INSTITUTE OF ECONOMICS
Centre for Economic and Regional Studies

KRTK KTI

Közgazdaság- és Regionális Tudományi Kutatóközpont
KÖZGAZDASÁG-TUDOMÁNYI INTÉZET

CERS-IE WORKING PAPERS | KRTK-KTI MŰHELYTANULMÁNYOK

Cheating in primary school: Experimental evidence on ego-depletion and individual factors

TAMÁS KELLER – HUBERT JÁNOS KISS – SZABOLCS SZÁMADÓ

CERS-IE WP – 2020/48

[November] 2020

https://www.mtakti.hu/wp-content/uploads/2020/11/CERSIEWP202048.pdf

INSTITUTE OF ECONOMICS, CENTRE FOR ECONOMIC AND REGIONAL STUDIES, BUDAPEST, 2020

ABSTRACT

We contribute to the experimental literature on primary school students' cheating behavior by studying i) how cheating is influenced by ego depletion; ii) how it correlates with different individual factors. We carried out a large-scale, pre-registered experiment in the field of 28 Hungarian primary schools (126 classrooms) on a voluntary subsample of 1,143 students at grade levels 4 to 8. Students' cheating behavior was measured by the incentivized dice-roll experiment. We find suggestive evidence that our light-touch treatment on ego-depletion increased students' deceptive behavior. Cheating behavior correlated weakly with students' individual characteristics. In a multivariate context controlling for between-classroom differences, we document that students' cognitive ability correlated negatively, while their age positively, with their cheating behavior. We found students' social context (their classroom belonging) as a more decisive determinant of students' cheating behavior than individual characteristics.

JEL codes: A13,C91,D91

Keywords: honesty, cheating, individual factors, ego depletion, dice-roll exercise, pre-registered experiment

Tamás Keller
Computational Social Science - Research Center for Educational and Network Studies, Centre for Social Sciences. 1097 Budapest, Tóth Kálmán utca 4.
and
Institute of Economics, Centre for Economic and Regional Studies. 1097 Budapest, Tóth Kálmán utca 4.
e-mail: keller.tamas@tk.mta.hu

Hubert János Kiss
Institute of Economics, Centre for Economic and Regional Studies. 1097 Budapest, Tóth Kálmán utca 4.
and
Department of Economics, Corvinus University of Budapest. 1093 Budapest Fővám tér 8.
e-mail: kiss.hubert@krtk.mta.hu

Szabolcs Számadó
Department of Sociology and Communication, Budapest University of Technology and Economics. 1111 Budapest, Egry J. u. 1. E.71.
and
Computational Social Science - Research Center for Educational and Network Studies, Centre for Social Sciences. 1097 Budapest, Tóth Kálmán utca 4.
and
Evolutionary Systems Research Group, Centre for Ecological Research
e-mail: szamado.szabolcs@tk.mta.hu

Author contributions: T.K.and S.S. conceived the idea; T.K.and H.J.K. did the pre-registration; T.K.and H.J.K. designed the experiment; T.K.collected the data; T.K.analyzed the data; T.K.made the figures and tables; T.K., H.J.K., and S.S. wrote the paper.

Funding: T.K and H.J.K acknowledge support from the Institute of Economics's internal grant that supported innovative research ideas during the COVID-19 epidemic. T.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 135766). H.J.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 119683). S.S. was supported by the European Structural Investment Funds (ESIF) in Hungary (GINOP) 2.3.2-15-2016-00057.

Csalás az általános iskolában: Kísérleti bizonyíték az ego lemerítés és egyéni tényezők hatásáról

KELLER TAMÁS – KISS HUBERT JÁNOS – SZÁMADÓ SZABOLCS

ÖSSZEFOGLALÓ

Az általános iskolás tanulók csaló viselkedését vizsgáló kísérleti irodalomhoz járulunk hozzá azt tanulmányozva, hogy i) a csalást miként befolyásolja az ego lemerítése; ii) a csalás hogyan függ össze egyéni tényezőkkel. Egy nagy, előregisztrált kísérletet végeztünk terepen, 28 magyar általános iskolában (126 osztályban), 1143 tanuló önkéntes mintáján, akik 4.-8. évfolyamba jártak. A csalást ösztönzött dobókocka kísérlettel mértük. Meggyőző bizonyítékot találunk arra, hogy a kezelésben használt enyhe ego lemerítés megnövelte a csalást. A csalás gyengén korrelál a tanulók egyéni jellemzőivel. Többváltozós elemzésben, melyben figyelembe vettük az osztályok közötti különbségeket, azt találjuk, hogy a tanulók kognitív képessége negatívan, míg a koruk pozitívan mozog együtt a csalással. További eredmény, hogy a tanulók társas környezete (az osztály, amelybe járnak) erősebben meghatározza a csaló viselkedésüket, mint az egyéni jellemzőik.

JEL: A13,C91,D91

Kulcsszavak: becsületesség, csalás, egyéni tényezők, ego lemerítés, dobókocka feladat, előregisztrált kísérlet

Cheating in primary school: Experimental evidence on ego-depletion and individual factors

Tamás Keller[1,2,*]

Hubert János Kiss[2,3]

Szabolcs Számadó[4,2,5]

[1] Computational Social Science - Research Center for Educational and Network Studies, Centre for Social Sciences
[2] Institute of Economics, Centre for Economic and Regional Studies
[3] Corvinus University of Budapest
[4] Department of Sociology and Communication, Budapest University of Technology and Economics
[5] Evolutionary Systems Research Group, Centre for Ecological Research
[*] Corresponding author

October 16, 2020

Study Registration: This study was registered at the Open Science Forum. https://osf.io/jhms2/

Author contributions: T.K.and S.S. conceived the idea; T.K.and H.J.K. did the pre-registration; T.K.and H.J.K. designed the experiment; T.K.collected the data; T.K.analyzed the data; T.K.made the figures and tables; T.K., H.J.K., and S.S. wrote the paper.

Acknowledgments: We are thankful to Gergő Tóth and the participants of seminars at the Institute of Economics and Department of Sociology and Communication for their suggestions and comments.

Funding: T.K and H.J.K acknowledge support from the Institute of Economics's internal grant that supported innovative research ideas during the COVID-19 epidemic. T.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 135766). H.J.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 119683). S.S. was supported by the European Structural Investment Funds (ESIF) in Hungary (GINOP) 2.3.2-15-2016-00057.

Ethics: Research was approved by the Ethics Review Committee of the Centre for Social Sciences (TK CSS). We confirm that all methods were carried out in accordance with relevant guidelines and regulations.

Abstract

Cheating has received growing attention from scholars. Besides experiments carried out with university students and adults, the cheating behavior of primary school students gained less attention. We contribute to the experimental literature on primary school students' cheating behavior by studying i) how cheating is influenced by ego depletion; ii) how it correlates with different individual factors. We carried out a large-scale, pre-registered experiment in the field of 28 Hungarian primary schools (126 classrooms) on a voluntary subsample of 1,143 students at grade levels 4 to 8. Students' cheating behavior was measured by the incentivized dice-roll experiment, which we have modified to track individual students' dishonest behavior while keeping their integrity. We find suggestive evidence that our light-touch treatment on ego-depletion increased students' deceptive behavior. Students who received the dice-roll task at the end of a 20-minutes long questionnaire cheated more than those who received it at the beginning of the questionnaire. Cheating behavior correlated weakly with students' individual characteristics. In a multivariate context controlling for between-classroom differences, we document that students' cognitive ability correlated negatively, while their age positively, with their cheating behavior. We found students' social context (their classroom belonging) as a more decisive determinant of students' cheating behavior than individual characteristics. We discuss the implication of our results in light of educational practices and formulate recommendations for future research.

Keywords: honesty, cheating, individual factors, ego depletion, dice-roll exercise, pre-registered experiment

I. Introduction

Honesty is considered a valuable and desirable human trait. Yet, while some individuals are honest, others are not (DePaulo et al., 1996; Kashy & DePaulo, 1996; Hess & Hagen, 2006). Dishonesty can be explained by pro-self or pro-social motives: self-promotion, undermining the reputation of competitors (Hess & Hagen, 2006) vs. group-serving lies (Shalvi & De Dreu, 2014). There is an intense experimental interest in understanding honesty (also referred to as truth-telling) or the opposite of it (known as dishonesty, cheating, deception or lying). A well-established methodology involving experimental games emerged to measure dishonest behavior (see Fischbacher & Föllmi-Heusi, 2013; Rosenbaum et al. 2014, Abeler et al. 2019). A key finding of this literature is that while a fraction of the participants in these cheating experiments is an unconditional cheater or non-cheater, a considerable share is affected by monitoring and psychological cost. In this regard, a fundamental research question is what factors determine if an individual is an unrepentant cheater or a virtuous non-cheater. While Economics posits that individuals weigh costs and benefits and they behave dishonestly when it pays off, we observe that many of us are honest even if being dishonest gives a substantial benefit at zero or minimal costs (López-Pérez and Spiegelman 2013, Fischbacher & Föllmi-Heusi, 2013, Abeler et al. 2019) or are not optimally dishonest (Mazar et al. 2008, Abeler et al. 2019). Social psychology proposes that honesty is the result of internalizing norms that induce psychological costs of acting dishonestly (Abeler et al. 2014).

