic dishonesty increase exponentially. Thus, finding the widespread roots of cheating is more important now than ever. In this study, we focus on how societal norms and interactions with peers influence lying about scores in order to obtain a benefit in a high school population. We show that (1) the societal norms that go hand in hand with test-taking in school, as administered by a teacher, significantly dampen small-scale dishonesty, perhaps suggesting that environment-specific rewards offsets cheating; (2) providing reminders of societal norms via pre-reported average scores leads to more truthful self-reporting of honesty; (3) the matrix search task was shown to not depend on class difficulty, confirming its effectiveness as an appropriate method for this study; (4) males seem to cheat more than females; and (5) teenagers are more dishonest earlier in the day. We suggest that students understand that cheating is wrong, an idea backed up by the literature, and that an environment which clearly does not condone dishonesty helps dampen widespread cheating in certain instances. This dampening effect seems to be dependent on the reward that students thought they would get for exaggerating their performance.

Keywords: cheating; dishonesty; rewards; expectations; behavioral psychology
Introduction

Cheating is a complex and often contradictory phenomenon. It is well-established that humans choose cooperative options in many realistic scenarios, with cooperation or “playing fair” often shaped by social heuristics [1-3]. However, cheating in specific situations is still seen to be highly prevalent [4]. One particularly intriguing phenomenon is academic dishonesty. This is perhaps most evident in high schools, where grades earned are thought to pave the path to students’ futures. The rapidly rising expectations of high schoolers has brought levels of cheating to dizzying heights; as many as 90 percent of students reported cheating in high school or in college [5]. This is up from just under 25 percent in the 1940s. Maturity is often thought to be one of the main constraining factors for cheating. This is true in that younger students (freshman and sophomores in high school), cheat more than older kids on tests, homework, and essays[6, 7]. However, this trend is ‘reset’ upon entering a new environment, that is, younger students in college are more likely to cheat than older students in high schools, with overall cheating being similar in different environments. Thus, it appears that there are other things impacting dishonesty apart from physiology, knowledge, and general maturity.

Although cheating has important applications for school related activities, individuals who engage in academic dishonesty are also more likely to engage in unethical behavior outside of school [8, 9]. This is because individuals who succumb to the temptation to cheat have been shown to have less self-control than those who do not, a key point with many societal ramifications [5]. Considering that dishonesty is so common in academic and professional environments, we expect to find widespread dishonesty and corruption in other areas. With that
in mind, it must be noted that young children do not have nearly the same ability or willingness
to be dishonest, suggesting that it is not an innate property of humans.

Unethical practices by corporations costs the US tens of billions of dollars each year.
However, things that ordinary people would not consider problematic can prove to be when
occurring on a large scale in a population. For example, insurance fraud and small-scale tax
evasion by millions of people costs the US government more than $320 billion dollars in revenue
each year [10]. Such statistics beg the question of what so many different people could possibly
have in common if dishonesty is indeed not innate. That is, if humans understand fairness on an
intuitive level driven by both societal mechanisms and by social heuristics, what enables this
high level cheating in specific situations?

There are many root causes of academic dishonesty, perhaps one of the most important of
which is the idea of social conformity and societal pressure to succeed [11, 12]. Such societal
factors have the ability to affect large masses of people, making them suitable candidates for
explaining the widespread phenomenon of cheating. Many studies have shown that the people
around us affect our behavior in subtle ways [13]. Part of the reason that cheating in high schools
has reached such astronomical heights is that a self-perpetuating system of pressure and stress is
running in America’s high schools. In an age of online statistics concerning just about
everything, rising pressure is on students to succeed [14]. This increases stress, decreases actual
performance, and increases cheating, part of a horrible cycle that has led some researchers to
refer to cheating in high schools as an “epidemic “[5] . This issue is exacerbated by the fact that
many teachers are not fully aware of the stress they may be causing their students [15]. The idea
of necessary, objective success in school is a huge problem in our society, and has other
implications such as depression, brought on by the dichotomous thinking promoted by many ill-
advised parents. However, this is not the only thing that makes cheating as prevalent in American schools.

