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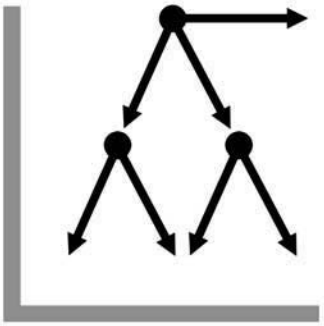

Peer Effects in Cheating on Task Performance

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Abstract

Recent research has shown that the presence of peers can increase individual output both in the lab and the field. As a new explanation for higher individual output levels, we test whether peer settings are particularly prone to cheating even if peer settings do not provide additional monetary benefits of cheating. Participants in our real effort experiment had the opportunity to cheat when declaring their output levels. Although cheating did not have different monetary consequences when working alone than when working in the presence of peers, we find that cheating on task performance is a more severe problem in peer settings. Our results have far-reaching repercussions regarding organizational design in the context of group settings where principals are not fully able to observe agents' output levels.

Keywords: cheating, peer effects, personnel economics, organizational design, experimental economics

JEL: J20, J30, M50

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1 Introduction

Recent research indicates the existence of positive peer effects on work effort and individual output levels (e.g., Falk and Ichino 2006, Mas and Moretti 2009, Bäker and Mechtel 2013, Beugnot et al. 2013). These studies show that individual output is, on average, higher when working in the presence of one or more peer(s) as opposed to working alone. Interestingly, these results hold even when there are no peer-specific monetary rewards or task interdependencies between workers (Falk and Ichino 2006, Bäker and Mechtel 2013). From a management perspective, it therefore appears to be promising to rely on peer settings when designing organizations. However, it is evident that in almost all situations principals cannot (fully) observe agents' effort/output levels and output quality. The resulting moral hazard problem opens the floor for agents to behave in a way not desirable from the principal's point of view. Thinking about organizational design, it is therefore important to test whether peer settings are more prone to moral hazard in terms of cheating.[1] Following Nargin et al. (2002), we understand cheating as a form of shirking, i.e. reducing effort and not *behaving* according to the rules.[2] If we found more cheating behavior in peer settings, implementing such organizational structures would superficially increase output to the cost of negative side effects such as worse product quality. With regard to the design of organizational processes, this result would then question the overall benefits of peer settings.

With this study we aim to shed more light on peer effects, opening the floor for cheating behavior in a real effort experiment. Drawing on the design used by Ariely et al. (2008) and Pascual-Ezama et al. (2013), we implement experimental conditions that differ with respect to whether cheating is possible or not. To analyze peer effects in cheating, we run these conditions as peer and individual sessions (as done by Falk and Ichino 2006). In the former, two participants work in the same room on their own tasks, while each participant works alone in a separate room in the latter condition. Comparing the output between session types allows us to identify whether peer settings are more prone to cheating behavior.

The setups used by Ariely et al. (2008) and Pascual-Ezama et al. (2013), on the one hand, and Falk and Ichino (2006), on the other hand, differ with regard to their payoff schemes. In the first two experiments, participants receive a piece rate for every completed

[1] In general, several ways of cheating seem possible: (1) manipulating oneself (i.e. doping, see e.g. Preston and Szymanski 2003, Kräkel 2007, Schermer 2008), (2) manipulating others (i.e. sabotage, see e.g. Preston and Szymanski 2003, Dato and Nieken 2013), (3) manipulating the evaluator or principal (i.e. influence activities, see e.g. Milgrom and Roberts 1988, Kräkel 2007) or (4) manipulating one's output. Our study contributes to this last category of cheating. The agent manipulates the quality of output by reducing his or her (unobservable) effort. An example could be a researcher not proofreading an article though asked to do so by his or her co-authors, a journalist not checking the accuracy of facts, a sales person not presenting all the selling points of a product or a teacher not correcting pupils' exams for spelling mistakes.

[2] Lying, in turn, would refer to not telling the truth (see e.g. Croson et al. 2003).

task. This piece rate is linearly decreasing in cumulated output and participants can decide to end the experiment at any point of time, allowing to calculate individual reservation wages. In the latter, participants receive a fixed wage and have to work for a given period of time. To test whether peer effects in cheating potentially vary with the payoff scheme, we run conditions based on both schemes. We started applying Ariely et al.'s (2008) and Pascual-Ezama et al.'s (2013) setup and currently run sessions using the fixed wage. In this first draft of the paper, we therefore report results based on the conditions with the piece rate.[3]

Overall, our results indicate that peer settings are indeed more prone to cheating. For conditions where cheating is not possible, we find that the presence of a peer increases individual output only very moderately. The difference in absolute output levels between single and peer sessions when cheating is not possible is not statistically significant, while we find a weakly significant positive effect on the speed with which participants fulfilled their tasks. At first glance, this result seems to contradict previous studies. However, as the average reservation wage in both conditions is almost zero, the participants of our experiment were on average highly motivated (and therefore highly productive) workers. Falk and Ichino (2006), Mas and Moretti (2009), and Bäker and Mechtel (2013) show that average peer effects are mostly driven by low productive workers who increase their output levels in the presence of peers. Given that participants in our experiment are rather productive, the absence of strong positive peer effects is not surprising and fits the existing evidence. Most importantly, for conditions in which cheating is possible, we find that the number of completed tasks and the speed of fulfilling these tasks is significantly higher in peer sessions. Given our experimental design, we can clearly identify that this increase in output/speed is due to actual cheating behavior. Working in the presence of peers appears to cause participants to feel a certain pressure to perform. However, it does not increase productive effort but cheating. This finding casts some doubt on the desirability of implementing peer settings – at least when other motivational instruments can be applied and cheating is possible.[4]

The remainder of the paper is organized as follows. In Section 2, we describe the related

[3]Until now, about 50 percent of the fixed wage condition sessions took place. Preliminary results support the findings relying on the piece rate scheme. Overall, average output is higher under the piece rate scheme, but the interaction of cheating behavior and the presence of peers is confirmed when applying the fixed wage scheme.