Cheating is more than a morally despicable human predisposition. Laboratory experiments connected to real field behavior show that dishonesty in laboratory correlates with fare evasion (Dai, Galeotti, and Villeval 2018), deceptive market practices (Kröll and Rustagi 2016), and fraudulent job absenteeism (Hanna and Wang 2017). Thus cheating, if it remains uncontrolled, leads to severe consequences at the social level.

Meta-analyses on the experimental research body of unethical behavior reveal many factors that increase unethical behavior (Belle and Cantarelli 2017; Köbis et al. 2019). For example, Gino and Mogilner (2014) show that priming university students with money-related words instead of time-related words increased students' cheating afterward, highlighting that if greed is activated, humans tend to incline to behave unethically. In contrast, the willingness to maintain a positive (self- and public) image, monitoring, and moral reminders decrease dishonesty (Belle and Cantarelli 2017; Köbis et al. 2019). For example, Shu et al. (2012) show that university students lied less if they signed an honesty statement at the beginning rather than at the end of tasks where they could cheat, indicating that social and moral norms refrain people from acting dishonestly.

Developmental psychologists found (Talwar and Crossman 2011) that while lying in early childhood can be seen as part of cognitive development, dishonesty might become a problem behavior in late childhood and adolescence, and it even can persist when adolescents become adults (Stouthamer-Loeber, 1986; Gervais et al. 2000). Hence, it is of utmost importance to investigate who cheats and why at this age to better understand the subsequent problem behaviors that stem from it. The arena of primary education is one of the most relevant social contexts where students spend a significant amount of time. Thus it is a relevant context for studying cheating behavior in late childhood and adolescence.

Students' deceptive behavior in school is a complex phenomenon. It does not restrict academic cheating (Bucciol, Cicognani, and Montinari 2020; Mccabe 2015). Students' dishonesty is connected to school misconduct – such as disruptiveness, homework non-completion, and absenteeism (Cohn and Maréchal 2018) – and to selfish motives (Maggian and Villeval 2016).

We study dishonesty in primary school using an incentivized experiment. As a consequence, this paper is closest to field experiments in compulsory education on students' cheating behavior (Alan, Ertac, and Gumren 2019; Bucciol and Piovesan 2011; Cadsby, Song, and Yang 2019; Cohn and Maréchal 2018; Glätzle-Rützler and Lergetporer 2015; Maggian and Villeval 2016; Maggioni and Rossignoli 2020). This evolving literature is still in its infancy, and it is limited in some respects[1].

First, most of the prior scholarship is based on experiments conducted in a few numbers of classrooms with a limited geographical variation.[2] Thus, this research is potentially restricted to students with similar backgrounds. For example, the research by Cohn and Maréchal (2018) is based on 162 students from 8 classrooms in 2 schools. Glätzle-Rützler and Lergetporer (2015) analyze data of 383 students from 20 different classes in 4 schools, and the research by Alan, Ertac, and Gumren (2019) concerns of 720 students from 31 classes in 10 schools. Large-scale field experiments are necessary, therefore, with a vast number of classrooms that compass on different school environments and cover students with various backgrounds.

Second, as attested by Table 1, the results of prior experiments among students in compulsory education are conflicting on the individual correlates of students' cheating behavior.[3] For example, concerning the correlation between students' cheating behavior and their cognitive abilities Alan, Ertac, and Gumren (2019) finds a positive and significant correlation, but Cohn and Maréchal (2018) report a negative relationship that fails to be significant. Similarly, while Glätzle-Rützler and Lergetporer (2015) show that 16-17 years old students cheat less than their 10-11 years old peers, Maggian and Villeval (2016), find a hump-shaped profile peaking among 9-10-year-olds while Cohn and Maréchal (2018) report no relationship between age and cheating.[4] The conflicting results call for new tests based on a transparent pre-registered design (Nosek et al. 2015). None of these field experiments were pre-registered. Moreover, based on the existing literature, we attempted to identify the main individual factors that may associate with cheating, measure them all and test them all jointly, without focusing on one (or some) of them.

[1] For a comprehensive overview of the literature of deceptive behavior (not just those conducted in compulsory education) see Jacobsen, Fosgaard, and Pascual-Ezama (2018)

[2] Table A1 In the Appendix provides relevant information on the incentivized cheating experiments that are closest to our work.

[3] Most of the papers have several specifications, some of them significant, while others not. We focus on the main results and classify the finding as significant if there is convincing evidence.

[4] In some cases the difference in findings reported in Table 1 may be due to the fact that the same phenomenon can be captured with different proxies. For instance, we interpret as a manifestation of socioeconomic status both parental education (Cohn & Maréchal, 2018) and household wealth or income (Maggioni & Rossignoli, 2020; Alan et al., 2019).

Table 1: Summary of incentivized field experiments with primary school children

Authors	Female	Age	S.E.S.	Altruism	Delay of gratification	I.Q. / ability	G.P.A.	Disruptive school behavior
Glätzle-Rützler & Lergetporer (2015)	- / ns	- / **						
Bucciol & Piovesan (2011)	nc	+ / ns						
Cadsby et al. (2019)	nr	- / ***	nr			nr		nr
Cohn & Maréchal (2018)	- / ***	- / ns	- / ns			- / ns		+ / **
Maggian & Villeval (2016)	- / *	inverted U / *		- / ***				
Maggioni & Rossignoli (2020)	- / ns	+ / ns	- / ns	- / ns			+ / **	
Alan et al. (2019)	+ / ns		+ / *	- / ns	nc	+ / **		

*/**/*** denote p<0.01/0.05/0.1.
ns = not significant
nc = not consistent
nr = not reported

Third, results are mixed in terms of the question of how self-control/ego-depletion leads to unethical behavior[5]. Since resisting temptation and refraining from cheating requires self-control, depleting students may evoke self-interest and drive the automatic inclination towards deceptive behavior (Shalvi, Eldar, and Bereby-Meyer 2012; Tabatabaeian, Dale, and Duran 2015). Some experiments find support for this idea among university students (Gino et al. 2011; Mead et al. 2009). Lying is, however, cognitively more challenging than truth-telling (Suchotzki et al. 2017), which serves as a possible contra argument to the ego-depletion hypothesis. This argument might explain why evidence from a meta-analysis (Belle and Cantarelli 2017) is mixed on the question of how ego-depletion is related to unethical behavior. For example, Yam, Reynolds, and Hirsh (2014) show that hungry (and thus depleted) students have cheated less for drinks (an unethical behavior that is unrelated to the deprived physiological need) than students who have had a full meal within 4 hours prior to the experiment. Thus, some experimental evidence challenges existing work on the effects of ego-depletion and urges new research on this question.

Fourth, a computerized recording method that allows tracking individual students' dishonest behavior while keeping their integrity of getting caught by their teachers is rare in the literature (Glätzle-Rützler and Lergetporer 2015, Maggian and Villeval 2016, Alan et al. 2019) and calls for new research. The majority of existing research deployed realistic choice situations where students were tempted to cheat to detect students' deceptive behavior. Students were incentivized to cheat by misreporting the outcomes of random events (e.g., coin-flip, dice-roll, see: Gerlach, Teodorescu, and Hertwig 2019) where only one particular outcome of the random process was rewarded. Since students did the exercise in private in many cases, researchers could reveal students' cheating behavior only at the group level, but students' individual deception remained hidden (Bucciol and Piovesan 2011; Cohn and Maréchal 2018).

Fifth, almost all prior experiments have been conducted under supervised conditions in the school (Alan et al. 2019; Cohn and Maréchal 2018; Glätzle-Rützler and Lergetporer 2015) or in summer camps (Bucciol and Piovesan 2011), in some case even in the presence of the teachers (Maggian and Villeval 2016). In these social contexts, however, students' individual decisions might be influenced by a socially desired behavior (school climate). Even in the case when students do the exercises in private, they might fear that their behavior will be salient to teachers or peers. There is a need, therefore, to investigate students' cheating behavior under less supervised conditions.

