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Make It Too Difficult and I'll Give-Up; Let Me Succeed and I'll Excel: The Interaction between Assigned and Personal Goals

James Fan
Naval Postgraduate School

Joaquin Gomez-Minambres
Chapman University, gomezmij@lafayette.edu

Samuel Smithers
University of Leicester

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Make it too Difficult and I'll Give-Up; Let me Succeed and I'll Excel: The Interaction between Assigned and Personal Goals

James Fan,[1] Joaquin Gomez-Minambres[2] and Samuel Smithers[3]

Abstract

We examine the motivational effects of setting both assigned and personal non-binding goals on a real effort laboratory experiment. In order to derive conjectures for our experiment, we develop a model with goal-dependent preferences. In line with previous studies, we find that goal setting leads to a higher performance. We also find that goal-setting is most effective if subjects were able to achieve previous goals. Therefore, in goal setting, "success breeds success". In particular, we observe that when subjects are initially allowed to attain assigned goals, they are better at self-motivating in the future when performing under personal goals.

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1. Introduction

1.1. Motivation

Goal-setting captures a very intuitive motivational technique. A goal, even if not tied to a worker's monetary compensation, can make a boring task more challenging and interesting. Therefore, goals facilitate pride in accomplishment fostering intrinsic motivation and performance. The goal setting literature, which we describe in detail in Section 1.2., focuses on goals assigned by a principal to an agent (*assigned goals*) and on goals self-set by the agent (*personal goals*). Very little is known, however, about the relationship between previous goal-attainments and the effectiveness of goals that agents impose on themselves.

To illustrate the importance of this relationship on work motivation and performance, let us consider the following example. Psychologists have shown that when students set clear and specific goals they are more motivated to perform than students who are just trying to "do their best" (Locke and Latham 2002). This type of self-monitoring is certainly an important element of students' academic success. However, most teachers are aware that the goals that they assign as well as the feedback provided throughout the course strongly affect students' motivation. In particular, when students receive a clear goal from the teacher and succeed, their commitment

[1] James Fan: Naval Postgraduate School, Graduate School of Business and Public Policy, 1 University Circle, Monterey, CA 93943. Email: james.fan(at)nps.edu.

[2] Joaquín Gómez-Miñambres: Lafayette College, Department of Economics, 730 High Street, Easton, PA 18042. Chapman University, Economic Science Institute. One University Drive, Orange, California 92866. Email: gomezmij(at)lafayette.edu.

[3] Samuel Smithers: University of Leicester, Department of Economics, University Rd, Leicester LE1 7RH, UK. Email: samuelsmithers(at)live.co.uk.

increases. Thus, students obtain validation as they observe goal progress and feel that they are becoming more knowledgeable and/or skillful, which significantly increases their willingness to assign appropriate personal goals in the future (Schunk 1991).

The previous example points out that the relationship between goal attainment and commitment is reciprocal: attaining a goal helps to increase goal-commitment, and this increases the effectiveness of later goals. In line with this intuition, psychology research reports that goal-commitment influences the difficulty level of the subject's personal goals (Locke 1996). Moreover, according to Bandura (1997) and Latham (2000), commitment can be raised by *enactive mastery*, i.e., the experience of success on a task. When put together, these ideas suggest that in an environment that alternates between assigned and personal goals (such as our teaching example), the best way to maximize subjects' performance is to create appropriate *attainment trajectories* for them: In particular, start assigning low goals so as to allow subjects to experience success, which raises their self-efficacy and hence their commitment to subsequent personal goals.[4]

Our experimental setting tests this intuitive idea. We consider a real-effort laboratory experiment with a summation task where workers are assigned, in addition to monetary incentives, non-binding (i.e., wage-irrelevant) goals that may affect intrinsic motivation to work. Our multi-period environment allows us to study the interaction between types of goals across time. Participants are allocated to either a control group (with no goals) or one of two treatment groups. The first treatment has participants alternating between setting personal goals and being assigned goals, with the assigned goals first being low then high. The second treatment mimics this but reverses the order of the assigned goals to being high then low. With this approach we look to study not only the effect of non-binding goals on production but also the interaction between past goals (either easy or difficult) and current goal setting effectiveness.

