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Why real leisure really matters: incentive effects on real effort in the laboratory

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Abstract On-the-job leisure is a pervasive feature of the modern workplace. We studied its impact on work performance in a laboratory experiment by either allowing or restricting Internet access. We used a 2×2 experimental design in which subjects completing real-effort work tasks could earn cash according to either individual- or team-production incentive schemes. Under team pay, production levels were significantly lower when Internet browsing was available than when it was not. Under individual pay, however, no differences in production levels were observed between the treatment in which Internet was available and the treatment in which it was not. In line with standard incentive theory, individual pay outperformed team pay across all periods of the experiment when Internet browsing was available. This was not the case, however, when Internet browsing was unavailable. These results demonstrate that the integration of on-the-job leisure activities into an experimental labor design is crucial for uncovering incentive effects.

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1 Introduction

1.1 Studying incentives in the lab

Incentive theory plays a crucial role in the study of economic phenomena and is a natural candidate for extensive experimental investigation. As a result, the field of experimental labor economics (Charness and Kuhn 2011) has emerged to test many of the predictions that have been generated by incentive and contract theories (Laffont and Martimort, 2002; Bolton and Dewatripont 2005). These experimental protocols have, however, left aside the study of on-the-job leisure activities which unarguably constitute an important part of the work environment (Malachowski, 2005). In this paper, we propose to fill this gap by integrating on-the-job leisure into the evaluation of incentive effects in the laboratory.

From a methodological standpoint, the inclusion of on-the-job leisure activities in laboratory experiments may help attenuate *active participation,* an issue raised by Lei, Noussair and Plott (2001) in the context of experimental asset markets. Specific details of an experiment protocol, such as availability of alternatives to focal "work", might encourage or fail to encourage subjects to actively perform effortful work. For example, subjects may engage actively in a focal work task because of expectations, rewards, and lack of desirable alternatives. When desirable alternatives are present, active participation in effortful work may be traded off to some degree, revealing subtle incentive effects such as from small shifts in wage or manipulations of incentive schemes. We suspect that *active participation* has previously been an issue because, despite predictions that individual incentives should outperform team incentives (Alchian and Demsetz, 1972; Holmström, 1982), several published studies, and perhaps even more unpublished studies, have failed to observe such differences (van Dijk, Sonnemans and van Winden, 2001; Dohmen and Falk, 2011).

1.2 The real-leisure alternative

We investigated the effects of providing a leisure alternative on subjects' performance in a real-effort work task by either allowing or restricting Internet access during the experiment. We considered a real-effort mental arithmetic (summation) task in the spirit of previous laboratory experiments (Niederle and Vesterlund, 2007; Bartling, Fehr, Maréchal and Schunk, 2009; Eriksson, Poulsen and Villeval, 2009; Dohmen and Falk, 2011).[1] We manipulated the incentive setting by rewarding work performance according to either an individual pay or team pay scheme.

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[1] A large number of studies have incorporated other types of real-effort tasks such as solving mazes (Gneezy, Niederle and Rustichini, 2003), puzzles (Rutström and Williams, 2000), anagrams (Charness and Villeval, 2009), optimization problems (Dickinson and Villeval, 2008; Montmarquette et al., 2004; van Dijk, Sonnemans and van Winden, 2001), typing (Dickinson, 1999) or mailing tasks (Carpenter, Matthews and Schirm, 2010; Falk and Ichino, 2006).

We used Internet browsing to represent on-the-job "real-leisure"[2] because it is a growing and popular on-the-job leisure activity and a representative feature of the workplace. The availability of on-the-job Internet access has increased, due in part to most Americans now owning a smartphone capable of Internet browsing and less subject to employee usage restrictions (Smith, 2013). According to a 2005 study by *American Online* and *Salary.com*, employees spent about 26 % of their time on activities unrelated to their work (Malachowski, 2005). Almost half of this time was spent browsing the Internet. Also, the Internet is frequently browsed by and widely available to university students (our subject pool), providing them with a wide range of activities (Jones et al. 2009).

Previous studies have proposed alternative experimental designs to moderate *active participation* in experiments. For example, Mohnen, Pokorny and Sliwka (2008) gave subjects the option to take a 25-second time-out during which they were not able to work on the counting task and for which they were paid 0.10€. While subjects frequently engage in pleasurable activity during their breaks (e.g. socializing, browsing the Internet), the time-out setting investigated by Mohnen and colleagues rewarded subjects for taking breaks characterized by inactivity. Contrary to these designs with "abstract" leisure, in our environment we expect heterogeneity in derived utility from leisure (here proxied by internet access). However, Internet browsing, by offering an unprecedented range of leisure options, reduces the heterogeneity in the value of leisure compared to other "real leisure" alternatives such as giving subjects access to selected magazines. Also, the advantage of this implementation is that subjects can choose to engage in leisure *activity*—a more representative feature of the real workplace.