Conformity has been shown to have an incredibly powerful effect on people’s opinions and people’s’ actions, sometimes even causing individuals to give an obviously incorrect answer just to fit in with a group that is blatantly wrong about something [16]. Despite this being a prime candidate for why immoral academic behavior is so prevalent in our schools, surprisingly little research has been done on the topic. Many students seem to (correctly) believe that many of their peers are cheating and use this to justify their actions [17, 18]. However, another study came up with a seemingly contradictory finding – cheating decreased significantly in classes that reported high student cohesiveness in their classroom [19]. Furthermore, that study also found that cheaters operated on less mature stages of moral development, thus suggesting that cheating was an individual choice and not a result of true vicarious learning. Since many of the few field studies done on the topic have been self-reported surveys, more research, particularly more direct observational research, needs to be done in order to find what the true correlation between various social interactions and cheating is. It is important to note that different types of social interactions (such as the ones between friends, family, or strangers) could lead to different results in terms of promoting or inhibiting dishonest behavior.

An important influence of cheating, and one that often goes unmentioned, is the effect of the environment on the rate of dishonest behavior. This is a difficult factor to study because most test-taking situations where cheating is directly observed by researchers are outside of the usual learning environment, such as a classroom. Also, surveys, the most common way to study dishonest behavior, cannot realistically expect the participant to recall an accurate answer about places where they cheated. Much of the research in this area has focused on asking students
about their perceptions of classroom environments and then surveying the participant about
dishonesty there [19, 20]. The results of two different surveys conclusively found that different
classroom environments have significantly different levels of cheating, with similar qualities
describing classrooms with reduced levels of dishonesty in both the US and South Korea. This is
important in and of itself because it shows that research about how social interaction and
perception of the environment affects academic dishonesty in high school is probably
generalizable to other societies. However, nearly all of the aforementioned studies fail to
recognize the importance of the actual classroom in the dishonest experience. This oversight
leads us to believe that some conclusions may not representative of academic cheating as it
naturally occurs.

Previous studies have found that priming can make a significant difference on how much
people falsify their scores; for example, thinking about the Ten Commandments reportedly
eliminates statistically significant cheating. Some of those studies also found that creativity was
an important factor in academic dishonesty, that is, more creative people cheated more.
Interestingly, intelligence was not correlated with cheating in those studies[10, 21].

Different studies of cheating often come up with vastly different conclusions, probably
due to the sheer number of variables that can impact dishonesty. For example, increasing the
expected magnitude of reward for dishonesty was not found to significantly increase cheating.
However, other studies have studied something similar and have come up with opposite or
inconclusive results. One of the many variables that must be considered in such experiments is
perceived punishment for dishonesty. The effect of punishment on cheaters was found to be
dependent on the population, various environmental factors, and perceived benefit from
dishonesty [22-24]. Gender is also an interesting factor to consider when studying academic
dishonesty; many studies found that males cheat slightly more than females without a statistically significant result. For instance, a study of more than 270 students in Italy found no statistically significant difference between cheating in males and females, but proposed that a larger sample size or a different experiment might show one [25].

For this study, we collected and analyzed data from tests administered by teachers during class time in order to simulate the effect of the school environment on cheating. We delve into how various factors related to social behaviors relate to dishonesty, both individually, and when working in pairs.

**Materials and Methods**

All anonymized data is available online at https://sourceforge.net/projects/behavioral-correlates-cheating. The project was approved by the Massachusetts State Science and Engineering Fair SRC and the Lincoln-Sudbury Regional High School IRB. The project was reviewed and a form was signed (written consent) by three members of the school IRB. All participants gave written consent to the experiment, and consent on behalf of minors was given by participants’ parents. The IRB reviewed the method of consent used for minor participants in this study. Although participants were blinded to the goals during testing, teachers were instructed to debrief their students after all tests were administered.

In this study, we gave a matrix search task test to $N = 243$ students ($N_{\text{individual}} = 161$ split among 4 individual experimental conditions, and $N_{\text{pairs}} = 82$ split among 2 pair conditions) from different classes and grade levels at Lincoln-Sudbury Regional High School, a US high school located in Sudbury, MA. Participants were recruited through their teachers, who told students in their classes that this experiment would be taking place during class time. No exclusion criteria
were applied: all students were allowed to participate, and participation was voluntary (See Table 149 for a table of descriptive statistics on participants).