Consistent with previous experimental results on goal setting (see Literature review), we find that goal-setting leads to a higher average effort than no goal. Additionally, we find that effort is increasing in the goal level, for both self-set and assigned goals. Remarkably, we also find that the previous goal level faced and whether the previous goal was achieved both have a positive impact on performance. This result is consistent with our theoretical framework, and it suggests that previous goal attainments promote current goal commitment.

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[4] Our analysis of attainment trajectories is related to another psychology principle, namely that *small wins* build confidence to perform a task. According to Weick (1984): "*If people work for something concrete, if people have an opportunity for visible success from which they draw confidence, and if people can translate their excitement and optimism into immediate action, then a small win is probable, as is their heightened interest in attempting a second win*." In our paper, a small win is provided when the worker attains the goal set by the manager, increasing subsequent goal commitment and hence the likelihood of a second win.

The intuition of these results is that when subjects have attained a goal in the past, they are better at self-monitoring through personal goals in the future, which implies that the interaction between assigned and personal goals is most effective when assigned goals increase in difficulty over time. Our results have important implications for personnel and organizational economics. In particular, workers who have attained goals in the past are better at self-motivation. Therefore, a wise managerial strategy is to assign realistic goals that allow workers to succeed at the beginning of the employment relation and let them assign personal goals afterwards.

1.2. Literature Review

In this paper, we focus on non-binding goals; that is, goals that do not trigger monetary consequences when reached. In the psychology literature, this type of goals has been argued to enhance workers' motivation and performance (see Locke 1996 for a review). The main findings of this vast psychological literature are the following. First, specific and difficult (but perceived as attainable) goals leads to greater performance than vague and easy goals. Second, workers are more motivated (or committed) to attain goals when they are convinced that the goal is important and difficult to attain. Finally, goals increase persistence of workers' effort. A meta-review conducted by Locke and Latham (2002) finds that goal-setting has worked in 90% of the studies analyzed. This evidence provides a strong premise for the assertion that goals can enhance intrinsic motivation if they are set appropriately. One of our main contributions is to show that what goals are appropriate for a particular worker depends, among other things, on the history of previous goal attainments.

In the economics and management literature, a growing number of papers have studied why non-binding goals might be effective. Some authors have used reference-dependent preferences to explain the findings highlighted in the psychology literature. For example, Heath et al. (1999) interprets goals as reference points that alter the worker's intrinsic utility, dividing the space of outcomes between gains -when the goal is attained- and losses -when the goal is not attained. Therefore, non-binding goals can motivate people to work harder to avoid being in the domain of losses. In Gómez-Miñambres (2012) workers' types are defined according to their different degrees of commitment to attain goals. From a theoretical standpoint, we build on this idea but consider that, instead of being exogenously given, goal-commitment depends on previous goal attainments. This generates interesting dynamics of attainment trajectories since previous goal-attainments can determine the effectiveness of current goals.

Broadly speaking, the goal-setting literature can be divided into two categories: *assigned goals* and *personal goals*. *Assigned goals* are set by a principal (employer, manager, teacher, etc.) to an agent (employee, worker, student, etc.) who then decides on an effort level. In a laboratory experiment, Corgnet, Gómez-Miñambres and Hernán González (2015) find that managers set goals that are, on average, challenging but attainable for workers. These goals increase performance and decrease time spent in leisure activities relative to other type of goals or to no-goals. Corgent, Gómez-Miñambres and Hernán González (2018) study goal-setting in a

contract-design experiment. They show that low-powered incentives are easier to observe when managers can also assign non-binding goals to workers. Smithers (2015) presents results on setting a low-level and a high-level goal to two separate groups. He finds that both goals lead to an increase in performance over a control, with the high goal causing the greater increase, whilst holding the piece-rate scheme constant. Fan and Gómez-Miñambres (2019) consider a lab-experiment to study the effects of goal setting in teams with weak-link production technology. They show that the most effective goals are challenging but attainable for weak-link workers. However, many managers fail to realize that and assign goals that are too-difficult and hence sub-optimal from the point of view of profit-maximization. Finally, in a field study, Van Lent and Souverijn (2017) study goals are set during one-on-one interviews between students and their randomly assigned mentor. This simple goal-setting intervention is able to significantly increase students' performance in the course.