[4]As stated in footnote 3, our preliminary results from the fix wage conditions support the findings from the piece rate payment scheme. There is a level effect, meaning that average output levels are smaller under the fix wage for all experimental conditions. In the fix wage case, we find positive peer effects on putput levels when cheating is not possible (which perfectly fits in the literature). These positive peer effects are even larger when cheating is possible. The share of wrongly solved riddles which were handed in by the participants as being correctly solved is slightly smaller under the fix wage than under the piece rate regime – which is plausible given the absence of positive monetary incentives at the margin. However, to sum up, we still observe peer effects in cheating under this payment scheme.

literature. Section 3 presents the experimental design. Results are described and discussed in Section 4, before Section 5 concludes.

2 Related Literature and Theoretical Considerations

Peer effects have mainly been studied in the context of the educational system with the aim of e.g. giving policy implications as to whether to apply ability tracking in school (e.g. Hanushek et al. 2003, Kim et al. 2008, Lavy et al. 2012). However, recently some studies have dealt with peer effects in the work place (Mas and Moretti 2009) or analyzed peer effects in (field) experiments (Falk and Ichino 2006 and Bäker and Mechtel 2013). These recent studies point to the existence of positive peer effects on individual output for work place settings. In addition to analyzing whether peer effects exist and whether they are indeed positive, some studies try to shed more light on specific factors that foster or hinder the appearance of peer effects such as gender or race of peers.

An important aspect to be considered when judging the results of studies on peer effects is the interdependence in tasks or compensation between peers. For example, the study by Mas and Moretti (2009) analyzed supermarket cashiers. While they were paid independently in the form of an hourly wage, their tasks were not independent, because work (checking of goods) that was done by one cashier did not have to be done by another, i.e. one hard working cashier could reduce the workload of her peers. Consequently, peer effects in this setting might in part be due to a desire to help one's coworkers. Similarly, peer effects found based on field data from study groups or school classes might be driven by interdependence of task (studying together might facilitate learning) if not compensation.

One way to isolate effects arising from peers' monetary or task interdependence from "pure" peer effects is conducting experiments which exclude both types of interdependence. Falk and Ichino (2006) conducted such a field experiment where pupils had to prepare letters for mailing either with another pupil working on the same task in the same room or not. Participants earned a fixed hourly wage and worked for four hours on the task. Consequently, there was neither task nor monetary interdependence and still Falk and Ichino find that participants in the peer settings had a significantly higher output on average, i.e. completed more letters per hour.

What drives this effect? Social Comparison Theory (Festinger 1954) tells us that individuals base their opinion of themselves on - among others - comparisons with other individuals of their reference group. Perceivably in peer settings the peers form the reference group and to maintain a positive self-perception it is important to measure up or outperform the peers. That is social processes might indirectly and potentially unintentionally induce a

competitive mind frame in peer settings. The management toolbox contains instruments to actively foster such a competitive setting, for example tournament compensation under which employees compete for a bonus (see e.g. Lazear and Rosen 1981). The multitude of studies on worker behavior under tournament compensation schemes tells us that it is a powerful motivational instrument, but that it also induces unwanted behavior, such as rat races or unproductive behavior in the form of sabotage or cheating (e.g., Cadsby et al. 2010, Gilpatric 2011, Harbring and Irlenbusch 2011).[5] If peer settings induce a similar competitive mind frame (even in the absence of monetary consequences) then it seems plausible that they also induce adverse behavior.

While there is a vast body of literature looking at determinants and consequences of cheating or fraud , evidence on cheating in social settings or personal interactions is rather scarce. The existing studies contain elements of monetary and/or task interaction, thereby impeding the measurement of pure peer effects in cheating. They report that under team compensation individuals cheat more than under individual compensation, because under the latter they cannot "help" their colleagues by cheating (Conrads et al. 2013, Danilov et al. 2013, see Briggs et al. 2013 for a theoretical analysis, see Erat and Gneezy 2012 for higher likelihood of lying when it only helps others).[6] In tournament settings where cheating only helps oneself, the experimental findings by Schwieren and Weichselbaumer (2010) show positive effects of competition on cheating, which seems to be driven by the rather unproductive who do not want to be seen as the low performers or want to increase their chances of winning.[7] Using field data on vehicle emission tests, Pierce and Snyder (2008) find that the degree of (un)ethical behavior of inspectors working for different organizations is influenced by the norms of the employing organizations, i.e. organizational norms and managers influence fraud behavior. This finding is in line with the experimental results by Jones and Kavanagh (1996) who find an influence of managers' (un)ethical behavior on employees' (un)ethical behavior. However, they also find evidence for peers' (un)ethical behavior on employees' (un)ethical behavior. This ties in with the results of a number of studies which show that own cheating behavior positively depends on perceptions of others' cheating behavior, i.e. the acceptability of cheating (see Ichino and Maggi 2000, Carrell et al. 2008, Megehee and Spake 2008, and O'Fallon and Butterfield 2008), and negatively depends on the penalty for cheating (see Megehee and Spake 2008 and O'Fallon and Butterfield 2008)

[5]Using data on cheating behavior of teachers in schools, Jacob and Levitt (2003) show that an increase in performance incentives leads to increased cheating behavior even without a competitive or team setting.