In line with the real-effort literature we argue that a real-leisure option cannot be instantiated simply as a decision for a monetary alternative. For example, workers who may be reluctant to steal money from an employer or firm may still be willing to spend time browsing the Internet while paid for being "on-the-job". They may justify Internet browsing as part of their legitimate search for valuable work information or they may consider paid work to include some real-leisure "breaks". Internet browsing on the job has been shown to damage employees' productivity (Young, 2005; 2006) and incurred U.S. corporations at least $85 billion in yearly costs (Alder, Noel and Ambrose, 2006). Consideration of leisure-related issues in the experimental economics literature dates back to Dickinson's (1999) labor supply study in which subjects working on a typing task were provided an option to leave the laboratory whenever they had achieved a certain output level. Quitting options have since been introduced into subsequent studies on minimum wages and workfare (e.g. Falk and Huffman, 2007, Abeler et al., 2011). Given the lack of control over subjects' activities and desired alternatives outside the laboratory, heterogeneity in quitting behaviors has been difficult to interpret. Quitting options are also not representative of the typical workplace regime as salaried employees in

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[2] Evidence from neuroscience supports an association between rewarding Internet activities and dopamine (Koepp et al., 1998; Tamir and Mitchell, 2012), supporting the notion that Internet browsing is a "real", not abstract, form of leisure. Furthermore, dopamine levels across different parts of the brain have been shown to influence one's work ethic (Treadway et al., 2012), suggesting the mechanism by which real-leisure alternatives may interfere with real-effort.

most organizations are required to comply with a minimum number of completed work hours per pay period.

Unlike previous experiments, our design embeds on-the-job leisure alternatives into the work environment, allowing the measurement of each subject's time allocation to leisure or work activities. While two related experimental studies (Eriksson, Poulsen and Villeval, 2009; Charness et al. 2010) have introduced on-the-job leisure alternatives by giving subjects access to magazines (for browsing or reading), they have not reported effects of on-the-job leisure activity on subjects' performance.[3]

To our knowledge, ours is the first experimental work to have measured subjects' time allocation to real-effort work tasks or on-the-job leisure and to have analyzed the effects of access to leisure on subjects' performance. We studied the effect of on-the-job leisure in two of the most popular incentive schemes: individual pay and team pay (e.g. Prendergast, 1999; Lazear, 2000; Hamilton, Nickerson and Owan, 2003). We conducted a 2×2 design in which we varied the availability of Internet access (available or not) and the type of pay (rewarded according to individual performance or team performance). For each of the four treatments, subjects were matched in groups of seven to ten people and completed the experiments in five periods of 20 min.

Subjects used the Internet option when available. They dedicated 28.5 % of their time to browsing the Internet under team pay while only dedicating 11.9 % of their time to Internet browsing under individual pay. Consequently, the impact of Internet browsing on subjects' performance was different across payment schemes. The availability of Internet browsing reduced production significantly under team pay while it did not reduce production under individual pay. In addition, we observed that incentive effects (measured as the difference in production between the individual pay and the team pay treatments) were more pervasive when Internet browsing was available. In the presence of Internet browsing, incentive effects were significant across all periods of the experiment while no incentive effects were found in the first two periods of the experiment when Internet browsing was not included in the design. This suggests that incentive effects may be sensitive to real-leisure alternatives such as Internet browsing and that previous real-effort experiments lacking this feature may have failed to uncover incentive effects which are reasonable to expect in the workplace.

2 Experimental environment

We developed a framework in which subjects could undertake a real-effort task, while being able to browse the Internet.[4]

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[3] Since Deci (1971), experiments measuring motivation have also provided subjects access to magazines during experiments as a real leisure alternative to a focal task (though they do not measure and report time allocated to browsing magazines). The provision of magazines while measuring "free choice intrinsic motivation" is still reported in more recent psychology and decision science publications (e.g. Zapata-Phelan, Colquitt, Scott, and Livingston, 2009).

[4] A video presentation of the software is available at: https://sites.google.com/site/realleisureincentives/home/video.