Personal goals are self-chosen by the agent as a source of internal motivation, typically to attenuate self-control problems. Hsiaw (2013) considers an optimal stopping problem where there is an option value of waiting. By providing a reference point, goal-setting attenuates the present-biased agent's tendency to stop too early. A similar approach is presented in Koch and Nafziger (2011), where personal goals are used to evaluate future outcomes. However, if self-control problems are too severe, the goal can be too painful to be accepted. In a related paper, Koch and Nafziger (2016) explain how people face a trade-off when deciding how to set the brackets of their goals. Evaluating goals under narrow brackets (e.g., daily goals) help present-biased agents to stick to their goals. However, broad brackets (e.g., monthly goals) minimize the probability of falling short. Therefore, when agents face significant uncertainty about their productivity, they should bracket their goals more broadly to minimize the risk of failure.

Brookings, Goerg and Kube (2017) find evidence of the effectiveness of personal goals in a field study. They show that when piece rates incentives are accompanied by personal goals, performance is significantly higher than with simply piece rate. Moreover, the study shows that goals are higher when there are piece rates than when there are not (i.e., under purely intrinsic motivation). In a laboratory setting, Dalton, Gonzalez and Noussair (2016) report similar evidence showing that self-chosen goal contracts are more cost-effective than piece rate contracts, and workers choose goals which they tend to outperform. By contrast, Akın and Karagözoğlu (2017) do not find a positive effect of self-imposed goals on performance.

Personal goal-setting has also been studied outside of workplace environments. For instance, Harding and Hsiaw (2014) show that consumers with realistic goals for energy conservation achieve significantly higher savings than those choosing very low or unrealistically high goals. In an education setting, Clark, Gill, Prowse and Rush (2017) study different types of personal goals among college students: Task-based goal (number of practice exams to complete) and performance-based goal (grade in the course). They show that only task-based goals have a significant impact on students' performance. In a similar setting, van Lent (2019) does not find a positive effect of personal goals when college students are able to revise their goals. The authors

justify this negative result by stating that goals, set and revised in multiple-question surveys, might not have been salient enough. Finally, Markle, Wu, White and Sackett (2018) and Burdina, Hiller and Metz (2017) show that marathon runners with a personal goal improve performance compared to those runners with no goals. Moreover, in these studies, goal setting effectiveness increases when the goal is attainable, a result consistent with previous results in the assigned goals literature (e.g., Corgnet et al. 2015) as well as our own findings.

2. Theory

In this section, we develop a simple model with goal-dependent preferences to inform our theoretical hypotheses. We start by describing workers' preferences. We then discuss the different motivational effects of assigned and personal goals. We finish discussing how previous goal-attainments may affect a worker's commitment to achieve goals.

2.1. Worker Preferences

We denote by $y \geq 0$ to be the worker's performance and by $g \geq 0$ to be the goal given to the worker, either exogenously assigned or self-set by the worker. We assume that there is an upper limit for worker's performance given by $\overline{y}$ which can be justified by the existence of time constraints. The worker derives intrinsic satisfaction from attaining goals -$V(y, g, \beta)$- which we assume to be a function of the worker's performance relative to the goal and his degree of goal commitment, β. In addition to this, the agent receives a monetary compensation, $\alpha < \overline{y}$, for each unit of performance.[5] We assume that this piece rate is exogenously given and independent of goal-attainment. Finally, we assume a quadratic cost of effort function for the worker, $c(y) = y^2/2$. Given these assumption, the worker's utility function is given by:

$$U(y, g, \alpha, \beta) = \alpha y + V(y, g, \beta) - \frac{y^2}{2}$$

We consider a worker's intrinsic utility with two components: a *goal payoff* function, $v(y - g)$, and a *goal-commitment* function, $\psi(g, \beta)$. The goal payoff function shows that a goal acts as a reference point for worker's intrinsic utility (satisfaction from goal attainment). For simplicity we assume a linear goal-payoff function[6] such that $v(y - g) = y - g$. The goal commitment function captures two fundamental ideas: (i) attaining more difficult goals is more rewarding than attaining easier goals and (ii) a more committed worker (i.e., higher β) derives a

[5] In the next subsection we explain the technical need to impose $\alpha < \overline{y}$.