[6]An exception to these findings is Waller and Bishop (1990) who find higher cheating under the piece rate than under an implicit team compensation. This might be due to the fact that the compensation was not communicated as a team compensation and cooperation could not be guaranteed.

[7]Kandel and Lazear 1992 argue that in teams, peer pressure induces the low productive team members to increase their effort. However this effort is generally assumed to be productive.

that might be imposed by e.g. the manager or the organization in general. With respect to the effect of peers, some articles argue that they serve as a reference point and thereby influence behavior (e.g. Trevino 1986). However, Gould and Kaplan (2011) make a case for peers *learning* to cheat from their (high performing) peers.

Given the literature discussed above, we expect (1) individual output to be higher in peer sessions than in individual sessions when cheating is not possible. Furthermore, we expect (2) that individuals produce higher output levels when cheating is possible in the individual sessions. Cheating reduces individuals' marginal effort costs of producing output and can therefore be used as a means to perform "better" at lower individual effort costs. Additionally, the peer setting potentially increases individuals' perceived psychological pressure to produce more output. We therefore (3) expect that individual output is highest in peer sessions when cheating is possible.

3 Experimental Design and Procedure

3.1 Experimental Design

Following Falk and Ichino (2006), we implement a real effort task in both an individual setting as well as a peer setting. The only difference between the two settings is that in the peer setting participants work in the presence of another participant working on the same task. They can see each other and are allowed to communicate. We did not conduct a field experiment but chose instead to implement a laboratory setting allowing us to vary the possible degree of cheating which would have been more difficult in a field setting.

To generate our three conditions that differ in the potential for and observability of cheating, we rely on the real effort tasks used by Ariely et al. (2008) and Pascual-Ezama et al. (2013). Participants have to solve riddles: They receive a sheet of paper with a sequence of 850 randomly drawn letters. Within this sequence, there are 10 instances of two consecutive letters "p". The participants' task is to find these 10. We create our three conditions by varying whether cheating is possible and whether - if possible - it can be observed ex-post in order to obtain a measure for the degree of cheating. In the "no cheating" condition (NC), each solved riddle is checked for correctness before the participant may begin with working on the next riddle. Thus, cheating is not possible. In the "observable cheating" condition (OC), solved riddles are not checked for correctness but simply collected on a pile. Thus, in the aftermath of the experiment it was possible to check how often participants cheated (an identification strategy similar to the one used by Fischbacher and Föllmi-Heusi 2013). Lastly, in the "blind cheating" condition (BC) - as in the OC - solved riddles where not

checked for correctness, and here they were directly destroyed by feeding the sheet of paper into a paper shredder in front of the participant(s). Thus, cheating was possible and the participants knew that it was not possible to check whether they indeed cheated or not.

Table 1 shows our 3x2 design. Applying a between-subjects design, participants are randomly assigned to one of the six session types.

	Individual sessions	Peer sessions
No cheating possible (NC)	1 (NC_1)	4 (NC_2)
Cheating possible & observable (ex-post) (OC)	2 (OC_1)	5 (OC_2)
Cheating possible & not observable (BC)	3 (BC_1)	6 (BC_2)

Table 1: Experimental design: six session types.

As stated in the introduction, we run different experimental conditions that apply both compensation schemes used in the closely related studies: a fixed wage for a given period of time (Falk and Ichino 2006) and a piece rate scheme (Ariely et al. 2008 and Pascual-Ezama et al. 2013). In this first draft of the paper, we focus on the latter compensation scheme as only 50 percent of the fix wage sessions took place until now. Ariely et al.'s (2008) compensation scheme of a decreasing piece rate offers an interesting setting for observing the strength of the motivational effect induced by peer settings. Any peer effect that can be observed in addition to the strongly motivational instrument of a piece rate speaks to peer settings being a very strong motivator. Implementing a declining piece rate allows to measure motivational effects (or task performance) not only in how quickly participants worked on the tasks but also in how many tasks they decided to work on, or phrased differently: when they quit working (reservation wage). In accordance with Ariely et al. (2008), participants earn 55 cents for the first riddle, 50 cents for the second riddle, and so on. That is, the piece rate declines by 5 cents per completed riddle. The eleventh riddle is the last one to pay any monetary amount different from zero.

3.2 Experimental Procedure

The procedure of the experiment was as follows (see Appendix):

(1) Written instructions on the task, the procedure and the compensation are presented on paper and read out loud by the experimenter. Any questions are answered publicly. The instructions contain an example riddle and a table depicting the amount of money earned per completed riddle as well as the cumulated amount of money for any number of completed riddles. At several points within the instructions participants are informed that they can

stop solving riddles at any point in time.