Our experiment among Hungarian primary school students addresses these concerns in turn. Our voluntary subsample of 1,143 students from 126 classrooms and 28 schools (geographical location see Appendix Figure 1) provides a large student population with diverse backgrounds (1). We have submitted a detailed pre-analysis plan before receiving the data, where we specified our coding decisions and statistical models in advance, which we strictly follow throughout the analysis (2). We depleted students' self-control with a 20 minutes long test. We randomized whether students solved this test before or after the cheating exercise. Our measure of self-control/ego-depletion is highly relevant in the educational context since students are routinely depleted by (even longer) exercise that bears a cognitive load. We provide

[5] We are not aware of any study on primary school students that investigates how ego depletion associates with cheating.

one of the first tests for depleting the primary school students, particularly (3). We have worked out a computerized recording method, which enables us to observe individual cheating behavior, and we apply this method to the standardly used dice-roll (Fischbacher and Föllmi-Heusi 2013) exercise (4). We have carried out our experiment in unsupervised circumstances since we have surveyed primary school students at home (under legally ordered home-based online education)[6] with an online application. Thus, students in our sample might not obey the desired school behavior, and they were less prone to potential peer-pressure and fear from the school consequences of their deceptive behavior (5).[7]

Our finding provides suggestive evidence for the ego-depletion hypothesis. Students who received the cheating task at the end of the 20 minutes long questionnaire rather than at the beginning misreported the number they have rolled by 4.4 percentage points more likely ($p = 0.075$), which is a substantial difference compared to the 12% cheating ratio in the control group. We found that cheating is negatively associated with students' abilities measured by a grade-specific math test, and it is positively connected to their age. Most of the deployed background variables (gender, age, S.E.S., G.P.A., school behavior, altruism, and delay of gratification) of students, however, remained uncorrelated to students' cheating behavior. Thus, our finding suggests that students' cheating behavior is uniformly distributed across different social groups and echoes the conclusion of some prior research (Bucciol and Piovesan 2011) and calls attention to the more intense study of contextual rather than individual factors. We discuss the implication of our findings on ego-depletion in the light of educational practices.

II. Hypotheses

II. 1. Hypothesis I: Ego depletion

We expect that a larger share of participants will cheat in the treatment group where students were depleted and answered the cheating task at the end of the 20 minutes-long questionnaire. Apart from questions related to the students' ability in math, the questionnaire included a social attitude test to measure altruism and a delay of gratification tasks. The cognitive math test (a sample exercise is shown in Figure A1 in the Appendix) is a usual manipulation task in ego-depletion experiments (Carter et al. 2015). Our delay of gratification task requires resisting the temptation of an early reward (to obtain a larger reward later), while in the social attitude tasks, respondents are tempted to be selfish.

Our assumption is grounded in the theory of ego-depletion (Baumeister et al. 1998), arguing that self-control is a limited resource and requires effort to exercise, which was supported by evidence gained in experiments run (generally) with university students (Gino et al. 2011; Mead et al. 2009).

[6] The Hungarian government decided to close all schools on March 16 due to coronavirus infection and has ordered a digital education work schedule, which is essentially homeschooling.

[7] However, we acknowledge that supervision induced by the school environment may have been supplanted by parental supervision. In the Discussion we deliberate more on the consequences of the online questionnaire.

II. 2. Hypothesis II: Associations of cheating

We test associations between cheating and several pre-registered individual-level predictive factors jointly on the data.

Factor 1: Grade-specific math test. We assume a negative relationship between students' cognitive ability (proxied by grade-specific math test) and their cheating behavior.

Psychological studies report a negative relationship between cognitive abilities and cheating behavior (Shepherd et al. 1971,Thijssen et al. 2017). In experiments conducted by economists, however, the relationship between cognitive abilities and cheating is not clear. Measuring cognitive abilities by crystallized and fluid intelligence Cohn and Maréchal (2018) found that more intelligent students cheated less (negative relationship), however, the relationship was not significant. Using the Raven scores Alan, Ertac, and Gumren (2019) established a positive relationship between deceptive behavior and cognitive abilities, the relationship, however, turned out to be not significant when households' income status was added to the model.

One might assume a *negative* correlation between students' cheating behavior and their cognitive ability because:

a) cognitive abilities correlate positively with factors (S.E.S., school behavior) that associate negatively with cheating;
b) more able students understand better that their cheating will be possibly visible to teachers, researchers, etc., and therefore they will cheat less.

One might, however, assume a positive correlation between students' cheating behavior and their cognitive ability because:

a) good cognitive abilities help to realize that students can cheat (Ding et al. 2018).

Our research contributes to this debate. Since more possible mechanisms speak for the negative correlation, we assume that students' cognitive abilities measured by their grade-specific math test correlate negatively with their cheating behavior.

Factor 2: Grade-point average (G.P.A.). We assume that cheating associates with worse performance in school (negative relationship), contrary to the prior findings of Maggioni and Rossignoli (2020), who report that a higher G.P.A. correlated positively with cheating behavior.

Since cognitive abilities and G.P.A. show a strong positive correlation, the mechanisms listed before are at work in this case as well. For example, on survey data Finn and Frone (2004) find that cheating is more likely among lower-achieving students.[8]

Another possible argument for the negative relationship between cheating and students' G.P.A. is that students who value more their self-image and reputation (those who perform well in the school) will probably cheat less. Shaw et al. (2014) and Shaw and Olson (2015) show that children act in an appropriate way not only for the sake of doing the right thing but they

[8] Such results have been reported also for university students, see for instance Newstead et al. (1996).

are also concerned about their reputation. Similarly, Bryan et al. (2013) find that being a cheater hurts the self-image.

Factor 3: Socio-economic status (S.E.S.). We assume that higher S.E.S. associates with less cheating (negative relationship). The literature does not offer an unambiguous prediction on the effect of family background. For instance, Cohn and Maréchal (2018) found no significant relationship between parental education and cheating, though the estimated coefficient had a negative sign. Alan, Ertac, and Gumren (2019) found, however, a positive link between S.E.S. (proxied by household income) and cheating. They show that higher income (reported by the teacher about each elementary school student) associates with more cheating.[9] Thijssen et al. (2017) report that children of lower educated mothers cheated more often.

Observational literature in psychology (Griffiths 1952, Tuddenham et al. 1974, Achenbach and Edelbrock 1981) document a lower prevalence of dishonesty for children and adolescents from higher S.E.S. families, speaking for a negative correlation.[10] Even though the literature is mixed, our impression is that the balance is tilted toward better socio-economic status being associated with less cheating.

Factor 4: Teacher-reported school behavior. We assume that cheating associates with worse behavior in school (negative relationship). In line with our hypothesis, Cohn and Marechal (2018) found that those students who had good school behavior cheated less.

Factor 5: Demographic variables. As indicated in our pre-registration plan, we hypothesized that girls tend to cheat less, as revealed by Maggian and Villeval (2016) and Cohn and Marechal (2018). We have noted, however, that Alan, Ertac, and Gumren (2019) find that girls cheated more. We have not pre-specified any hypothesis about the association between students' age and cheating behavior since the prior literature produced mixed results on this question. For example, Talwar and Crossman (2011) hypothesize that cheating follows an inverted U-shape as a function of age, peaking in elementary school. Indeed, Maggian and Villeval (2016) find a hump-shaped profile. However, Glätzle-Rützler and Lergetporer (2015) report a negative association between age and cheating since 11th graders (16-17 years old) cheated less than 5th graders (10-11 years old).

Factor 6: Altruism. We assume that altruistic students tend to cheat less (negative relationship).[11] Maggian and Villeval (2016) and Alan, Ertac, and Gumren (2019) report that altruistic students have committed less deceptive behavior, although only the result of Maggian and Villeval (2016) is significant. A recent experiment by Kerschbamer et al. (2019) with a university subject pool has confirmed this finding.

Factor 7: Delay of gratification (D.G.). In our pre-analysis plan, we have not specified any hypothesis about the relationship between D.G. and cheating. We are aware only of one paper that studies the relationship between patience (a concept tightly related to delay-of-

[9] This paper also calls the attention to the many aspects of family background. Besides family wealth it is often proxied by parental education, but also parental styles, effort and expectations can be regarded as part of family background. It is not clear how our proxy for family background captures these aspects.

[10] Other studies (Dodge et al., 1994; Boyle and Lipman, 2002) found similar empirical evidence between SES and behavioral problems in general.

[11] We use the terms altruism and social attitude in an interchangeable manner throughout the study.

gratification) and cheating, and this paper failed to find a significant association (Alan, Ertac, and Gumren, 2019).

III. Methods

In February 2020, we have conducted a randomized field experiment among 2898 students among 4 to 8-grade students in Hungarian primary schools (which is equivalent to primary and middle school in the U.S.) in 148 classrooms and 29 schools to influence students' school behavior. Our initial field experiment was pre-registered in the R.C.T. register of the American Economic Association [blinded for review].

Our recent pre-registered [blinded for review] experiment surveyed the same students with an online survey. The data collection lasted from 18 May to 8 June 2020. Students' participation in the survey was voluntary, and they have filled in the survey at home under unsupervised circumstances[12]. Students filled in a circa 20 minutes long questionnaire that contained a 10 minutes long grade-specific math test[13], questions on students' ability to delay gratification and altruism, and a "dice-roll" exercise.