[6] Our goal-dependent utility is similar to the one proposed by Gómez-Miñambres (2012), who uses it in an adverse selection setting. Other authors have considered a goal dependent function consistent with prospect theory properties (e.g., Heath et al. 1999). A more general specification would not alter the key prediction for our experiments (see Footnote 3). Moreover, our alternative specification is simpler yet more in line with the psychological idea of goal-commitment, a key component of our paper.

higher marginal utility from accomplishing more difficult goals. The simplest function consistent with this idea is $\psi(g,\beta) = \beta g$. Thus, worker's intrinsic utility is given by:

$$V(y,g,s) = \beta g(y-g)$$

Note that, in our model, easy goals have a low impact on a worker's utility. Therefore, a worker has a (non-monetary) incentive to set challenging goals for himself, though this is no guarantee that workers will always choose the optimal goal. In fact, our model will show that under certain conditions, assigned goals encourage higher work performance.

2.2. Assigned vs. Personal Goals

We study two different types of goals: *assigned goals* and *personal goals*. As we show in this section, both types of goals can have differing motivational implications. Let us consider first the case of assigned goals. Given a goal, g, a piece rate, α, and his degree of commitment, β, a worker chooses a level of performance, y, that maximizes his overall utility. Thus,

$$y(g) = \underset{y}{\operatorname{argmax}}\, U(y,g,\alpha,\beta) = \begin{cases} \alpha + \beta g & if \quad g < \frac{\overline{y}-\alpha}{\beta} \\ \overline{y} & otherwise \end{cases} \qquad [1]$$

Note that the worker's performance increases not just with the monetary incentive, but also with the goal. Moreover, the goal has a higher impact on performance for those workers who are more committed to attain the goal.[7] In essence [1] captures the idea that the worker faces two types of incentives to work, a monetary incentive provided by the piece rate, α, and a non-monetary incentive provided by the commitment to attain the goal, β. Finally, [1] also clarifies why we need to assume that $\alpha < \overline{y}$, otherwise the worker would achieve the upper limit of performance even in the absence of goals.

Let us now consider the case of *personal goals*. If the worker could decide his own goals, he will choose it in such a way that his utility is maximized given his anticipated performance, $y(g)$. Thus, the optimal personal goal is given by:

$$g^p = \underset{g}{\operatorname{argmax}}\, U(y(g),g,\alpha,\beta) = \begin{cases} \frac{\alpha}{2-\beta} & if \;\; \beta < 2\left(1-\frac{\alpha}{\overline{y}}\right) \\ \frac{\overline{y}-\alpha}{\beta} & otherwise \end{cases} \qquad [2]$$

[7] Note also that production monotonically increases with the assigned goal in an interior solution. This is a direct consequence of our linear goal payoff function. With a prospect theory function the most effective motivator would be a goal that is challenging but attainable for the worker (see Wu et al. 2008 and Corgnet et al. 2015 for analytical proofs). In other words, production should increase with the goal when the goal is attainable and decrease with the goal when the goal becomes unattainable for the worker. However, in our framework, the upper limit in production determines what goals are possible to attain. Above that, goals do not increase production, and as we show in the next section, unattainably high goals would diminish goal commitment. Therefore, our model and a prospect theory alternative both predict that higher goals are more effective than lower goals, if they are attainable.

And the worker's performance given this personal goal can be computed by substituting [2] into [1]:

$$y(g^p) = \begin{cases} \frac{2\alpha}{2-\beta} & if \;\; \beta < 2\left(1 - \frac{\alpha}{\overline{y}}\right) \\ \overline{y} & otherwise \end{cases} \qquad [3]$$

Therefore, if $\beta < 2\left(1 - \frac{\alpha}{\overline{y}}\right)$, the worker always achieves his personal goal by a generous margin ($y(g^p) = 2g^p$). In fact, in this case, personal goals would not maximize performance, $y(g^p) < \overline{y}$. Perhaps not surprisingly our model predicts that workers will not push themselves too hard when given the opportunity to assign personal goals.