(2) The experimenter announces the piece rate for the first riddle (55 cents) and participants start working on it.

(3) Once a riddle is completed, the experimenter acts according to the experimental condition (checking the riddle, simply collecting, or destroying it) and asks whether the participants wants to work on another riddle for the applicable piece rate.

(4) Once a participant declines working on another riddle, the experiment ends and (s)he fills out a short questionnaire.

(5) The participant is paid privately according to the number of solved riddles plus a show-up fee of 2.50 Euro.

4 Results

4.1 Descriptives

Subjects were students at a German university. In total, 272 students participated in the experiment.

Table 2 displays the number of observations for the six different session types. For individual sessions, the number of observations equals the number of sessions. For the peer sessions, the number of sessions equals half the number of observations. The observable cheating condition was implemented in a second step and mainly serves as a way to verify whether participants cheated more in peer sessions. Therefore, the number of observations is lower than in the other two conditions. Importantly, we do not find significant differences in participants' observable characteristics between the OC and BC conditions. For the following analysis we therefore pool both "cheating" conditions to emphasize that not the observability but the possibility of cheating is our main point of interest.[8]

	Individual sessions	Peer sessions
No cheating possible (NC)	**36**	**70**
Cheating possible	**60**	**106**
(ex-post) observable cheating (OC)	25	36
not observable cheating (BC)	35	70

Table 2: Number of observations per session type.

Figure 1 shows the distribution of the number of completed riddles per session type. It is evident that the majority of participants completed exactly 11 riddles, i.e. worked as long as it paid a positive piece rate. The average reservation wage for the no cheating

[8] Our results remain mostly robust for unpooled data.

condition is 10 cents in the individual sessions and 7 cents in the peer sessions. For the cheating conditions, the average reservation wage is 7 cents and 5 cents for individual and peer sessions, respectively. However, as Figure 1 shows, there is also substantial variation in the number of completed riddles, ranging from the theoretical minimum of 1 to 20, the maximum number of riddles provided. Looking at the distributions, they vaguely resemble a normal distribution, but results from t-tests (see below) should be interpreted with caution. We therefore additionally run Wilcoxon rank sum tests.

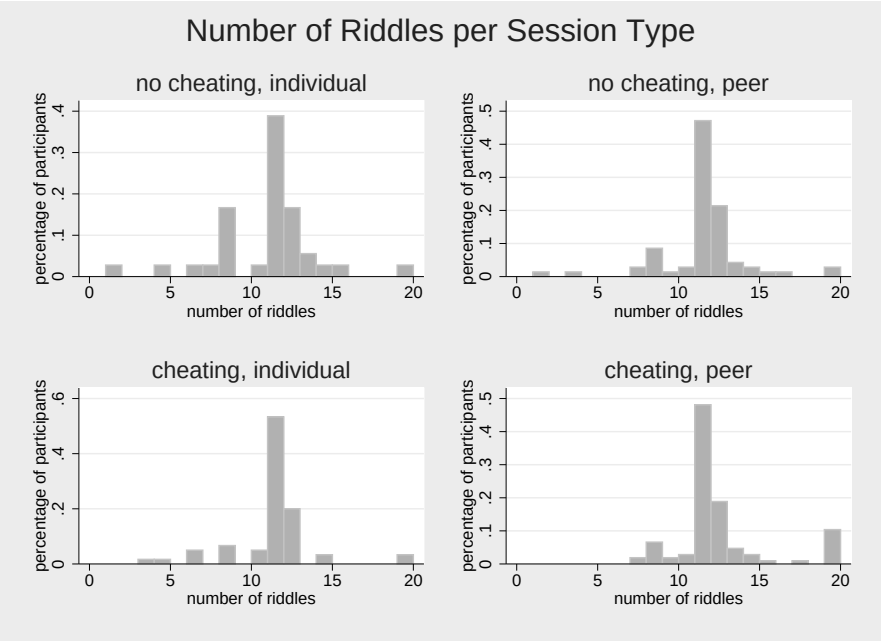

Figure 1: Histograms of output per session type.

4.2 Existence and Causes of Peer Effects

To test whether peer effects exists, we first compare individual sessions and peer sessions per experimental condition with respect to (a) the average number of completed riddles and (b) the number of completed riddles per minute, i.e. participants' speed. Table 3 shows the average number of completed riddles, Table 4 displays the average speed per sessions type. The last two columns in both tables show results of a t-test and a Wilcoxon rank sum test, testing for significant differences between individual and peer sessions. The average number of solved riddles per experimental condition is also depicted in Figure 2.

Looking at the 'no cheating' condition (first row in Table 3 and Table 4, we find no evidence for peer effects for the number of completed riddles and only slight evidence for peer effects for the speed, where the number of completed riddles per minute is slightly

higher in the peer session according to a t-test. However, for the cheating condition we find peer effects for the number of completed riddles and also for speed. Taken together, these findings suggest that in a setting where a piece rate is already causing high motivation, the peer pressure induced by a peer setting does not lead to an additional increase in productive effort (i.e. working faster or more), but rather induces participants to engage in cheating behavior to increase output or speed.[9]

	# of riddles			
	Individual sessions	Peer sessions	t-test	Wilcoxon
No cheating	10.47	11.09	n.s.	n.s.
Cheating	10.83	12.05	**	**

Notes: * significant at 10%; ** sign. at 5%; *** sign. at 1%.