2.1 The work task

Adapted from previous research using mental arithmetic (summation) tasks (e.g., Eriksson, Poulsen and Villeval, 2009), the work task required real-effort in the form of mental concentration (because it makes strong demands on working memory (see Chase and Ericsson, 1982)). By using a long, repetitive and effortful task we ensured that individual performance was mostly driven by real (mental) effort considerations. The duration of our task, five periods of 20 min each, as well as its intricacy were considerably greater than in previous real-effort experiments that have reported the use of summation tasks (Niederle and Vesterlund, 2007; Bartling, Fehr, Maréchal and Schunk, 2009; Eriksson, Poulsen and Villeval, 2009; Dohmen and Falk, 2011). The task required subjects to sum up tables of 36 numbers without using a pen, scratch paper, or calculator (see Table 1). Each table had six rows and six columns of randomly-generated numbers from zero to ten. Before providing the grand total in the bottom-right cell, subjects had to provide separate subtotals for each of the 12 rows and columns. Calculating these subtotals did not directly generate earnings but could help subjects compute the grand total. A correct grand total answer increased production by 40 cents while 20 cents were subtracted if the answer was incorrect.[5] After completing each table, subjects learned whether their answer was correct and what their accumulated production value was. At the end of each period, subjects learned the total amount of money generated on the work task by all subjects of their group.

At any point during the experiment, all subjects in the treatments with Internet availability could switch from the work task to Internet browsing, and vice versa. Subjects could spend as much or as little time as they wanted on the various activities, each of which was undertaken on a separate screen. To switch activities, subjects simply chose the corresponding option from a drop-down menu at the bottom-right of their screens.

2.2 Internet browsing

In the "Internet" treatments where the leisure alternative was available, if subjects chose to browse the Internet, the work task window was replaced by an Internet window (embedded in the software; see Fig. 1). Within the bounds of university policy, subjects could use the Internet however they liked, including email, instant messaging, and social networking. Their confidentiality was assured and maintained, but the software tracked the exact amount of time spent on each activity. Subjects did not receive feedback regarding others' use of the Internet. Although subjects could not complete the work task while browsing the Internet, switching between tasks was quick and easy. Subjects were told in the instructions that using any internet-based devices, or calculators, to sum up numbers was not allowed.

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[5] So that subjects did not lose money for their participation, penalties only applied when individuals had already produced a positive amount.

Table 1 Work task

	Column1	Column2	Column3	Column4	Column5	Column6	Sum row
	3.00	6.00	3.00	0.00	6.00	0.00	
	10.00	5.00	1.00	5.00	2.00	3.00	
	8.00	3.00	5.00	4.00	8.00	7.00	
	1.00	6.00	0.00	9.00	8.00	0.00	
	3.00	7.00	0.00	8.00	10.00	4.00	
	3.00	10.00	10.00	6.00	10.00	0.00	
Sum column							

Fig. 1 Embedded Internet screen

2.3 Click pay

In addition to the activities described above, subjects could click on a yellow box that appeared at the bottom of their screen every 25 s, independent of whether the subject was currently working on the task or browsing the Internet. Each time subjects clicked on the yellow box they earned five cents. The earnings on this task were intended to represent a fixed wage of $12 which was paid in addition to the performance pay.

3 Treatments, hypotheses and procedures

3.1 Treatments

We conducted four treatments as part of a 2×2 design in which we varied the availability of the Internet ("Internet" or "no Internet") and the type of performance-based incentive scheme ("individual pay" or "team pay"). In the individual pay treatments, subjects were rewarded on the work task according to their individual production. Under team pay, the total production of the group was

equally distributed among subjects so that each of them received 10 % of the total production of the ten group members in each session.

3.2 Hypotheses

We derive our hypotheses from the moral-hazard in teams model introduced by Holmström (1982). We consider N workers producing a total output $f(e_1, e_2, \ldots, e_N)$ which depends on each worker's effort e_i where $i \in \{1, \ldots, N\}$. Each worker i decides to allocate her time, normalized to one, to the following activities: work effort $e_i \geq 0$ or leisure $l_i \geq 0$, so that $e_i + l_i \leq 1$. The utility function of worker i can be expressed as follows:

$$U_i := s_i f\left(e_i; e_j, \ldots, e_N\right) - C(e_i) + \eta(l_i)$$

where $C(e_i)$ stands for the cost of effort function with $C' > 0$ and $C'' > 0$, $\eta(l_i)$ stands for the utility of leisure with $\eta' > 0$ and $\eta'' < 0$, and s_i stands for the share of group production assigned to worker i. Under team pay, $s_i = \frac{1}{N}$ while under individual pay workers are rewarded according to their actual contribution to the group outcome. If we assume that $f(\cdot)$ is separable in workers' effort and in particular if we assume that $f\left(e_i; e_j, \ldots, e_N\right) = A \sum_{k=1}^{N} e_k$, where A is the marginal product of effort, then $s_i = \frac{e_i}{\sum_{k=1}^{N} e_k}$ under individual incentives.[6] We derive our main predictions by using the following specification of the workers' utility function[7]:

$$U_i := s_i A \sum_{k=1}^{N} e_k - \alpha \frac{e_i^2}{2} - \beta \frac{(1 - l_i)^2}{2}$$

where $\alpha > 0$ and $\beta > 0$ We obtain the following equilibrium values for work effort for individual pay with (without) Internet: $min\left\{\frac{A}{\alpha+\beta}, 1\right\}\left(min\left\{\frac{A}{\alpha}, 1\right\}\right)$ and for team pay with (without) Internet: $min\left\{\frac{A}{N(\alpha+\beta)}, 1\right\}\left(min\left\{\frac{A}{N\alpha}, 1\right\}\right)$.[8] We compare work effort, leisure (time spent browsing the Internet), and production across treatments and summarize our findings in the following hypotheses.

Hypothesis 1 (*Internet Availability Effects across Incentive Schemes*)

Under individual [team] pay, subjects are expected to produce less with the real-leisure option to browse the Internet than without it, provided $\alpha + \beta > A[N(\alpha + \beta) > A]$. Otherwise, for a given incentive scheme no difference in subjects' production is expected between the available and unavailable Internet treatments.

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[6] Kandel and Lazear (1992) assume nonseparability in effort so as to justify the existence of partnerships and eliminate the possibility of self-employment. In this paper, we do not aim at justifying the existence of partnerships and simply assume separability of the utility function in effort so as to match our experimental design more closely.

[7] For simplicity of exposition, we express the utility of leisure (Internet browsing) as the opportunity cost of not browsing the Internet $(1 - l_i)$.

[8] We derive these calculations in Appendix 1.

Therefore, if the cost of effort (α) and the utility of leisure (β) are sufficiently high compared with the marginal productivity of effort (A), Internet availability will reduce subjects' production. This condition is more likely to be satisfied under team pay since $N > 1$. Additionally, the decrease in production due to Internet browsing should be more pervasive where the utility of leisure (β) is greater.

Hypothesis 2 (*Incentive Scheme Effects and Internet Availability*)

When Internet is [not] available, subjects are expected to produce less with team pay than with individual pay, provided $N(\alpha + \beta) > A[N > A]$. Otherwise, no difference in subjects' production is expected between incentive schemes.

Therefore, if the cost of effort and the utility of leisure are sufficiently high compared with the marginal productivity of effort, production should be higher under individual pay than under team pay. This condition is more likely to be satisfied when Internet is available since $\beta > 0$. In addition, we show in Appendix 1 that in the case in which Internet is available the difference in production between individual pay and team pay increases in the utility of leisure and in the cost of effort if $\alpha + \beta \leq A$ and $N(\alpha + \beta) > A$, and decreases in both variables if $\alpha + \beta > A$.

3.3 Procedures

Two-hundred forty three individuals were recruited from a subject pool at a major U.S. university to participate in the current study in exchange for money. The experiments took place between December 2010 and May 2011 with treatments randomly assigned across 26 experiment sessions (see Table 2).[9]

Subjects were told that the set of computerized instructions were identical for all the subjects. Subjects had 20 min to read the instructions (see Appendix 3), with a timer displayed on a large screen at the front of the lab.[10] Experimental sessions lasted on average two hours and thirty minutes.

At the end of the experiment, subjects were paid their earnings in cash, rounded up to the nearest quarter. Individual earnings at the end of the experiment were computed as the sum of the earnings in the five periods. Subjects earned on average $26.94 (including the $7 show-up fee).

4 Results

4.1 Aggregate measures

We define production as the monetary amount generated by a subject's answers on the work task divided by the reward for each correct answer (40¢). Production can thus be interpreted as the total number of correct tables completed by a given

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[9] Technical issues prevented the analysis of one of the sessions in the treatment with individual pay and no Internet.

[10] None of the subject asked questions or requested extra time.

Table 2 Summary of treatments

	Real-leisure availability	
	No internet	Internet
Incentive schemes		
Individual pay	7 (57)	7 (66)
Team pay	6 (60)	6 (60)

Cells report number of sessions (subjects)

All sessions involved groups of ten subjects except two sessions with 8 subjects in the treatment with individual pay and Internet, and two sessions with 8 subjects and three sessions with 7 subjects in the treatment with individual pay and no Internet

subject discounted by the (weighted) number of incorrect answers. In Table 3, we report descriptive statistics of subjects' total production from the work task in the five periods of the experiment, across treatments.