Note also that in [3] if the degree of commitment is high enough the worker is able to achieve the production limit through personal goals. This is because, in this case, the marginal intrinsic utility of increasing production would outweigh the marginal cost so, in effect, the worker would always be better off by increasing his goal and meeting it with higher production less than the limit. In the more interesting (and perhaps realistic) case of an interior solution, assigned goals are more effective motivators when they are more challenging than the worker's personal goal. Thus, $y(g) > y(g^p)$ if and only if $g > g^p = \frac{\alpha}{2-\beta}$. This implies that assigned goals are likely to be more effective for workers with low goal commitment, who are assigning themselves low personal goals.[8]

In this section we have shown that goal-commitment is an essential element of the relationship between assigned and personal goals. In the next section we propose that goal-commitment can change in response to the worker's history of previous goal attainments.[9]

2.3. The effect of past goals on commitment

Commitment is the key of goal-setting. Without it, a worker will not be motivated to achieve his goals. Our goal commitment function $\psi(g, s)$ captures the intuitive idea that it is more rewarding to attain challenging goals than it is to attain easier ones. In the previous section we treated the degree of commitment to attain goals as fixed. However, psychologists often

[8] Since $\frac{\partial g^p}{\partial \alpha} > 0$, another implication is that assigned goals are more effective than personal goals when monetary incentives are low. Even though we do not test these predictions in our experiment, it would be interesting to explore in future research.

[9] In a previous version of this model we considered an ability parameter, θ, in the cost of effort function ($c(y) = y^2/2\theta$). It is easy to show that an increase in ability has essentially the same implications as the increase in the worker's degree of commitment: higher performance, personal goals, etc. We decided to abstract away from ability because it did not add anything of interest. However, there is an important difference between ability and commitment that we emphasize in this paper. While ability is likely to remain fixed (at least in the short-run), the degree of goal commitment is much more malleable and, in particular, can easily be affected by the history of previous success and failures as we discuss in Section 2.3. In other words, while ability is typically considered an exogenous parameter in models of work motivation, we argue that goal-commitment should be endogenized.

emphasize that goal-commitment can change in response to previously encountered goals and experiences. For example, Gary P. Latham, considered one of the "fathers" of the psychology literature on goal setting jointly with Edwin Locke, states that:

"People learn on the basis of evidence (e.g., revenue, client surveys, staff turnover) that they have failed to attain their goal no matter how much they truly tried to attain it. Through such repeated experiences they typically "learn" to give up; they learn helplessness. Thus, there are employees who have learned that they cannot increase revenue from existing clients, they have learned that they are poor at bringing new clients, and that they are not able to work effectively with staff. They have tangible evidence to support their conclusions that they should give up their attempts to attain their goal" (Latham 2000, p. 164)

In other words, failing to attain a previous goal can diminish or even destroy current goal commitment. It is then not surprising that Latham (2000, p. 166) suggests that one solution for maintaining goa-commitment is Bandura (1997)'s proposed idea of "enactive mastery", which in our environment involves sequencing assigned goals in such a way that all but guarantees early success for an individual.

The simplest way to incorporate these ideas in our theoretical framework is by assuming that a worker is committed to a goal only if the previous goal was attained, in which case the degree of commitment is determined by the value of the previously achieved goal. That is, if we denote by g_0 to be the previous goal and by y_0 the previous production level, $\beta = g_0 \mathbf{1}_{y_0 > g_0}$, where $\mathbf{1}_{y_0 > g_0}$ is an indicator function taking the value 1 when the goal was attained and 0 otherwise. To see the implications for our experiment, consider the case in which the worker produces in two periods. In the first period, he receives an assigned goal that can be either unattainably high or achievable. That is $g \in \{g_L, g_H\}$ with $g_H > \overline{y} > g_L$. In the second period, he decides on a personal goal. According to our goal-setting model and a goal-commitment function that depends on previous goal attainments, the production of the second period will be higher when the worker previously received a low goal and succeed than when he received a high goal and failed. In particular, $y_H(g^P) = \alpha < \frac{2\alpha}{2-g_L} = y_L(g^P)$. Further, if the worker keeps encountering goals in the future, he will be more committed to them when he was initially allowed to succeed than when he failed because the personal goal, and hence subsequent goal-commitment, in the former case was higher: $g^p(g_H) = \frac{\alpha}{2} < g^p(g_L) = \frac{\alpha}{2-g_L}$.

This simple example points out that when previous goal attainments influence workers' goal commitment, they will be better at self-motivating (i.e., assigning effective personal goals), when they have been allowed to succeed in the past. Based on this theoretical framework, in the next section we briefly summarize our main testable hypotheses.

2.4. Testable Predictions

In this section, we use our theoretical framework to provide two testable hypotheses for our experiment. The first Hypothesis is in-line with previous results in the goal setting literature. The second Hypothesis is specific to our model involving the interaction of assigned and personal goals.