Table 3: Average output per session type.

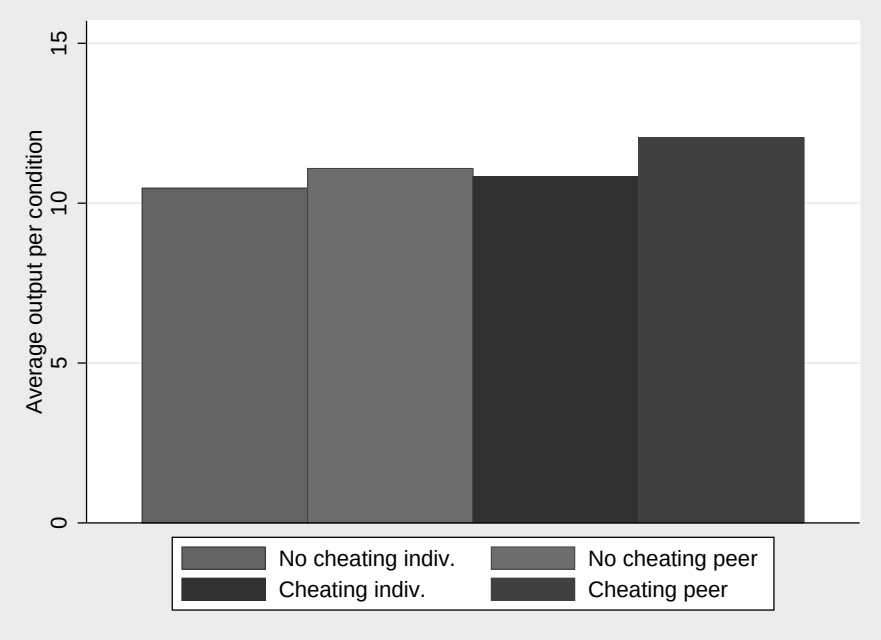

Figure 2: Average output per session type.

To underpin these results that peer settings lead to more cheating, we conducted the observable cheating condition. While it is not possible to tell which of the participants

[9]The preliminary results based on the sessions with the fixed wage scheme that have been conducted so far (roughly 50 percent of the targeted number of total sessions) support the findings presented above. However, it turns out that average output is significantly smaller in all four experimental conditions. Under the fixed wage regime (which yields smaller individual output levels), the positive peer effects are statistically significant. This result supports our conjecture that the insignificant peer effects found in the no cheating condition under the piece rate regime are driven by the fact that participants were already highly motivated due to the piece rate.

	# of riddles per minute			
	Individual sessions	Peer sessions	t-test	Wilcoxon
No cheating	0.44	0.49	*	n.s.
Cheating	0.47	0.52	**	**

Notes: * significant at 10%; ** sign. at 5%; *** sign. at 1%.

Table 4: Average speed per session type.

cheated (similar as in Fischbacher and Heusi 2013, Gill et al. 2012), we can calculate the percentage of riddles that participants cheated on, i.e. did not solve correctly, separately for individual sessions and peer sessions. We find that the percentage of cheating is 0.03 in individual sessions and 0.07 in peer sessions. The fact that cheating is more than twice as common in peer sessions supports our conclusion that our finding of positive peer effects only in sessions that allow for cheating is caused by increased cheating and not increased productive effort. When we correct average output levels in the cheating sessions for the share of wrong solutions in the OC condition, it turns out that the positive peer effects are driven by cheating. According to Table 3, average output in cheating individual sessions equals 10.83 riddles. Correcting for the share of 3% wrong solutions, we end up with 10.51 corrected units of output – which perfectly corresponds to average output in the no cheating individual condition (10.47). The same holds for peer sessions. Correcting average output (12.05) when cheating is possible for the share of 7% wrong answers gives a number of 11.21 corrected units of output – once again very close to the value of 11.09 that we observe for peer sessions when cheating is not possible.

In addition to comparing the average number of completed riddles and the speed across individual and peer sessions, we also run Ordinary Least Squares (OLS) regressions with the number of completed riddles and the speed as dependent variables. Our main explanatory variable is a dummy variable for whether the session was an individual session or a peer session ("peer"=1). We also include a dummy variable for the experimental condition "cheating", with "no cheating" as the reference category (model 1). Model 2 further includes the number of minutes needed for completing the first riddle as an inverse measure of ability, gender (1=male), year of birth, and the Big Five personality measures of neuroticism, openness to experience, agreeableness, conscientiousness and extraversion. They were measured using the short item version of the NEO-FFI by Costa and McCrae (1989).

Table 5 shows the results from OLS regressions for the dependent variable "number of completed riddles" for different estimation models; Table 6 shows the results for the dependent variable "speed". In both tables, the first and the fourth column show the results for the complete sample, columns 2 and 5 contain the estimation results for individual

sessions only, columns 3 and 6 for peer sessions only.