Under team pay, subjects' total production was significantly lower in the treatment in which Internet was available than in the treatment in which it was not, whether we used parametric or non-parametric clustered tests. Clustered tests were used to control for the fact that individual production in a given session may have been affected by group production.[11] These findings are in line with Hypothesis 1 according to which the availability of Internet reduces production under team pay as long as $N(\alpha + \beta) > A$. Under individual pay, even though average (median) production was 11.0 % (6.8 %) lower when Internet was available than when it was not, the difference was not statistically significant. This is consistent with our model when $\alpha + \beta \leq A$, in which case the level of effort is maximal whether Internet is available or not. The fact that Internet effects were significant under team pay while they were not significant under individual pay relates to the fact that Internet usage was more pronounced under team pay (28.5 % of subjects' available time) than under individual pay (11.9 %) (Clustered t test and rank-sum tests: $p < .001$ and $p = .008$, respectively).

Intensive Internet users produced significantly less than other subjects, regardless of the treatment, stressing the disruptive effect of using the Internet. In particular, the probability of completing a given table correctly was negatively affected by switching between the work task and the Internet and by the time spent browsing (see Appendix 4 for the statistical analysis). Also, production levels were negatively correlated with the time subjects spent on the Internet. The correlation coefficients were equal to -0.727 (p < 0.001) and -0.582 (p < 0.001) under pay and individual pay, respectively.[12]

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[11] This correction was especially relevant for the treatments with team pay in which case the contributions of other group members, displayed on a subject's screen at the end of each period, may have affected an individual's motivation to work. This may have led subjects to free ride whenever they observed an increase in group production as is the case in standard public good games (see Ledyard (1995) for a survey, and (Corgnet et al. 2011) for further analyses).

[12] We find similar results using a panel regression of individual production with robust standard deviations for session clusters and controlling for a period trend, in which internet coefficients are negative and significant for both treatments (p's < 0.001).

Table 3 Total Production

Treatment		Average	Median	Standard deviation	Two-sided p values clustered t test (clustered rank sum test)
Incentive scheme	Internet availability				
Individual pay	No Internet	24.60	23.50	12.19	$p = .272$
	Internet	22.16	22.00	11.86	$(p = .118)$
Team pay	No Internet	19.53	21.25	9.19	$p = .035$
	Internet	15.64	15.25	10.55	$(p = .014)$

We summarize our findings as follows.

Result 1 (internet effects) Under team pay, subjects produced significantly less in the treatment in which Internet was available than in the treatment in which it was not. Under individual pay, the availability of Internet had no significant effect on subjects' production.

In the treatments in which Internet was available, subjects produced on average 41.7 % more under individual pay than under team pay (Clustered t test and rank-sum tests: $p = .001$ and $p = .005$, respectively). Similarly, in the absence of Internet subjects produced 25.9 % more under individual pay than under team pay (Clustered t test and rank-sum tests: $p = .012$ and $p = .014$, respectively). These findings are summarized below.[13]

Result 2 (incentive effects) Regardless of Internet availability, subjects produced significantly more under individual pay than under team pay.

In addition to engaging in the work task and Internet browsing, subjects could obtain earnings from the low-effort clicking task. No significant differences in the clicking task earnings were observed across treatments (see Table 5 in Appendix 2).

4.2 Production dynamics

We measured time allocations to Internet browsing and work effort over the five periods of our experiment to study the dynamics of production. The evolution of production is particularly relevant in our setting given that fatigue and boredom are likely to arise when completing the real-effort task repeatedly. Consistently, Internet usage surged from period three onwards (see Corgnet et al. 2011 for further analyses). Under individual (team) pay, subjects allocated 5.6 % (19.1 %) of their time to Internet browsing during the first two periods compared with 16.4 % (34.8 %) during the last three periods. The increase in shirking (Internet use) over time under team pay is consistent with findings in public good games, in which