III.1. The dice-roll experiment

We developed a modified version of the standardly used dice-roll experiment (Fischbacher and Föllmi-Heusi 2013) that allowed us to collect individual data about students' dishonest behavior while keeping the identity hidden. The dice-roll experiment was an online application developed by an IT-company and embedded into the online survey. In the dice-roll experiment, students were tempted to cheat by real incentivization. All students in the experiment have, in fact, received the incentives after the experiment. The dice-roll experiment had the following steps:

1. We created a student-specific preference scale. Before rolling the dice, students were asked in the application to rank six different objects according to the subjective value that they attached to the particular object. The objects differed in monetary values. The wording of the question prompted students that the object they rank as best should be the most desirable that they will be happy to receive as a gift[14]. Figure 1 shows the objects (gifts) that students rank-ordered.
2. Students next rolled the dice virtually, and the application informed them which gift they will get[15]. Their subjective rank-order about the gift appeared again on the screen.

[12] Due to the Covid-19 epidemic, schools changed from school-based education to home-based online education, therefore, we were not able to conduct the experiment in schools.
[13] Figure A2 in the Appendix shows a math-test example.
[14] "Please rank the items below based on how valuable you find them. The item you consider most valuable should be the one you would most like to receive as a gift." ["Kérlek, rendezd sorrendbe az alábbi tárgyakat az alapján, hogy azokat mennyire tartod értékesnek. Az a tárgy, amit a legértékesebbnek tartasz, legyen az, amit a legszívesebben kapnál ajándékba".]
[15] "Based on the number you have rolled, you will receive the following gift that we will deliver to your school" ["Dobásod értéke alapján a következő ajándékot fogjuk eljutni Neked az iskoládba"]

For example, if they have rolled one with the dice, the application informed them to receive the least desired object that they have chosen.

3. Students were then asked to enter the number they rolled in the application. We tempted students to indicate a higher number than they have rolled since students knew that depending on the number they enter, they will receive[16] different gifts.

By using this design, we can detect whether students were honest (they entered the number they rolled), or have cheated (they entered a different number than rolled). The application stored both the rolled number and the number entered by the students. These two numbers might (not) correspond. Examples of possible misreport is hown in Figure A2 in the Appendix.

Pencil box	*Pouch*	*Mug*	*Pen*	*Keyring*	*Badge*

Figure 1: The objects (gifts) used in the dice-roll app as incentives

III.2 Descriptive statistics about the data

In sum, 12.6% of students (N = 144) have indicated a different number (gift) as rolled. We refer to these students as those who have cheated, which is our primary outcome variable. The incidence of cheating is low but of similar magnitude than in several other studies. Cadsby et al. (2019) / Maggian and Villeval (2016) / Maggioni and Rossignoli (2020) report cheating levels of 11-29% / 14.4% / 17.6%.

Among those students who have cheated, the majority (N = 97) have indicated a more valuable gift that they have rolled. A smaller share of students (N = 47) has indicated, however, a less valuable gift on their individualized preference list. A closer look at this non-rational decision reveals that students have usually chosen the pencil box or the pouch: those gifts that all students, on average, found the most valuable. Thus, we assume that when students have opted for a less valuable gift, they were less mindful of constructing their preference list[17].

Figure 2 shows the distribution of cheating behavior as a function of math test score and ego depletion. Table 2 presents descriptive statistics for the analytic sample.

[16] We made clear to students that they would receive the gifts corresponding to the reported number short after the data collection ends. About a week after closing data collection, the gifts were delivered to the schools of the students where they could recollect it. The fact that students did not receive the reward immediately may have affected the decision of the students.

[17] Our secondary outcome counts the extent of the cheating (that we call exaggeration), focusing on the cases where students have opted for a more valuable gift on their individualized preference list than they have rolled. We have pre-registered, that if for any of the levels of exaggerations (ranging from 0 to 5), we do not have at least 20 observations, then the number of observations does not allow us to carry out a proper analysis on the outcome. For categories 3, 4, and 5, there are less than 20 observations in our data , we refrain, therefore, deriving any further conclusion from the results on the secondary outcome called *exaggeration*.

Table 2: Descriptive statistics

	Outcome variables			Treatment	Individual factors							
	Cheated	More valuable gift[a]	Less valuable gift [fatigue] [a]	Depleted students	N of books	DG[b	Altruism[c]	Math test	GPA[d]	Disruptive school beh.[e]	Girl	Age
Mean	0.126	0.089	0.045	0.690	0	0.807	0.840	0.621	3.737	1.331	0.499	12.82
SD	0.332	0.284	0.207	0.463	1	0.395	0.367	0.288	0.983	0.382	0.500	1.432
Min	0	0	0	0	-0.724	0	0	0	1	1	0	9.781
Max	1	1	1	1	3.226	1	1	1	5	3.375	1	16.32
N	1143	1096	1046	1143	1106	1143	1143	1143	1127	1025	1143	1143
Missing %	0	0.0885	0.045	0	3.24	0	0	0	1.4	10.32	0	0

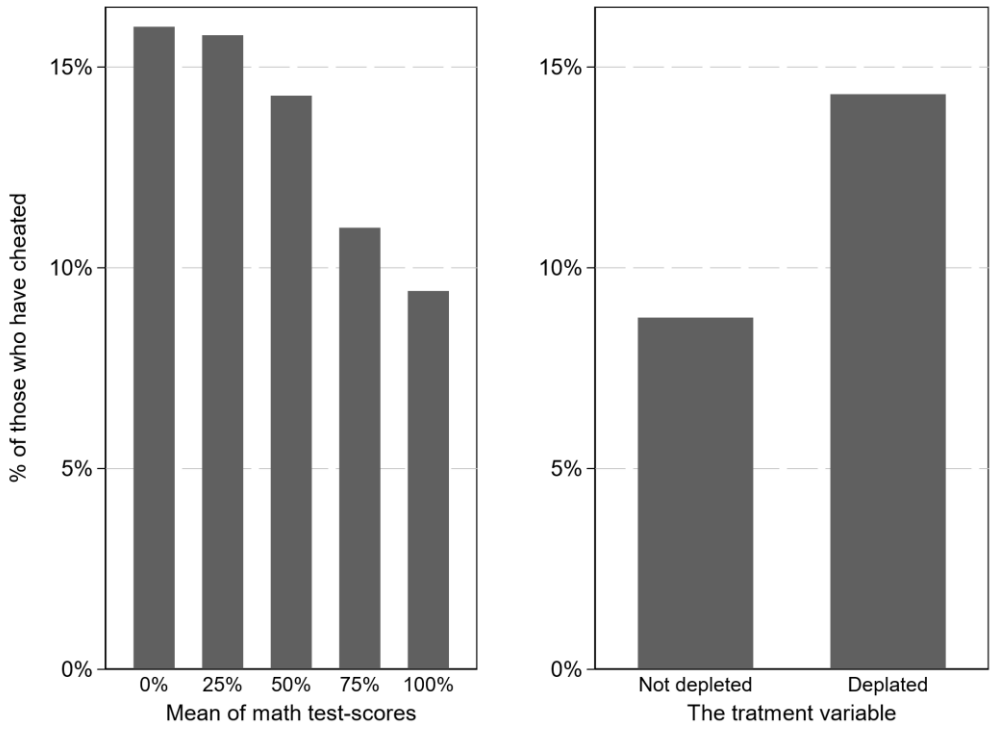
[a] Missingness is due to the pre-registered decision rule that restricted our analysis on the cases where students have opted for a more/less valuable gift on their individualized preference list than they have rolled

[b We measured students' ability to delay gratification (D.G.) in a hypothetical choice situation by asking the following question: Imagine that you can choose wristbands, but the number of wristbands you can choose depends on when you get them. If you want to get a wristband in your preferred color today, you can choose one. However, if you wait until tomorrow, you can choose two wristbands." Students' delay-of-gratification will be coded as follows: zero: if students chose immediate gratification; one if students have chosen two wristbands

[c] We measure altruism with the following questions: "Imagine that you are going to the zoo with some of your classmates. One of your classmates has forgotten to bring money for the entrance ticket. You have enough money for two entrance tickets. Would you lend your classmate the money for the entrance ticket?" Altruism is binary variable =1 if the student lent money and 0 otherwise. The category "I do not know" was be coded as zero

[d] Students' G.P.A. refers to the mid-term grades in the academic year 2019/20 (January 2020). It is the average of students' teacher-reported non-missing grades from core subjects (Mathematics, Hungarian grammar, Hungarian literature). Grades are integers between 1 and 5; a larger number means better school performance.

[e] An index calculated form the mean (instead of the pre-registered sum) of the following eight disruptive school behaviors: teasing others, playing or reading something, being noisy, walking around, eating or chewing gum, sending letters, talking or laughing, being late. We have asked the frequency of doing these behaviors by using the following scale: 1 = "Never", 2= "Sometimes", 3 = "Frequently", 4 = "Almost always".