The individual conditions consisted of a control, where we collected and hand-graded the tests (N = 42), and three experimental versions, which involved self-reported scores by the students and the recycling of other testing materials to eliminate students’ anxiety over repercussions. The three experimental tests were different in that one was just self-reporting a score (N = 30), one where the participant was asked to list three qualities that described their best friend (priming; N = 60), and one where a false average of 11 matrices was given to the participants before they took the test (N = 29). The pair versions were divided into a control (N = 21 pairs) and experimental (N = 20 pairs) section, with double the questions. For the pair experimental there was no priming, resulting in a test analogous to the plain self-reported version from the individual conditions. Pairs were created randomly by a random number generator. We could see if people were dishonest by comparing the averages of the classes for the control and experimental groups – a large discrepancy would indicate cheating on the part of the experimental group. The test consisted of 20 or 40 (individual test and pair test, respectively) 4x3 matrices where the participant had to find the two numbers that sum up to 10 in as many matrices as they could in four minutes (see Fig. 1 for schematic of task). In the instructions, students were told that four randomly chosen students from each class would receive a Jolly Rancher for every matrix they correctly solved.
Fig. 1. Schematic of portion of matrix search task test. The bottom of the figure shows a larger view of one of the matrices, with the correct answer filled in blue. The real task had 20 matrices (individual condition) and two independent sets of 20 matrices (for a total of 40) for the pair condition.

After the test, participants were asked a series of post experimentation questions about how they perceived their honesty, intelligence, and popularity, as well as the class and the ‘block’ in which they were taking the test. We ranked the classes on a scale of 1-3, with 1 being the most difficult, to see if class difficulty correlated with score or the self-reported characteristics. The ‘block’ is a system of time used by the high school where we conducted this experiment, and was converted into a number 1-6 which represented when the class occurred.
during the day, with 1 being the earliest (at 7:50 A.M.). This data would be used to test if anything related to time, such as alertness, was correlated with academic dishonesty. We used peoples’ names to identify their gender. Outliers such as those with scores greater than the number of matrices given were removed from our analyses (N = 2). For this study, we mainly looked at the individual conditions, although we do bring some interesting findings about the pair conditions as well.

Results

Looking at the distribution of scores, the individual control is a positively-skewed unimodal distribution (median = 6, skewness = 0.67), while the experimental condition where an average was given more closely resembles a normal distribution with an outlier (median = 6, skewness = 0.17 with the outlier removed). The large standard deviation of the scores of the control classes (SD = 3.93) is almost double that reported in prior literature using the same experimental task [10]. The experimental version where priming about friends was given is highly asymmetrical despite having the same median (median = 6), and is less spread out (SD = 3.27) than the regular experimental (see Fig. 2). Focusing on individual groups, we found no statistically significant difference between the means of the different versions (see Fig. 3). A formal comparison of distributions with the Kolmogorov-Smirnov test was also not significant (P = 0.886), likely due to the sample size. However, the differing significance in regression models (such as dependence on gender in the experimental conditions but not in the control, which has been shown to be associated with cheating in the literature) leads us to believe that some cheating did occur.
Fig. 2. Histograms of scores in individual conditions. Blue line represents mean.
Fig. 3. **Mean number of matrices solved in the four individual experimental conditions.**

Error bars are 95% confidence intervals. While the distributions are visibly different between conditions (compare Fig. 2), there is no significant difference in means between individual conditions.

First, we examined how demographics (age, gender, number of siblings), self-perception (honesty, popularity, intelligence), and environmental factors (class level, block) influenced individual score across univariate models. Scores were not dependent on class level in either the control (p = 0.054) or the experimental conditions (p = 0.189), in accordance with literature that claimed that this task was not influenced by success in school (see Table S2). Our study also found a difference between cheating in boys and girls. It was statistically significant for the individual average condition (p = 0.032) with a large effect size of 3.4 extra matrices found
among males, while the other experimental conditions were suggestive of a gender gap in performance, with boys performing better in all three. In the control, no such difference was present (p = 0.107), leading us to believe that boys cheated more than girls overall. Indeed, when we pooled all the experimental conditions together, the gender gap turned out to be statistically significant, with boys cheating more by about 1.8 matrices (p=0.013; see Table S3). We also found time of day to be negatively correlated with cheating: for each block later in the day, students in the experimental conditions only ‘performed’ 0.5 matrices worse (p = 0.008). There was no such difference in the control (p = 0.545; see Table S4), suggesting dishonesty in the self-reported scores. The additional variables were not significant predictors of score in univariate models (p > 0.05).