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[13] We confirm these findings in a difference-in-difference regression of total production with robust standard deviations for session clusters. We find that the coefficient for the *Team Pay* dummy is negative and significant ($p = 0.002$). However the *Internet* dummy and the interaction dummy, although negative, are not significant ($p = 0.152$ and $p = 0.489$).
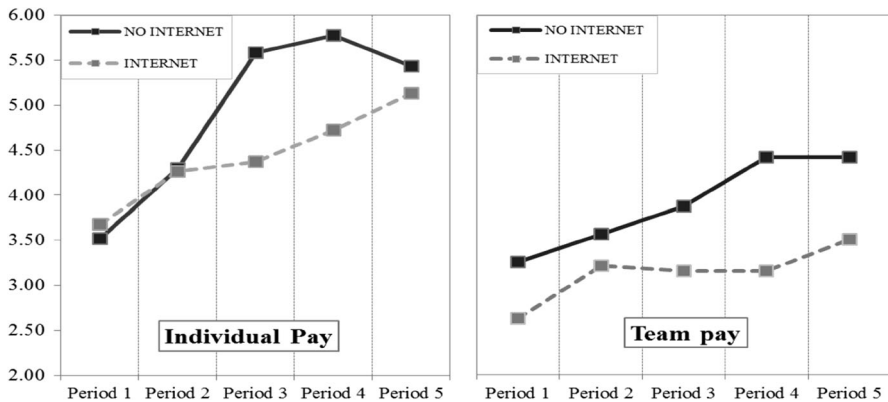
Fig. 2 Period evolution of average production for treatments with and without Internet access. The case of individual (team) pay is shown on the left (right) panel

contributions are found to decrease over time (see Ledyard (1995) for a survey).[14] We observed a positive trend in production for each of the four treatments (see Table 6 in Appendix 2), consistent with learning effects in repeated mental calculation tasks noted in the literature (e.g. see Charness and Campbell, 1988). The dynamics of production differ, however, across treatments as is illustrated in Fig. 2.

Under individual pay, the treatment in which Internet was available and the treatment in which it was not led to similar production levels in the first two periods. However, from period three onwards subjects produced relatively more in the treatment in which Internet was not available. A similar pattern of production was observed under team pay incentives (see right panel in Fig. 2). These observations suggest that the effect of Internet availability is particularly pronounced after period 2, when Internet usage becomes more prevalent (see Fig. 3 below).

Consequently, we proceed by comparing the Internet and No Internet treatments in the first two periods of the experiment and in the last three periods separately, for each incentive scheme (see Table 4).

Under individual pay, the negative effect of Internet browsing was significant in the second part of the experiment while it was not in the first part of the experiment (see Dummy Internet in Table 4). This finding suggests that the effect of introducing a real-leisure alternative to the work task is likely to be more pronounced when the work task is sufficiently long. In our model, Internet browsing does not impact production whenever the cost of effort is low enough ($\alpha + \beta \leq A$) since then subjects exert maximal effort regardless of Internet availability. However, as fatigue emerges in the second part of the experiment, the cost of effort is likely to rise which may imply that $\alpha + \beta > A$. In that case, our model predicts that Internet browsing will affect production negatively in line with our empirical findings. In the case of team pay and unlike the case of individual pay, the negative effect of

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[14] In (Corgnet et al. 2011), we show (see Table A.2, p5), similarly to the findings in public good games, that an increase in group production in a given period decreased the production of high performers (above the average group production) while increasing the production of low performers (below the average group production) in the next period.
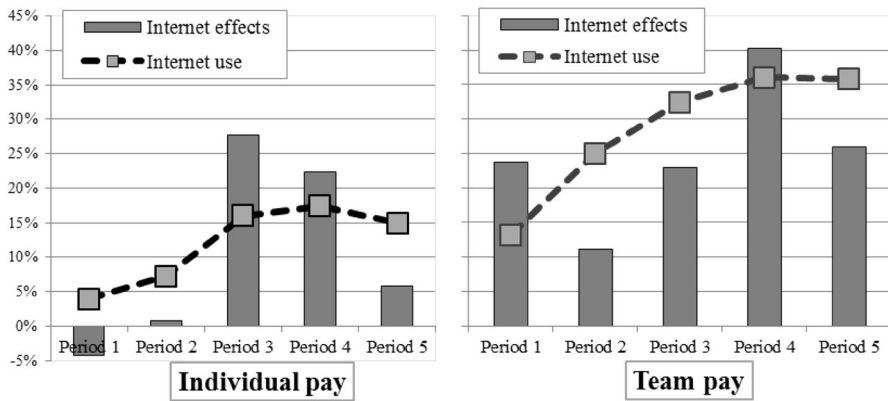
Fig. 3 Dynamics of Internet effects across incentive schemes. The case of individual (team) pay is shown on the left (right) panel. *Internet effects* are the difference in average production between Internet and no Internet treatments. *Internet use* is the percentage of time subjects spent browsing the Internet

Internet availability was observed across all periods of the experiment. The fact that internet effects were observed in the first part of the experiment under team pay while they failed to be observed under individual pay is consistent with our model as long as $\alpha + \beta \leq A$ and $N(\alpha + \beta) > A$. We summarize our findings in Result 3.