In Section 2.2 we showed that, if the worker is committed, both personal and assigned goals are effective motivators and that their effectiveness increases with the value of the goal.

Hypothesis 1 (Goal Setting Effectiveness)

(i) We expect a higher performance with goal setting than in its absence.
(ii) We expect high goals to be more effective than lower goals.

Moreover, in Section 2.3 we argued that previous goal-attainments determine goal commitment. In an environment that alternates between assigned and personal goals, this implies that when previously assigned goals were unattainably high, current goal commitment and hence personal goals and performance decrease.

Hypothesis 2 (Interaction of Assigned and Personal Goals)

We expect personal goals to be more effective when the worker is initially assigned an attainable goal.

We design a controlled laboratory workplace environment to test these hypotheses.

3. Experimental Design

3.1. The work-task

We use a real effort task based on Niederle and Vesterlund (2007)'s addition task, and augmentation by Smithers (2015). The task consists of summing up randomly generated set of five double-digit numbers in five-minute segments. Subjects were not allowed to use a pen, scratch paper or calculator. This rule amplified the level of effort subjects had to exert in order to complete tables correctly. An example of the work task is shown in Figure 1.

Figure 1: Example of addition task

The task is cognitively demanding, it requires effort and focus to complete, it only requires primary level math skills, and it has been found to be gender-neutral (see Niederle and Vesterlun, 2007). Therefore, we can assume that luck plays but a minor role in our experiment, and we can

interpret workers performance to be strongly correlated with their effort level. Participants were given a full five-minute incentivized round to practice before the experiment began. Afterwards they faced four rounds of the five-minute addition task. We chose four rounds to minimize the risk of worker fatigue.

3.2. Goal setting

The goals in the experiment are of two forms, assigned (exogenously-set) or personal (self-set). We selected two levels of difficulty for the assigned goals. The low goal (*L*) corresponds to the median production in a control group who were paid piece rate but did not have goals: 10 correct additions. Since goals motivate workers to produce even more, we expect this goal to be achievable by most of our subjects. The high goal (*H*) corresponds to the fifth quintile (top 20%) of producers: 14 correct additions. Therefore, we expect this goal to be challenging for the majority of our subjects and even unattainable by many of them.

3.3. Treatments

We consider a between-subjects design with three treatments: a *control* with no goals and two treatments alternating personal and assigned goals set at the beginning of each round: *Goal LH* and *Goal HL*. In the two goal treatments, subjects set personal goals in the first and third round and received assigned goals for the second and forth round. In Treatment *Goal LH* the low goal is assigned in round two and the high goal is assigned in round four. In Treatment *Goal HL* the goals are assigned in reverse order, with the high goal assigned in round two and the low goal assigned in round four. The experimental design is summarized in Table 1.

Table 1: Description of the experimental design

	Control	**Goal LH**	**Goal HL**
Round 1	No goal	Personal goal	Personal goal
Round 2	No goal	Low assigned goal	High assigned goal
Round 3	No goal	Personal goal	Personal goal
Round 4	No goal	High assigned goal	Low assigned goal

Subjects were informed about the order of personal/assigned goals in the instructions but did not know the difficulty of assigned goals.[10]

3.4. Procedures

Our subject pool consisted of students from a major US university. We conducted a total of 6 sessions for a total of 112 subjects. The experiment was computerized using z-Tree (Fischbacher, 2007). The instructions were handed out as well as displayed on subjects' computer screens.

[10] Screenshots of the instructions can be found in the Appendix

Before participants attempt the addition task, they completed a short GMAT style test of five questions in five minutes. We use the results of this task as a proxy for subjects' ability (Oswald, Proto and Sgroi, 2015). Moreover, after the addition task was completed, participants were asked to fill in a questionnaire asking about demographics, as well as qualitative questions related to goal-setting.

Participants were paid a show-up fee of $5, rewarded $0.5 for each correct GMAT question, and $0.2 per correctly answered addition problem. Average earnings were $17.4 (s.d. 3.54) and the experiment lasted a total of 40 minutes.

4. Results

4.1. Goal Setting

Table 2 presents a summary of the average number of correct answers achieved, average goal levels and the percentage of people who met their goals. A summary of the GMAT results and comparisons with the practice round can be found in the Appendix. There are no statistically significant differences in ability across treatments.