	Model 1			**Model 2**		
	(1)	(2)	(3)	(4)	(5)	(6)
	all	individual	peer	all	individual	peer
Peer	0.98***			0.92**		
	(0.36)			(0.37)		
Cheating	0.75**	0.36	0.96**	0.74**	0.54	0.94**
	(0.36)	(0.63)	(0.44)	(0.37)	(0.65)	(0.47)
Ability (inverse)				0.01	-0.23	0.07
				(0.15)	(0.25)	(0.18)
Male				-0.80*	-1.52**	-0.30
				(0.44)	(0.75)	(0.55)
Year of birth				0.02	0.00	0.03
				(0.02)	(0.06)	(0.02)
Neuroticism				-0.26	0.00	-0.91
				(0.98)	(1.56)	(1.36)
Openness				-0.20	-0.69	0.10
				(1.01)	(1.51)	(1.32)
Agreeableness				-0.52	-0.27	-0.58
				(1.60)	(2.42)	(2.19)
Conscientiousness				2.08**	0.16	3.18***
				(0.99)	(1.53)	(1.19)
Extraversion				-0.26	1.20	-1.17
				(1.04)	(1.92)	(1.23)
Constant	10.23***	10.47***	11.09***	-23.11	5.40	-50.72
	(0.39)	(0.53)	(0.32)	(44.39)	(116.64)	(47.47)
Observations	272	96	176	267	95	172
R^2	0.04	0.00	0.03	0.07	0.06	0.07

Notes: Heteroskedasticity-robust standard errors in brackets;
* sign. at 10%; ** sign. at 5%; *** sign. at 1%.

Table 5: OLS regression results. Dependent variable: number of riddles per participant.

As can be seen from Tables 5 and 6, columns 1 and 4, the number of riddles and the number of riddles per minute ('speed') is significantly higher in peer sessions than in individual sessions. Consequently, we find the expected positive peer effects.

The question remains, however, what drives these peer effects? The coefficients of the dummy variable 'cheating' in Tables 5 and 6, columns 1 and 4 show that the opportunity to cheat increased the number of completed riddles, and the speed, i.e. the number of riddles per minute. These results suggest that people cheat when possible (see e.g. Mazar et al. 2008 for a similar finding.

Apart from this, we find that male participants complete less riddles in total and per minute (lower speed) and more conscientious participants complete more riddles in total and per minute. Also, more able participants do not complete more riddles, but they are significantly faster, i.e. they complete more riddles per minute.

	Model 1			Model 2		
	(1)	(2)	(3)	(4)	(5)	(6)
	all	individual	peer	all	individual	peer
Peer	0.05***			0.04**		
	(0.02)			(0.01)		
Cheating	0.03*	0.02	0.03	0.02*	0.03	0.02
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Ability (inverse)				-0.05***	-0.06***	-0.04***
				(0.01)	(0.02)	(0.01)
Male				-0.04***	-0.04	-0.04**
				(0.02)	(0.02)	(0.02)
Year of birth				0.00	-0.00	0.00
				(0.00)	(0.00)	(0.00)
Neuroticism				-0.01	-0.03	-0.03
				(0.04)	(0.08)	(0.05)
Openness				-0.04	-0.06	-0.02
				(0.04)	(0.06)	(0.05)
Agreeableness				-0.03	-0.10	0.038
				(0.06)	(0.09)	(0.07)
Conscientiousness				0.11***	0.03	0.13***
				(0.04)	(0.08)	(0.05)
Extraversion				0.02	0.08	-0.01
				(0.04)	(0.07)	(0.05)
Constant	0.44***	0.44***	0.49***	-2.15	1.43	-3.12
	(0.01)	(0.02)	(0.02)	(2.60)	(3.87)	(3.24)
Observations	268	96	172	263	95	168
R^2	0.04	0.01	0.01	0.27	0.26	0.28

Notes: Heteroskedasticity-robust standard errors in brackets;
* sign. at 10%; ** sign. at 5%; *** sign. at 1%.

Table 6: OLS regression results. Dependent variable: number of riddles per minute per participant.

To analyze the causes of peer effects, i.e. why we find a positive coefficient for our dummy variable, we run the regressions for peer and individual sessions separately (see columns 2, 3, 5 and 6). Interestingly, we find no effect of the possibility to cheat in the individual sessions, but we find strong and positive effects of the possibility to cheat, on completed riddles in the peer sessions.[10] This suggests that participants do not cheat in individual sessions, but they do so in peer sessions. Thus, we find that peer settings increase cheating behavior.

5 Conclusions

Peer settings inducing positive peer effects have been deemed a cheap instrument to increase productivity. The aim of this experimental study was to analyze whether these peer effects

[10]For the dependent variable 'speed' there are no significant effect for either individual or peer sessions when separating the sample.

are indeed always "positive" from principals' point of view in the sense that they stem from increased productive effort. An alternative and much less desirable explanation would be that peer settings increase adverse behavior, such as cheating and sabotage, as has been found for competitive settings, e.g. rank-order tournaments.

Our results support previous findings about the existence of positive peer effects. However, we mainly find these effects for experimental conditions in which cheating is possible, and not for those in which it is not. This is a first indication that observed peer effects are driven by cheating. We generally find that cheating is more pronounced in peer settings than in individual settings.

The implications of our study for management are straightforward: Having shown that peer settings increase counterproductive behavior (and only weakly increase productive effort), managers are well advised to reconsider peer settings as a cheap tool for increasing performance. While they cause no harm if cheating and potentially other counterproductive behavior such as sabotage are not feasible, they provide strong incentives to engage in said adverse behavior if possible. This is surprising given that there is no monetary interdependence between peers in our setting - in contrast to tournaments or team compensation settings.