Result 3 (internet effects are dynamic)

(i) Under team pay, in all periods, subjects produced significantly less in the treatment in which Internet was available than in the treatment in which it was not

(ii) Under individual pay, during the first two periods, subjects produced similarly in the treatment in which Internet was available and in the treatment in which it was not. During the last three periods, subjects produced significantly less in the treatment in which Internet was available than in the treatment in which it was not

Regarding incentive effects, significant differences in production levels between individual and team pay were only observed in the second part of the experiment in the case in which Internet was not available (see Dummy Team Pay for no Internet Treatments in Table 4). In the case in which Internet was available, however, production was significantly higher under individual pay than under team pay across all periods of the experiment (see Dummy Team Pay for Internet Treatments in Table 4). As a result, in the presence of a real-leisure alternative to the work task, incentive effects are more likely to be detected in shorter and less effortful experiments where they might not be otherwise. We summarize this in Result 4.

Result 4 (incentive effects are dynamic)

(i) In the first two periods, subjects produced similarly under team pay and individual pay in the case in which Internet was not available. Subjects

Table 4 Production dynamics

Panel regressions with random effects and robust standard deviations for session clusters

	Individual pay treatments		Team pay treatments		No Internet treatments		Internet treatments	
	Periods 1 and 2	Periods 3–5	Periods 1 and 2	Periods 3–5	Periods 1 and 2	Periods 3–5	Periods 1 and 2	Periods 3–5
Intercept	2.89***	4.92***	2.73***	3.34***	3.09***	5.18***	3.09***	3.60***
Period trend	0.68***	0.17	0.45**	.23***	0.54***	0.10	0.59***	.28***
Dummy Internet	0.06	−0.85**	−0.49***	−0.97***	–	–	–	–
Dummy team pay	–	–	–	–	−0.50	−1.36***	−1.05***	−1.47***

Dummy Internet takes value 1 if the treatment allows for Internet browsing, and value 0 otherwise. Dummy Team Pay takes value 1 if subjects were rewarded with team pay, and value 0 if they were rewarded with individual pay

* p value < 0.10; ** p value < 0.05; *** p value < 0.01

produced significantly more under individual pay than under team pay, however, in the case in which Internet was available

(ii)   In the last three periods, subjects produced significantly more under individual pay than under team pay regardless of Internet availability

5 Conclusions

Studying incentives in the laboratory is a fundamental yet challenging endeavor. We contribute to the experimental labor economics literature by assessing how a real-leisure alternative (Internet browsing) interacts with manipulated incentives. We incorporated on-the-job leisure in the experimental protocol by either allowing or restricting Internet access in an experimental workplace. We showed that subjects dedicated time to this leisure activity when available, suggesting that part of the performance observed in labor experiments without real-leisure can be explained by the lack of alternative desirable activities. Importantly, we identified that the availability of Internet browsing did not have the same impact under different payment schemes. Under the weaker incentive scheme (team pay), Internet browsing was more prevalent than under the stronger incentive scheme (individual pay). As a result, incentive effects which were measured as the difference in production levels between the individual and the team pay treatments were more pervasive when Internet browsing was available. Our findings suggest that researchers conducting laboratory experiments without real-leisure alternatives may be operating under the hazard of unattenuated *active participation,* a condition that does not accurately model incentive tradeoffs between effortful tasks and leisure tasks and which might underestimate effects of incentive manipulation that really matter in the workplace.

Appendix 1

We solve the model by maximizing the utility function of worker $i \in \{1, ..., N\}$ with respect to work effort e_i for each of the four treatments:

$$\max_{e_i} U_i := s_i A \sum_{k=1}^{N} e_k - \alpha \frac{e_i^2}{2} - \beta \frac{(1 - l_i)^2}{2}$$

s.t.

$$e_i + l_i \leq 1$$

$$e_i, l_i \geq 0 \tag{1}$$

Deriving first order conditions of (1), we obtain the equilibrium work effort for each treatment.

Internet effects

- Under individual pay:

If $\alpha > A$ ($\alpha \le A$ and $\alpha + \beta > A$), then the increase in production in the no Internet treatment compared with the Internet treatment is equal to $\frac{\beta A}{\alpha(\alpha+\beta)}\left(\frac{\alpha+\beta-A}{\alpha+\beta}\right)$ which is increasing in β and decreasing in α (increasing in both α and β). If $\alpha + \beta \le A$, we will observe no differences across treatments.