Math test-score shows the numbers of exercise students solved correctly out of the four exercises deployed in the test.
Treatment refers to whether students received the cheating task at the end (depleted) or at the beginning (not depleted) of the 20-minutes-long questionnaire.

Figure 2: The distribution of cheating behavior as a function of math test score and ego depletion

Appendix Table A1 shows the balance in baseline variables between treated (those who received the cheating task at the end of the questionnaire) and control students (received the cheating task at the beginning of the questionnaire). For each baseline variables that were available before the randomization, we show the raw difference in means between the groups of students who received the cheating task at the beginning/end of the questionnaire (Column 2). We also have calculated the difference (Column 3) after controlling for classroom fixed effects of accounting for experimental design[18]. There is no perfect balance between treated and control students since we find a smaller share of girls among the treated students. The imbalance is the unintended consequence of the randomization because the randomization-procedure was blind to students' baseline characteristics. The balance test still indicates that all models should control for students' gender.

[18] We have pre-registered testing the balance on the following variables: gender, age, SES, GPA, teacher-reported school-behavior. In addition to these variables, we have tested the balance also on baseline variables collected in April 2020. These variables are grade-specific math test, delay of gratification, and altruism.

III.3 Empirical analysis

To test the ego-depletion hypothesis, we deploy the following model (EQ1).

$$Cheats_{sc} = \beta_0 + \beta_1 \times T_{sc}(+\beta_2 s \times X_{sc}) + \theta_c + \varepsilon_{sc} \qquad \text{EQ1}$$

Where T_{sc} is a binary variable equal to 1 if student *s* is in the treated group. We have pre-registered to deploy no control variables in the regression. We deviate, however, from our pre-registration and include gender and age as control variables, since we have obtained a not perfect balance between treated and control students (see Table A2 in the Appendix).

Test for Hypothesis II.

We use the following models to analyze the correlation between students' cheating behavior and the deployed individual factors:

$$Cheats_{sc} = \beta_0 + \beta_1 \times Factor_{sc} + \theta_c + \varepsilon_{sc} \qquad \text{EQ2}$$

In eight different models, we substituted $Factor_{sc}$ with the following variables: socio-economic status; altruism; delay of gratification; cognitive skills; students' teacher reported G.P.A.; students' teacher reported school behavior; students' gender, students' age. We denote classroom fixed effects with θ_c and the individual error term with ε_s. We have clustered standard errors at the school level.

Next, we test these individual factors jointly.

.

In hypothesis II., we test multiple hypotheses. We have pre-registered to consider our results as *confirmatory* if, after the Benjamini-Hochberg procedure[19], we receive significant results. Otherwise, we l consider our results *exploratory*, e.g., if our coefficients are significant at the 5% significance level.

IV. Results

IV.1.Results concerning Hypothesis I.

[19] The Benjamini-Hochberg procedure (Benjamini and Hochberg 1995) uses the following formula: p(i) = a*i/m for choosing the critical p-value of the significance test, where p(i) denotes the p-value for the hypothesis with the i-th lowest p-value, a is the significance level, m is the total number hypotheses tested. For example, testing eight hypotheses for the same outcome and the significance level of 0.05, the critical p-value would be 0.00625 for the coefficient with the lowest p-value (0.05* 1/8), which is the same as the Bonferroni correction. For the coefficient with the second-lowest p-value, the critical p-value will be 0.0125 (0.05*2/8). For the coefficient with the third-lowest p-value, the critical p-value will be 0.01875 (0.05*3/8). For the coefficient with the highest p-value, the critical p-value will be 0.05 (0.05*8/8).

In Table 3, we test whether students' resistance to temptation can be depleted, and thus, they would cheat more if they have solved the cheating task at the end of the 20-minute long questionnaire. In column 2 (after controlling for gender to induce balance between treated and control groups) find that our treatment indeed has depleted students, and they have cheated 4.4 percentage point more ($p = 0.074$) if they have received the cheating task at the end of the questionnaire. The corresponding effect size (0.132) speaks for a small effect. The point estimation (and level of significance) remain unchanged if we deploy more control variables (Columns 3 and 4).

We conclude that our result is substantially meaningful, even though it is not significant at the pre-registered 5% significance level. We employed a light-touch treatment and the share of students who cheated in the control group is low (8.8%, as Table 3 shows). Therefore the 4.6 percentage point difference between the treated and control groups means that the prevalence of cheating increases by 52% (4.6/8.8) if students are depleted, which yields a large increase.

Table 3: Results concerning Hypothesis I – Ego depletion

	(1)[a]	(2)[b]	(3)[c]	(4)[d]
Treated	0.046+	0.044+	0.046+	0.045+
	(0.023)	(0.024)	(0.026)	(0.024)
Constant	0.094**	0.109**	-0.200	-0.314
	(0.016)	(0.020)	(0.308)	(0.295)
Observations	1,143	1,143	995	1,143
R-squared	0.139	0.140	0.148	0.152
Effect Size	0.138	0.132	0.137	0.135
Mean in the control group	0.088	0.088	0.088	0.088

Robust standard errors in parentheses; ** p<0.01, * p<0.05, + p<0.1
Standard errors are clustered at the school level.
All models include classroom fixed effects
[a] The pre-registered model: No control.
[b] Controlling for Gender for inducing balance between treated and control groups
[b] Controlling for Gender, Age, N of books, G.P.A., Disruptive school behavior.
[c] Controlling for Gender, Age, N of books, G.P.A., Disruptive school behavior. The missing values are replaced with 0, and separate dummy variables control for missing status

We conducted a post-hoc robustness check to analyze more carefully whether the effect we measured in Table 3 is due to the depletion of students' self-control, or (alternatively) due to simple fatigue. To disentangle the effect of (voluntary) cheating from the (involuntary) fatigue, we analyzed the positive and negative misreports (the difference between the rolled and the reported numbers) separately. Note that the negative misreports are irrational since students opted for a less value gift – thus, it might be a sign of fatigue. Column 1 in Table A2 in the Appendix reveals no significant difference ($\beta = 0.002$; $p = 0.915$) between the control and treated groups when considering the negative misreports (fatigue). We, however, observe a 4.4 percentage point difference ($p = 0.012$) in positive misreports between the treated versus control groups (Column 3). Treatment, thus, increased the (voluntary) cheating, but not the (involuntary) fatigue. Hence, we depleted self-control, but we have not caused fatigue.

IV.2. Results concerning Hypothesis II.

Table 4 summarizes the results of Hypothesis II. The first eight columns of the table show the pairwise association between cheating and each individual factor, controlling for classroom fixed effect as pre-registered. The last two columns show the joint effect of these factors (with/without the replacement of missing values).

As column 1 shows, relative to boys, girls tend to cheat 2.9% percentage-point less ($p = 0.057$). Since, on average, 12.6% of students cheated, the effect of students' gender on cheating is substantially meaningful even though the effect size is small (-0.086). The pairwise association thus supports the relationship that girls cheat less (Maggian and Villeval, 2016; Cohn and Marechal, 2018). In a multivariable context (Column 9), the point-estimation of students' gender, however, becomes slightly smaller and loses its significance ($p = 0.185$). One might assume, therefore, that being a girl might contribute to less cheating since girls, on average, have better school behavior, and they earn better grades. In our post-hoc analysis, we have not found support for either of these mediations.

Students' age (Column 2) provides a positive effect on cheating behavior, meaning that older students cheat more (effect size is 0.136). This result conflicts with Glätzle-Rützler and Lergetporer (2015), who found the opposite.