We also found interesting results concerning self-perception. In the experimental condition where the average was given, score and honesty were negatively correlated – a one point decrease in honesty corresponded to a score of an additional 1.2 matrices (p < 0.001; See Table S5). Other demographic, self-perception, and environmental variables were ultimately not predictive of score. All of the aforementioned statistically significant results survived appropriate controls.

Interestingly, the absolute values of participants’ scores in our study were quite different from the literature. The average score in our control group was 6.8 matrices answered correctly, more than 50% higher than were reported by similar studies [10]. Our standard deviation was also significantly larger than that shown in previous studies.

Potentially due to the sample size and to testing irregularities that emerged after the conclusion of the experiment in post-experiment interviews with teachers, none of the variables
we tested for in the pair experiments were significant predictors of score. So, we will focus our
analysis on the individual versions of the test. However, we note the interesting finding that tests
done in pairs ‘underperformed’. That is, even in the control group, the mean did not even come
near to having a mean double that of the individual tests (the pair average was just under 65
percent higher than the individual average).

Discussion

This study strongly suggests that setting has a large impact on cheating behaviors. Some
studies found in the literature were done in universities, but it appears as though they were not
done in the classroom during regular class hours, all but negating the effect of the school
environment on the study. While this is useful for certain things, since it eases restrictions on
generalizing results, it does not accurately factor in the effects of societal norms on cheating. As
we noted in the results, the distribution of scores in the control was very different from the
experimental conditions, which leads us to believe that some people did in fact cheat, just not
enough to make a noticeable difference in our relatively small sample size.

This study further suggests that the type of reward is important in whether or not
dishonesty will be widespread. The dampening of a cheating effect might mean that the
classroom environment is prone only to one type of dishonesty, that is, cheating that concerns
grades. This would make our rewards for cheating seem unimportant, and thus not result in the
widespread cheating that is reported by surveys in high schools around the country. This idea
makes sense because morality is enforced in schools outside of graded assignments, and seems to
actually change the behavior of students for the better when things like grades are not concerned
[26].
It is interesting that class level is correlated with score, considering that earlier studies have found that intelligence does not correlate with dishonesty. This finding supports the idea that environment influences motivation as well – the data implies that students in more difficult classes were more motivated to do well even on something as unrelated to their studies as this matrix search task. This study confirms earlier findings that cheating is not correlated with intelligence, since different level classes had a similar difference between control and experimental conditions.

Self-reported honesty was found to be correlated with score in the individual condition where an average was given, and although this result only appeared in one condition, we consider it important for several reasons. Firstly, it seems to support the idea that some cheating occurred, just not enough to be picked up by the Kolmogorov-Smirnov test. This is because the negative coefficient of the regression is in line with logic – higher scores, presumably achieved by cheating, result in lower self-reported honesty. Furthermore, this finding seems to stress the importance of environment on people – the presence of the average was the only difference between this and the regular experimental group, which leads us to believe that the very idea of norms brought on by the mention of an average made people self-report more truthfully than in other experimental groups.

Self-reported intelligence was correlated with score in the control, but not in the experimental conditions, leading us to believe that cheaters understand that their new score is not representative of their ability. The larger standard deviation in the experimental conditions, probably caused by sporadic dishonesty, made the correlation not statistically significant. We found that self-reported popularity was not significant in any case, possibly because of the open-ended nature of popularity. The negative correlation between time of day and dishonest behavior
is interesting in that it suggests a possible link between alertness and cheating, and also because it could have important policy implications for testing. The small age range in the high school made correlation between it and score unlikely, and we accordingly found none.

We showed a statistically significant correlation between the score of males and the score of females, especially in the experimental conditions. An ANOVA on score that controlled for experimental condition and gender returned a statistically significant result (p = 0.005). Since there was no significant gender gap in the control, we believe that males cheated more when given the opportunity to do so. Furthermore, an overall model of all the individual versions also saw males performing better, likely due to dishonesty. Although for our study, age did not seem to be linked with this effect, the difference between this and an earlier study which found no gender gap in young children implies that genders begin to differentiate in morality sometime between 12 and 15. This makes sense in biological terms – more white matter in the brain develops the ability to cheat and lie. Also, adolescent boys are known for being significantly more impulsive than their female counterparts, which might cause them to cheat once and get trapped in the endless cycle of cheating and stress. This result is especially intriguing because it shows that maturity, which generally increases with age, does not consistently offset the biological and environmental factors that make cheating more likely.