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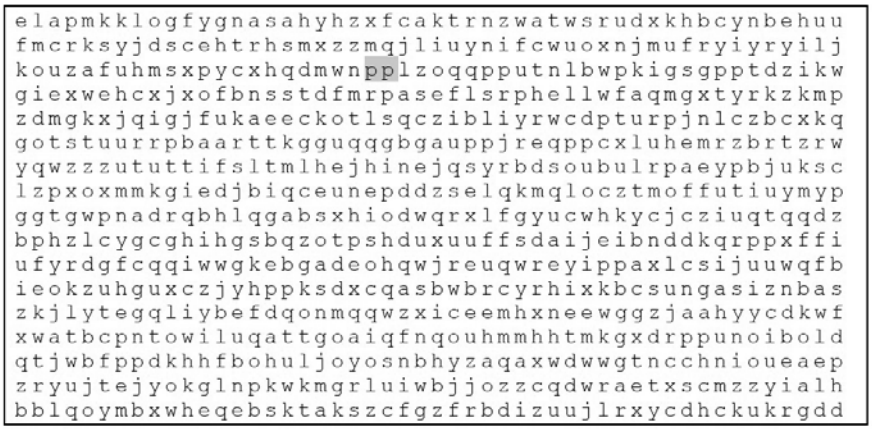
Appendix

No cheating condition

Instructions:

Welcome to this experiment and thank you for your participation. You will receive 2.50 Euro for arriving on time. Please turn off your mobile phones. Please read the instructions - which are identical for everyone - carefully. In case you have any questions, please raise your hand, so that we can assist you.

The amount of money you will have earned throughout the experiment will be paid out in cash at the end of the experiment. The payoff will be made in private so that no other participants will know your payoff. Your task in this experiment is to solve riddles, such as:



In the beginning of the experiment you are handed out a sheet of paper which contains ten pairs of the letter P which are printed side by side (pp). In order to solve the task of this sheet, all of these ten pairs must be found and highlighted.

Your payoff depends on the number of solved sheets. You receive the most money (55 cents) for the first sheet, for the second it is less (50 cents), even less for the third (45 cents), and so on (in 5 cent decrements). An overview over the exact payoffs depending on the amount of solved sheets can be found in the payoff table at the end of the instructions. You can end the experiment anytime at any self-determined point of time in the experiment. Before you are handed out a new sheet an experimenter is going to tell you how much money you can earn by solving this specific sheet.

It is up to you how many sheets you are going to solve. The only rules are:

1. Before you start, put your name on the top of the sheet.

2. You can work at only one riddle at once.
3. Do not start with a new riddle before you have completed the one you are working on.
4. After completing a sheet you hand it to the experimenter who checks it and files it in a folder.

   If you want to solve another riddle afterwards, the experimenter is going to hand one out to you.

If you do not want to solve another sheet, please tell the experimenter. This is when the experiment ends. You fill in a short questionnaire about your person and then you receive your payoff.
Payoff table:

Sheet	Payoff	Accumulated Payoff
1	0.55 Euro	0.55 Euro
2	0.50 Euro	1.05 Euro
3	0.45 Euro	1.50 Euro
4	0.40 Euro	1.90 Euro
5	0.35 Euro	2.25 Euro
6	0.30 Euro	2.55 Euro
7	0.25 Euro	2.80 Euro
8	0.20 Euro	3.00 Euro
9	0.15 Euro	3.15 Euro
10	0.10 Euro	3.25 Euro
11	0.05 Euro	3.30 Euro
12+	0.00 Euro	3.30 Euro

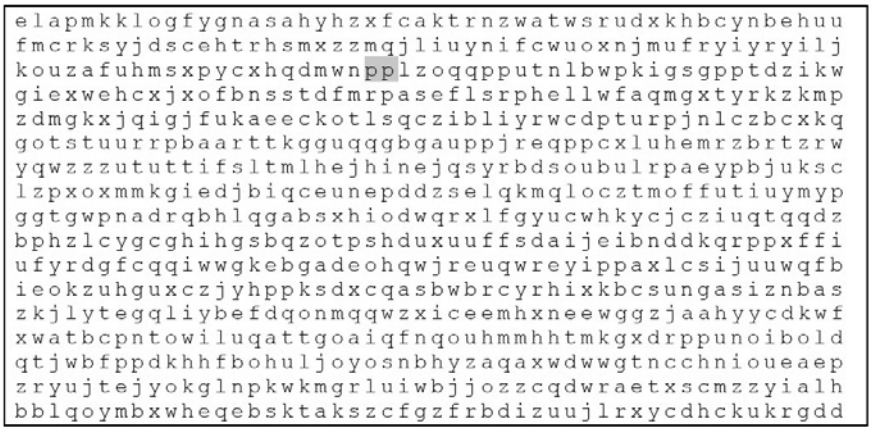
+ 2.50 Euro for arriving on time.

Observable cheating condition

Instructions:

Welcome to this experiment and thank you for your participation. You will receive 2.50 Euro for arriving on time. Please turn off your mobile phones. Please read the instructions - which are identical for everyone - carefully. In case you have any questions, please raise your hand, so that we can assist you.