Table 4: Results concerning Hypothesis II – associations of cheating

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)[a]
Girl	-0.029+								-0.036+	-0.022
	(0.014)								(0.020)	(0.016)
Age		0.045*							0.029	0.033+
		(0.019)							(0.020)	(0.019)
N of books			0.001						0.007	0.008
			(0.012)						(0.017)	(0.013)
Altruism (May 2020)				-0.008					-0.006	-0.005
				(0.028)					(0.034)	(0.029)
DG, (May 2020)					0.008				0.011	0.003
					(0.033)				(0.037)	(0.033)
Math test (May 2020)						-0.096*			-0.086+	-0.087*
						(0.036)			(0.048)	(0.039)
G.P.A., (January 2020)							-0.029		-0.012	-0.011
							(0.019)		(0.025)	(0.024)
Disruptive school behavior								0.047	0.024	0.029
(February 2020)								(0.036)	(0.035)	(0.036)
Constant	0.140**	-0.454+	0.125**	0.132**	0.124**	0.185**	0.235**	0.065	-0.156	-0.247
	(0.007)	(0.241)	(0.000)	(0.023)	(0.006)	(0.022)	(0.070)	(0.048)	(0.308)	(0.292)
Observations	1,143	1,143	1,106	1,143	1,143	1,143	1,126	1,025	995	1,143
R-squared	0.136	0.139	0.137	0.135	0.135	0.140	0.141	0.134	0.149	0.153
Adjusted R-squared	0.029	0.033	0.026	0.028	0.028	0.033	0.032	0.025	0.030	0.038
Effect Size	-0.086	0.136	0.004	-0.023	0.025	-0.288	-0.086	0.141		

Robust standard errors in parentheses; ** p<0.01, * p<0.05, + p<0.1
Standard errors are clustered at the school level.
All models include classroom fixed effects

[a] The missing values are replaced with 0, and separate dummy variables control for missing status

As hypothesized, those students who have achieved high scores on the grade-specific math test have cheated less (Column 6). Students who scored 100% on the grade-specific math test have cheated 9.6 percentage-points less than those who scored 0% on the test. Expressed in effect size, this is a sizable effect (-0.288). Although the coefficient is significant at p = 0.013 level, due to the large numbers of tested hypotheses, the point-estimation is not significant at the pre-registered 0.00625 level. Therefore, correcting standard errors for multiple testing by using the Benjamini-Hochberg procedure (Benjamini and Hochberg 1995), we do not have confirmatory evidence about the association between students' achievement on the math test and cheating. It is noteworthy that students' cognitive ability measured by their math test becomes only slightly smaller in the multivariate context and remains significant at p = 0.033 level. These results speak for a substantially important negative association between students' cognitive ability and their cheating behavior. Our result is in contrast with Alan, Ertac, and Gumren (2019).

In our pre-registration plan, we have speculated why students' math test might negatively correlate with their cheating behavior. We have deployed two possible explanations. First, students' cognitive abilities can mediate the effect of their S.E.S. or school behavior, particularly. Second, more able students might understand better that their dishonest behavior can be visible to their teachers, and the fear of being caught prevents them from cheating. Our data do not support any of these assumptions about mediation. The estimated coefficient of math test did not change significantly either after controlling for S.E.S. (the change in the coefficient of math test = 0.007, p = 0.309) or after controlling (in a separate model) for students' school behavior (change = -0.002, p = 0.478). Students' cognitive abilities might cause, therefore, that they understood better the risk that the online application indeed stores the truly rolled number, and thus more able students have cheated less. We could not apply a direct test for checking this assumption.

Students' S.E.S. measured by the number of books at home (Column 3), their altruism measured by the hypothetical lending question (Column 4), their delay of gratification[20] measured in a not-incentivized choice situation (Column 5), their school performance captured by the G.P.A. (Column 7), and their teacher-reported school behavior (Column 9) is not associated with students' cheating behavior. These point estimations are close to zero and are measured with relatively large standard errors relative to the estimated coefficient. Therefore, our results do not corroborate the prior scholarship in this regard.

V. Discussion

In sum, we found that primary school students can be depleted quickly by short light-touch exercises, which leads to an increase in their cheating behavior. Furthermore, individual

[20] Our nil-result on the association between students' DG and cheating behavior is not an artifact of the measurement. In our February 2020 field experiment, we have measured students' DG in a real choice situation with incentivized questions where students could choose one sticker now or two stickers tomorrow. The association between students' cheating behavior and incentivized DG (ß = -0.005, p = 0.844, N = 962) is qualitatively similar to the finding showed in Table 3.

characteristics of students give little explanation of why they cheat, emphasizing the importance of social and situational over the individual factors.

Our analysis revealed no relationship in the case of most of the pre-registered individual factors (see Table 5). Except for students' cognitive ability (measured by students' scores on the math test) and age, students' individual characteristics did not associate with their cheating-behavior. We conclude, therefore, that the significant findings on some individual factors reported in prior research could be context-dependent and ad-hoc.

We note, however, that in our online experiment, we had limited scope for controlling environmental factors (e.g., same speed of Internet, same I.T. device). The limited control may result in an increase of noise that could lead to a larger standard error of our estimates. Therefore, we are likely to detect the strongest relationships between individual factors and students' cheating behavior. Therefore, students' age and math test-scores seem to be tightly associated with their cheating behavior.

Our findings support the importance of social (instead of individual) context in students' cheating behavior. The adjusted R-square statistics in Table 3 show that students' individual characteristics net of their classroom belonging (captured by the fixed effects) explain little from the variance of cheating. Predicting cheating behavior based on class belonging (regression with class dummies), we can explain about 13.5% of the variance. If we include all the individual characteristics, then R^2 increases by a mere 1.1 percentage point. Therefore students' classroom belonging (and thus their social context) is a more decisive determinant of students' cheating behavior than individual characteristics[21].

Table 5. The summary results of the deployed hypothesis

Factor	Hypothesis	Assumed sign	Estimated result
N of books	More books =>less cheating	Negative	No relationship
D.G.	We have not specified any hypothesis	No assumption	No relationship
Altruism	More altruistic attitude => less cheating	Negative	No relationship
Math test	Better cognitive abilities => less cheating	Negative	Negative
G.P.A.	Good performance in school => less cheating	Negative	No relationship
Disruptive school behavior	Disruptive school behavior in school => less cheating	Positive	No relationship
Girl	Being Girl => less cheating	Negative	Negative (marginally)

[21] In two papers (Glätzle-Rützler and Lergetporer 2015, Bucciol and Piovesan 2015) the authors deploy the number of siblings (or being a sole child) as a control variable and report negative, but insignificant coefficients. Although we did not pre-register it, we investigate if the number of siblings is a relevant factor and find that it is not (coefficient: 0.009, p-value= 0.289). Similarly, being a first born is not an important aspect (coefficient: -.006, p-value= 0.825).

			mitigated by other variables
Age	We have not specified any hypothesis	No assumption	Positive

We find robust evidence that depleted students cheated more (with 4 percentage points) than those who were not depleted by our 20 minutes long questionnaire. The estimated coefficient is marginally significant ($p = 0.075$). It becomes, however, significant ($p= 0.012$) when we detach involuntarily fatigue from voluntary cheating in the outcome variable. Overall, however, effect size speaks about a small (0.134) effect.

Putting this result in a context, we note that there is an ongoing debate about the existence and size of ego depletion. For instance, Hagger et al. (2016), replicated the findings of prior experiments and has found that the size of the ego-depletion effect is not different from zero.[22] In a meta-analysis, Carter et al. (2015) also cast doubts on the general existence of the ego-depletion effect, once publication bias and small-study effects are properly taken into account.[23] In light of this debate, our result is suggestive evidence that ego-depletion plays an important role in cheating behavior.

Our results on ego-depletion indicate that in terms of cheating, the change of self-control is more relevant than its stock. We have noticed that students' ability to delay gratification (a proxy for self-control) does not associate with their cheating behavior ($\beta = -0.008$; $p = 0.803$). However, students' resistance to cheating (again self-control) indeed can be depleted, and they cheat more if they are exhausted. The fact that the coefficient of delay of gratification is not statistically different from zero suggests that it is not the stock but the change of self-control that matters for cheating.

Our findings have a practical consequence for practitioners of education, who should creatively involve tools to decrease depletion and foster encouragement in the daily school routine. Note that by depleting students with a relatively short test, we have deployed a light-touch treatment. In the real school context, students' resistance to cheating might be depleted much more intensively. For example, students are often tested by teacher-written tests at the end of the school day after having four or five 45-minutes long lectures. Thus one practical consequence of our finding would be to schedule students' assignments at the beginning of the school day in order to minimize their cheating-behavior.

Our results have an indication for the design of future experiments on students' cheating behavior. More particularly, students' cheating-behavior should not be combined with various other tasks or further experiments since these activities deplete students' resistance to cheating.

[22] They use the sequential-task paradigm that consists of two subsequent tasks and in the (no-)depletion treatment the first task did (not) use up self-control resources of the participants, while the second task was demanding in both treatments.

[23] Without considering these biases, studies document a significant ego depletion effect, effect sizes ranging from 0.24 to 0.3 in case of standardized tests.

Acknowledgments

We are thankful to Gergő Tóth, and to the participants of seminars at the Institute of Economics and Department of Sociology and Communication for their suggestions and comments.

Author contributions

T.K.and S.S. conceived the idea; T.K.and H.J.K. did the pre-registration; T.K.and H.J.K. designed the experiment; T.K.collected the data; T.K.analyzed the data; T.K.made the figures and tables; T.K., H.J.K., and S.S. wrote the paper.

Funding

T.K and H.J.K acknowledge support from the Institute of Economics's internal grant that supported innovative research ideas during COVID-19 epidemic.

T.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 135766).

H.J.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 119683).

S.S. was supported by the European Structural Investment Funds (ESIF) in Hungary (GINOP) 2.3.2-15-2016-00057.

Ethics

Research was approved by the Ethics Review Committee of the Centre for Social Sciences (TK CSS). We confirm that all methods were carried out in accordance with relevant guidelines and regulations.