As mentioned earlier, pairs significantly underperformed when compared to individuals taking the test. This is probably due to two factors: any cheating that occurred in the individual versions was negated because of limited time to cooperate, and time constraints did not allow for proper divvying up of work and focus on the completion of the task. Thus, teachers might use group work on certain tasks to reduce widespread cheating. However, they would have to
remember that two people in a group work at a different pace than as individuals, a fact that has
been often overlooked in the literature.

Conclusion

We generated a matrix search task test which we distributed to 16 high school classes
(N=243) in the form of six different experimental conditions. The participants were then asked
the time they were taking the test, their age, their perceived intelligence, popularity, and honesty.
We ranked the classes they were taking the test in by level of difficulty. The most important
findings were: (1) the societal norms that go hand in hand with test-taking in school as
administered by a teacher significantly dampen small-scale cheating – perhaps suggesting a trend
of environment-specific rewards setting off cheating; (2) reminding participants about societal
norms by giving them an average score made people report honesty more truthfully; (3) a matrix
search task is appropriate for these kind of studies because results do not correlate with
scholastic achievement; (4) males seem to cheat more than females; and (5) later time of day
dampens cheating in high school students. Dishonesty in school has important implications in the
lives of students after high school or college, and the various factors that influence and maintain
the prevalence of cheating in America’s public school systems are critical to curbing the massive
damage caused by seemingly minor dishonesty on the parts of millions of people in things like
tax returns and insurance claims. Furthermore, the idea that environment-specific rewards seem
to affect cheating rates is interesting and could be important in curbing academic dishonesty in
the future.

For future work, it would be interesting to examine the idea of environment-specific
rewards, which have been suggested by a few studies in the literature, much further. This would
involve looking at different settings, which would likely give vastly different results. For
instance, a child might be willing to act in a dishonest fashion to obtain an ice cream on a hot
summer day, but be less inclined to cheat on a similar task during the winter. Further research
might also concern the gender gap between dishonesty, and what factors influence how wide it
is. We could also examine different types of cheating, such as copying or plagiarism, and how
the results differ from the ones presented here. This research also raises the question of how
participants would fare on untimed or longer tests, especially in the pair groups. Further
investigation into cheating in different types of classes might yield interesting results: for
example, might people in English classes cheat more than those in math classes? Examining
different age ranges for this type of behavior might help solidify a link between adolescence and
cheating, and perhaps showing the ‘tipping point’ (if it exists) where maturity starts to override
impulse in cases of academic dishonesty. A larger sample size could allow for further analysis of
how tiredness and alertness affect dishonesty. Studies could also be done examining if a person
cheats more if a situation is perceived to be unfair or a task is seemingly undoable, which could
involve putting unreasonable time constraints on a task or giving another (fake) participant an
obvious advantage. Groups of more than two could also be examined, as could the effect of
doing a group activity first and then taking the test individually. Dishonest behavior in various
forms pervades everyday life, and we expect that studying not only the behavior but also the
context in which it occurs will lead to a better understanding of how to mitigate it.

Ethics Statement

IRB permission was obtained prior to conducting experiments. Participants all signed informed
consent forms, and consent on behalf of minors was given by participants’ parents. The IRB
reviewed the method of consent used for minor participants in this study. Data was anonymized to preserve confidentiality.

Acknowledgements

We thank Lincoln-Sudbury High School teachers Erica Wilsen, Lori Hodin, Benjamin Coleman, Helen Sotiriou, and Seth Weiss for administering tests to their classes. We thank Leah Isakov, Kimberly Murdaugh, and Alexander Isakov for helpful discussions.
Fig. 3. Mean number of matrices solved in the four individual experimental conditions. Error bars are 95% confidence intervals. While the distributions are visibly different between conditions (compare Fig. 2), there is no significant difference in means between individual conditions.
References


23. Grolleau G, Kocher MG, Sutan A. Cheating and loss aversion: do people lie more to avoid a loss?