The amount of money you will have earned throughout the experiment will be paid out in cash at the end of the experiment. The payoff will be made in private so that no other participants will know your payoff. Your task in this experiment is to solve riddles, such as:



In the beginning of the experiment you are handed out a sheet of paper which contains ten pairs of the letter P which are printed side by side (pp). In order to solve the task of this sheet, all of these ten pairs must be found and highlighted.

Your payoff depends on the number of solved sheets. You receive the most money (55 cents) for the first sheet, for the second it is less (50 cents), even less for the third (45 cents), and so on (in 5 cent decrements). An overview over the exact payoffs depending on the amount of solved sheets can be found in the payoff table at the end of the instructions. You can end the experiment anytime at any self-determined point of time in the experiment. Before you are handed out a new sheet an experimenter is going to tell you how much money you can earn by solving this specific sheet.

It is up to you how many sheets you are going to solve. The only rules are:

1. You can work at only one riddle at once.
2. Do not start with a new riddle before you have completed the one you are working on.

3. After completing a sheet you hand it to the experimenter who adds it to the other completed sheets.
   If you want to solve another riddle afterwards, the experimenter is going to hand one out to you.

If you do not want to solve another sheet, please tell the experimenter. This is when the experiment ends. You fill in a short questionnaire about your person and then you receive your payoff.
Payoff table:

Sheet	Payoff	Accumulated Payoff
1	0.55 Euro	0.55 Euro
2	0.50 Euro	1.05 Euro
3	0.45 Euro	1.50 Euro
4	0.40 Euro	1.90 Euro
5	0.35 Euro	2.25 Euro
6	0.30 Euro	2.55 Euro
7	0.25 Euro	2.80 Euro
8	0.20 Euro	3.00 Euro
9	0.15 Euro	3.15 Euro
10	0.10 Euro	3.25 Euro
11	0.05 Euro	3.30 Euro
12+	0.00 Euro	3.30 Euro

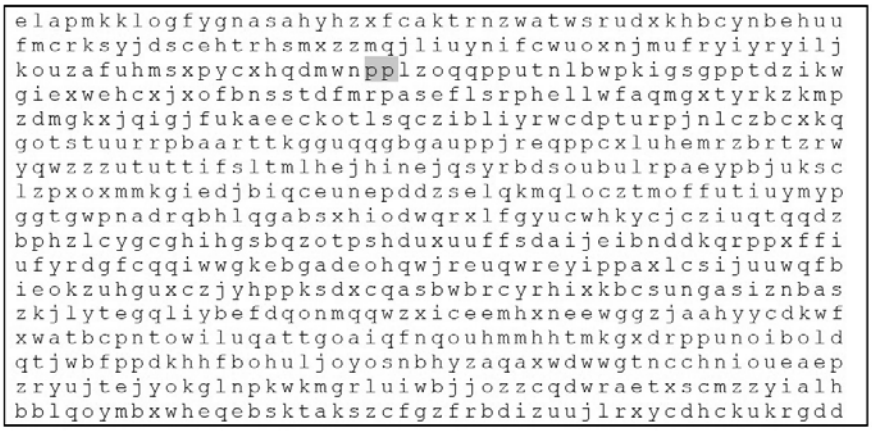
+ 2.50 Euro for arriving on time.

Blind cheating condition

Instructions:

Welcome to this experiment and thank you for your participation. You will receive 2.50 Euro for arriving on time. Please turn off your mobile phones. Please read the instructions - which are identical for everyone - carefully. In case you have any questions, please raise your hand, so that we can assist you.

The amount of money you will have earned throughout the experiment will be paid out in cash at the end of the experiment. The payoff will be made in private so that no other participants will know your payoff. Your task in this experiment is to solve riddles, such as:



In the beginning of the experiment you are handed out a sheet of paper which contains ten pairs of the letter P which are printed side by side (pp). In order to solve the task of this sheet, all of these ten pairs must be found and highlighted.

Your payoff depends on the number of solved sheets. You receive the most money (55 cents) for the first sheet, for the second it is less (50 cents), even less for the third (45 cents), and so on (in 5 cent decrements). An overview over the exact payoffs depending on the amount of solved sheets can be found in the payoff table at the end of the instructions. You can end the experiment anytime at any self-determined point of time in the experiment. Before you are handed out a new sheet an experimenter is going to tell you how much money you can earn by solving this specific sheet.

It is up to you how many sheets you are going to solve. The only rules are:

1. You can work at only one riddle at once.
2. Do not start with a new riddle before you have completed the one you are working on.

3. After completing a sheet you hand it to the experimenter who puts it into the document shredder.
   If you want to solve another riddle afterwards, the experimenter is going to hand one out to you.

If you do not want to solve another sheet, please tell the experimenter. This is when the experiment ends. You fill in a short questionnaire about your person and then you receive your payoff.
Payoff table:

Sheet	Payoff	Accumulated Payoff
1	0.55 Euro	0.55 Euro
2	0.50 Euro	1.05 Euro
3	0.45 Euro	1.50 Euro
4	0.40 Euro	1.90 Euro
5	0.35 Euro	2.25 Euro
6	0.30 Euro	2.55 Euro
7	0.25 Euro	2.80 Euro
8	0.20 Euro	3.00 Euro
9	0.15 Euro	3.15 Euro
10	0.10 Euro	3.25 Euro
11	0.05 Euro	3.30 Euro
12+	0.00 Euro	3.30 Euro

+ 2.50 Euro for arriving on time.