Competing interests

The author(s) declare no competing interests.

Availability of materials and data

Summary datafile uploaded as Kelleretal_Schools.csv.

References

Abeler, J., Becker, A., & Falk, A. (2014). Representative evidence on lying costs. Journal of Public Economics, 113, 96-104.

Abeler, J., Nosenzo, D., & Raymond, C. (2019). Preferences for truth- telling. Econometrica, 87(4), 1115-1153.

Alan, Sule, Seda Ertac, and Mert Gumren. 2019. "Cheating and Incentives in a Performance Context: Evidence from a Field Experiment on Children." *Journal of Economic Behavior and Organization* (111).

Baumeister, Roy F., Ellen Bratslavsky, Mark Muraven, and Dianne M. Tice. 1998. "Ego Depletion-Is the Active Self a Limited Resource-Baumeister et Al(1998).Pdf." *Lornal of Personality and Social Psychology* 74(5):1252–65.

Belle, Nicola and Paola Cantarelli. 2017. "What Causes Unethical Behavior? A Meta-Analysis to Set an Agenda for Public Administration Research." *Public Administration Review* 77(3):327–39.

Boyle, M. H., & Lipman, E. L. (2002). Do places matter? Socioeconomic disadvantage and behavioral problems of children in Canada. Journal of Consulting and Clinical Psychology, 70(2), 378.

Bryan, C. J., Adams, G. S., & Monin, B. (2013). When cheating would make you a cheater: implicating the self prevents unethical behavior. Journal of Experimental Psychology: General, 142(4), 1001.

Bucciol, Alessandro, Simona Cicognani, and Natalia Montinari. 2020. "Cheating in University Exams: The Relevance of Social Factors." *International Review of Economics* 67(3):319–38.

Bucciol, Alessandro and Marco Piovesan. 2011. "Luck or Cheating? A Field Experiment on Honesty with Children." *Journal of Economic Psychology* 32(1):73–78.

Carter, E. C., Kofler, L. M., Forster, D. E., & McCullough, M. E. (2015). A series of meta-analytic tests of the depletion effect: self-control does not seem to rely on a limited resource. Journal of Experimental Psychology: General, 144(4), 796.

Cohn, Alain and Michel André Maréchal. 2018. "Laboratory Measure of Cheating Predicts School Misconduct." *Economic Journal* 128(615):2743–54.

Dai, Zhixin, Fabio Galeotti, and Marie Claire Villeval. 2018. "Cheating in the Lab Predicts Fraud in the Field: An Experiment in Public Transportation." *Management Science* 64(3):1081–1100.

DePaulo, B. M., Kashy, D. A., Kirkendol, S. E., Wyer, M. M., & Epstein, J. A. (1996). Lying in everyday life. Journal of personality and social psychology, 70(5), 979.

Dodge, K. A., Pettit, G. S., & Bates, J. E. (1994). Socialization mediators of the relation between socioeconomic status and child conduct problems. Child development, 65(2), 649-665.

Finn, Kristin Voelkl and Michael R. Frone. 2004. "Academic Performance and Cheating:

Moderating Role of School Identification and Self-Efficacy." *Journal of Educational Research* 97(3):115–21.

Fischbacher, Urs and Franziska Föllmi-Heusi. 2013. "Lies in Disguise-an Experimental Study on Cheating." *Journal of the European Economic Association* 11(3):525–47.

Gerlach, Philipp, Kinneret Teodorescu, and Ralph Hertwig. 2019. "The Truth about Lies: A Meta-Analysis on Dishonest Behavior." *Psychological Bulletin* 145(1):1–44.

Gino, Francesca and Cassie Mogilner. 2014. "Time, Money, and Morality." *Psychological Science* 25(2):414–21.

Gino, Francesca, Maurice E. Schweitzer, Nicole L. Mead, and Dan Ariely. 2011. "Unable to Resist Temptation: How Self-Control Depletion Promotes Unethical Behavior." *Organizational Behavior and Human Decision Processes* 115(2):191–203.

Glätzle-Rützler, Daniela and Philipp Lergetporer. 2015. "Lying and Age: An Experimental Study." *Journal of Economic Psychology* 46:12–25.

Hagger, M. S., Chatzisarantis, N. L., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., ... & Calvillo, D. P. (2016). A multilab preregistered replication of the ego-depletion effect. Perspectives on Psychological Science, 11(4), 546-573.

Hanna, Rema and Shing Yi Wang. 2017. "Dishonesty and Selection into Public Service: Evidence from India." *American Economic Journal: Economic Policy* 9(3):262–90.

Hess, N. H., & Hagen, E. H. (2006). Sex differences in indirect aggression: Psychological evidence from young adults. Evolution and Human Behavior, 27(3), 231-245.

Jacobsen, Catrine, Toke Reinholt Fosgaard, and David Pascual-Ezama. 2018. "Why Do We Lie? A Practical Guide to the Dishonesty Literature." *Journal of Economic Surveys* 32(2):357–87.

Kashy, D. A. & DePaulo, B. M. Who lies? Journal of Personality and Social Psychology 70, 1037 (1996).

Kerschbamer, R., Neururer, D., & Gruber, A. (2019). Do altruists lie less?. *Journal of Economic Behavior & Organization*, *157*, 560-579.

Köbis, Nils C., Bruno Verschuere, Yoella Bereby-Meyer, David Rand, and Shaul Shalvi. 2019. "Intuitive Honesty Versus Dishonesty: Meta-Analytic Evidence." *Perspectives on Psychological Science* 14(5):778–96.

Kröll, Markus and Devesh Rustagi. 2016. "Shades of Dishonesty and Cheating in Informal Milk Markets in India." *SAFE Working Paper No. 134* (134):35.

Maggian, Valeria and Marie Claire Villeval. 2016. "Social Preferences and Lying Aversion in Children." *Experimental Economics* 19(3):663–85.

Maggioni, Mario A. and Domenico Rossignoli. 2020. "Clever Little Lies: Math Performance and Cheating in Primary Schools in Congo." *Journal of Economic Behavior and Organization* 172:380–400.

Mccabe, Donald. 2015. "Handbook of Academic Integrity." *Handbook of Academic Integrity* (1964):1–9.

Mead, Nicole L., Roy F. Baumeister, Francesca Gino, Maurice E. Schweitzer, and Dan

Ariely. 2009. “Too Tired to Tell the Truth: Self-Control Resource Depletion and Dishonesty.” *Journal of Experimental Social Psychology* 45(3):594–97.

Newstead, S. E., Franklyn-Stokes, A., & Armstead, P. (1996). Individual differences in student cheating. Journal of Educational Psychology, 88(2), 229.

Nosek, B. A., G. Alter, G. C. Banks, D. Borsboom, S. D. Bowman, S. J. Breckler, S. Buck, C. D. Chambers, G. Chin, G. Christensen, M. Contestabile, A. Dafoe, E. Eich, J. Freese, R. Glennerster, D. Goroff, D. P. Green, B. Hesse, M. Humphreys, J. Ishiyama, D. Karlan, A. Kraut, A. Lupia, P. Mabry, T. Madon, N. Malhotra, E. Mayo-Wilson, M. McNutt, E. Miguel, E. L. Paluck, U. Simonsohn, C. Soderberg, B. A. Spellman, J. Turitto, G. VandenBos, S. Vazire, E. J. Wagenmakers, R. Wilson, and T. Yarkoni. 2015. “Promoting an Open Research Culture.” *Science* 348(6242):1422–25.

Rosenbaum, S. M., Billinger, S., & Stieglitz, N. (2014). Let’s be honest: A review of experimental evidence of honesty and truth-telling. Journal of Economic Psychology, 45, 181-196.

Shalvi, Shaul, Ori Eldar, and Yoella Bereby-Meyer. 2012. “Honesty Requires Time (and Lack of Justifications).” *Psychological Science* 23(10):1264–70.

Shalvi, S., & De Dreu, C. K. (2014). Oxytocin promotes group-serving dishonesty. Proceedings of the National Academy of Sciences, 111(15), 5503-5507.

Shaw, A., Montinari, N., Piovesan, M., Olson, K. R., Gino, F., & Norton, M. I. (2014). Children develop a veil of fairness. Journal of Experimental Psychology: General, 143(1), 363.

Shaw, A., & Olson, K. (2015). Whose idea is it anyway? The importance of reputation in acknowledgement. Developmental Science, 18(3), 502-509.Shu, Lisa L., Nina Mazar, Francesca Gino, Dan Ariely, and Max H. Bazerman. 2012. “Signing at the Beginning Makes Ethics Salient and Decreases Dishonest Self-Reports in Comparison to Signing at the End.” Proceedings of the National Academy of Sciences of the United States of America 109(38):15197–200.

Shepherd, M., Oppenheim, B., & Mitchell, S. (1971). Childhood behavior and mental health. London: University of London Press.