- Under team pay:

If $N\alpha > A$ ($N\alpha \le A$ and $N(\alpha + \beta) > A$), then the increase in production in the no Internet treatment compared with the Internet treatment is equal to $\frac{\beta A}{N(\alpha+\beta)\alpha}\left(\frac{N(\alpha+\beta)-A}{N(\alpha+\beta)}\right)$ which is increasing in β and decreasing in α (increasing in both α and β). If $N(\alpha + \beta) \le A$, we will observe no differences across treatments.

Incentive effects

- In the presence of Internet:

If $\alpha + \beta > A$ ($\alpha + \beta \le A$ and $N(\alpha + \beta) > A$), then the increase in production under individual pay compared with team is equal to $\frac{(N-1)A}{N(\alpha+\beta)}\left(\frac{N(\alpha+\beta)-A}{N(\alpha+\beta)}\right)$ which is decreasing (increasing) in both α and β. If $N(\alpha + \beta) \le A$, we will observe no differences across treatments.

- In the absence of Internet:

If $\alpha > A$ ($\alpha \le A$ and $N\alpha > A$), then the increase in production under individual pay compared with team is equal to $\frac{(N-1)A}{N\alpha}\left(\frac{N\alpha-A}{N\alpha}\right)$ which is decreasing (increasing) in α. If $N\alpha \le A$, we will observe no differences across treatments.

Appendix 2

Table 5 Clicking task

	Individual pay and no Internet	Individual pay and Internet	Team pay and no Internet	Team pay and Internet
Success rate (%)	97.8	98.2	98.7	97.0
Proportion tests (p values)				
Individual pay and Internet	0.75	–	–	–
Team pay and no Internet	0.45	0.66	–	–
Team pay and Internet	0.58	0.39	0.2	–

Success rate: Average proportion of the 240 yellow boxes subjects had clicked before they disappeared from the screen

Table 6 Individual production

Panel regressions coefficients with random effects and robust standard deviations for session clusters.

	Individual pay and no Internet	Individual pay and Internet	Team pay and no Internet	Team pay and Internet
Intercept	3.33***	3.42***	2.95***	2.62***
Period trend	0.53***	0.34***	0.32***	0.17**

* p value < 0.10; ** p value < 0.05; *** p value < 0.01

Appendix 3

Instructions (team pay and internet)

Instructions for all treatments are available at:

https://sites.google.com/site/realleisureincentives/home/instructions

Note: In the no Internet treatments (INDIVIDUAL PAY & NO INTERNET, TEAM PAY & NO INTERNET), five slides regarding Internet browsing were removed.

Appendix 4

We show that using the Internet was disruptive. For example, those subjects who switched back and forth between the Internet and the task were more likely to complete a table incorrectly. In Table 7, we show the results of a Probit regression where the dependent variable is a dummy that takes value one if the table was correctly solved, and zero otherwise. We first observe that the probability of correctly completing a table is lower when subjects have already completed more tables (*Table number*). We also control for the time that subjects spent to complete a table, discounted by the time they were on the Internet (*Effective time*), and observe that those who took more time to complete a table were more likely to make mistakes. In Regression 1 we also control for a dummy (*Switching*) that takes value 1 if the subject switched (at least once) to the Internet screen before completing the table. In Regression 2 we control for the time that subjects spent on the Internet (*Time on Internet*). In Regression 3 we control for both variables. We find that browsing the Internet as well as switching back and forth between the Internet and the task screens decreased the probability of completing a table correctly.

Finally, we did not find significant differences across treatments as the treatment dummy (*Team Pay*) was never significant (p's > .964) when included in any of the three regressions reported in Table 7. We also conducted similar regressions controlling for interaction effects between the treatment dummy and the variables "Switching" or "Time on Internet", but the coefficients were never significant (p's > .270).

Table 7 Internet browsing and production accuracy

Probit regression of the probability of correctly completing a table with random effects and robust standard deviations for session clusters

	Regression 1	Regression 2	Regression 3
Intercept	0.873***	.854***	.879***
Period trend	0.070***	.072***	.070***
Table number	−0.023***	−.024***	−0.024***
Effective time	−0.106***	−.103***	−0.107***
Switching	−0.418***	–	−0.297**
Time on internet		−.095***	−0.042
Team pay	0.003***	−.003	0.003
Number of observations	3601	3601	3601
Wald test	49.73	58.54	59.48
Prob > χ^2	<0.001	<0.001	<0.001

* p value < 0.10, ** p value < 0.05, and *** p value < 0.01

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