Shu, Lisa L., Nina Mazar, Francesca Gino, Dan Ariely, and Max H. Bazerman. 2012. “Signing at the Beginning Makes Ethics Salient and Decreases Dishonest Self-Reports in Comparison to Signing at the End.” *Proceedings of the National Academy of Sciences of the United States of America* 109(38):15197–200.

Suchotzki, Kristina, Bruno Verschuere, Bram Van Bockstaele, Gershon Ben-Shakhar, and Geert Crombez. 2017. “Lying Takes Time: A Meta-Analysis on Reaction Time Measures of Deception.” *Psychological Bulletin* 143(4):428–53.

Tabatabaeian, Maryam, Rick Dale, and Nicholas D. Duran. 2015. “Self-Serving Dishonest Decisions Can Show Facilitated Cognitive Dynamics.” *Cognitive Processing* 16(3):291–300.

Talwar, Victoria and Angela Crossman. 2011. *From Little White Lies to Filthy Liars. The Evolution of Honesty and Deception in Young Children.* Vol. 40. 1st ed. Elsevier Inc.

Thijssen, Sandra, Andrea Wildeboer, Marinus H. van IJzendoorn, Ryan L. Muetzel, Sandra J.

E. Langeslag, Vincent W. V. Jaddoe, Frank C. Verhulst, Henning Tiemeier, Marian J. Bakermans-Kranenburg, and Tonya White. 2017. “The Honest Truth about Deception: Demographic, Cognitive, and Neural Correlates of Child Repeated Deceptive Behavior.” *Journal of Experimental Child Psychology* 162:225–41.

Yam, Kai Chi, Scott J. Reynolds, and Jacob B. Hirsh. 2014. “The Hungry Thief: Physiological Deprivation and Its Effects on Unethical Behavior.” *Organizational Behavior and Human Decision Processes* 125(2):123–33.

Appendix

Figure A1. Map of participating schools.

Table A1: Balance in the analytical sample – The mean of baseline variables in the control group and treated group relative the control group

	Control group	Treated group relative to control group		N
		Simple difference	controlling for classroom fixed effects[(a)]	
Girl	0.556	-0.084**	-0.078*	1,143
Age	12.84	-0.023	-0.004	1,143
N of books	0.038	-0.054	-0.050	1,106
GPA (January 2020)	3.746	-0.014	-0.008	1,127
Disruptive school behavior (February 2020)	1.315	0.024	0.012	1,025
Math test (April 2020)	0.69	-0.022	-0.021	983
Delay of gratification (April 2020)	0.835	-0.031	-0.035	983
Altruism (April 2020)	0.848	0.007	0.010	983

The difference between the means of the treated and control group is calculated with regression analysis. The dependent variable was the corresponding variable in the rows of the table, and a dummy variable has marked the treatment status (=1 if students are in the treatment group). Standard errors are clustered at the school level

[(a)] The regressions deployed classroom fixed-effects.

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05

Table A2: Robustness check for Hypothesis I

	Opted for a less valuable gift (probably involuntary fatigue)		Opted for a more valuable gift (probably voluntary cheating)	
	(1)[a]	(2)[b]	(3)[c]	(4)[d]
Treated	0.002	0.002	0.044*	0.042*
	(0.019)	(0.017)	(0.016)	(0.015)
Constant	0.045*	0.041*	0.070**	0.068**
	(0.017)	(0.016)	(0.017)	(0.016)
Observations	1,046	1,143	1,096	1,143
R-squared	0.130	0.118	0.155	0.148
EffSize	0.010	0.011	0.155	0.149
Mean in the control group	0.039	0.037	0.053	0.051

Robust standard errors in parentheses; ** p<0.01, * p<0.05, + p<0.1
Standard errors are clustered at the school level.
All models include classroom fixed effects and Gender as a control variable
The dependent variable: We have recoded the variable measuring the rank differences between the rolled and reported number. Positive values indicate the choice for a more valuable gift. Negative numbers indicate the choice foe a less valuable gift. The variable ranges from -5 to 5.
[a] The coding of dependent variable: (-5/-1 = 1) (0=0) (1/5=missing)
[b] The coding of dependent variable: (-5/-1 = 1) (0/5=0)
[c] The coding of dependent variable: (1/5 = 1) (0=0) (-5/-1=missing)
[d] The coding of dependent variable: (1/5 = 1) (-5/0=0)

Table A3: Results concerning Hypothesis I – Ego depletion after removing those who were not tempted

	(1)[a]	(2)[b]	(3)[c]	(4)[d]
Treated	0.038	0.036	0.041	0.037
	(0.026)	(0.027)	(0.029)	(0.027)
Constant	953	953	836	953
	0.165	0.167	0.167	0.176
Observations	0.113	0.106	0.121	0.108
R-squared	0.097	0.097	0.097	0.097
Effect Size	953	953	836	953
Mean in the control group	0.165	0.167	0.167	0.176

Robust standard errors in parentheses; ** p<0.01, * p<0.05, + p<0.1
Standard errors are clustered at the school level.
All models include classroom fixed effects
[a] The pre-registered model: No control.
[b] Controlling for Gender for inducing balance between treated and control groups
[b] Controlling for Gender, Age, N of books, G.P.A., Disruptive school behavior.
[c] Controlling for Gender, Age, N of books, G.P.A., Disruptive school behavior. The missing values are replaced with 0, and separate dummy variables control for missing status

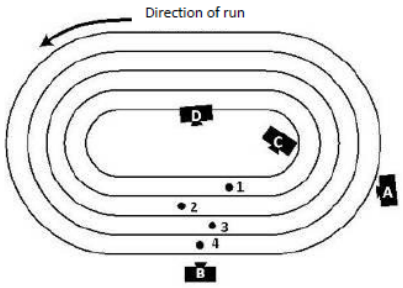
Table A4: Results concerning Hypothesis II – associations of cheating after removing those who were not tempted

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)[a]
Girl	-0.037+								-0.042	-0.029
	(0.020)								(0.025)	(0.023)
Age		0.037+							0.009	0.024
		(0.021)							(0.023)	(0.023)
N of books			-0.003						0.008	0.006
			(0.014)						(0.016)	(0.014)
Altruism (May 2020)				-0.021					-0.024	-0.017
				(0.032)					(0.041)	(0.033)
DG, (May 2020)					0.005				0.009	0.012
					(0.035)				(0.039)	(0.036)
Math test (May 2020)						-0.092*			-0.086	-0.077+
						(0.042)			(0.051)	(0.043)
G.P.A., (January 2020)							-0.031		-0.014	-0.014
							(0.021)		(0.028)	(0.027)
Disruptive school behavior								0.067+	0.044	0.044
(February 2020)								(0.038)	(0.037)	(0.039)
Constant	0.150**	-0.345	0.129**	0.149**	0.127**	0.189**	0.250**	0.047	0.097	-0.116
	(0.010)	(0.264)	(0.000)	(0.027)	(0.028)	(0.026)	(0.080)	(0.051)	(0.365)	(0.366)
Observations	953	953	924	953	953	953	941	860	836	953
R-squared	0.165	0.166	0.163	0.163	0.163	0.167	0.168	0.158	0.169	0.177
Adjusted R-squared	0.040	0.041	0.034	0.038	0.037	0.042	0.042	0.030	0.031	0.043
Effect Size	-0.110	0.110	-0.008	-0.062	0.015	-0.273	-0.092	0.195		

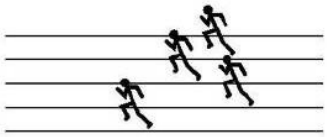
Robust standard errors in parentheses; ** p<0.01, * p<0.05, + p<0.1
Standard errors are clustered at the school level.
All models include classroom fixed effects

[a] The missing values are replaced with 0, and separate dummy variables control for missing status

CNN recorded the men's 1,500 meters race in Oskeiland from four camera angles. The following figure shows the positions of the four runners labeled 1, 2, 3, and 4, and the locations of cameras A, B, C, and D.



Which camera recorded the following picture of the position of the runners? Mark the letter indicating the correct answer.



(A) **(B)** **(C)** **(D)**

Figure A1: A sample math exercise from the test of four-graders

	Preferred gifts						Rolled gift	Chosen gift	Rank of rolled	Rank of chosen	Rank difference	Cheating variable
	1st	**2nd**	**3rd**	**4th**	**5th**	**6th**						
ID 1	Pouch	Pencil box	Keyring	Mug	Badge	Pen	Mug	Mug	4	4	0	0 (not cheated)
ID 2	Pen	Pencil box	Pouch	Mug	Keyring	Badge	Pencil box	Pouch	2	3	-1	1 (cheated) [probably fatigue]
ID 3	Pencil box	Mug	Pen	Pouch	Keyring	Badge	Badge	Pencil box	6	1	5	1 (cheated) [probably voluntary]

Figure A2: Examples for (mis)reporting the rolled gifts