Table 1. Summary of results across treatments

Control	**Goal LH**			**Goal HL**		
Correct	Correct	Goal	Achieved	Correct	Goal	Achieved
10.72	12.03	11.53	63%	10.99	11.59	49%
(3.00)	(4.24)	(3.69)	-	(3.71)	(3.10)	-
N=30	*N=41*			*N=41*		

Consistent with our Hypothesis 1.i, the two goal-setting treatments seem to generate higher production than the control. However, a difference in means test looking at pairwise comparisons show that only Goal LH generates significantly higher production (p-value 0.04).[11] Importantly, in line with our Hypothesis 3, assigning low goals first and high goals afterwards seem to be most effective. In fact, work production is significantly higher in treatment LH than in treatment HL (p-value= 0.018). Moreover, workers in treatment LH achieve the majority of the goals they get. Finally, as we see in Figure 2 below, workers in treatment LH not only perform better than those in treatment HL but this difference tends to increase over time. We study these dynamic effects in more detail in Section 4.3.

[11] In an effort to remain conservative all t-test p-values are for two-sided tests, even though our data provides some justification for conducting one sided-tests. Wilcoxon rank-sum tests provide very similar results. We performed further robustness checks controlling for math skills (GMAT) and found no difference.

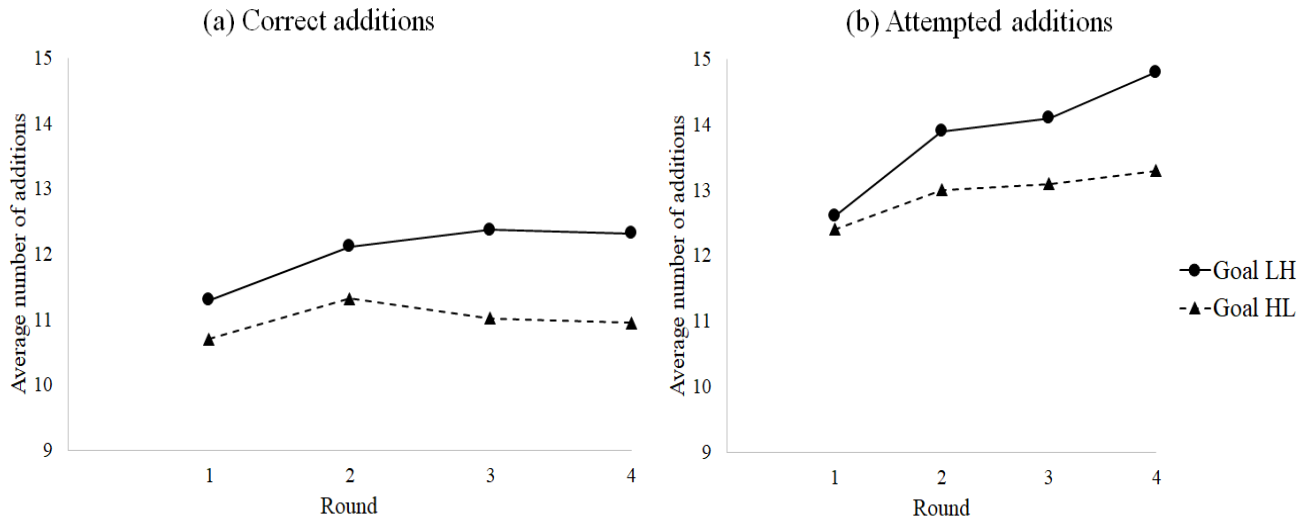


Figure 2. Average correct additions (left) and attempted additions (right) by round

In Table 3, we break down the information by round. This allows us to study dynamic effects.[12] As expected, subjects were mostly successful at meeting the low goal while they struggled to meet the high goal. Furthermore, subjects were slightly more successful meeting the low goal in the LH treatment (78%) than in HL treatment (72%). They were also much more successful meeting the high goal when in the HL treatment (34%) than in the HL treatment (22%). Consistent with our Hypothesis 1.ii in both treatments, the high goal lead to a higher average performance than the low goal. The effect is maximized in the LH treatment which placed the assigned goal in the final round.

Table 2. Summary of results across treatments by round

	Control	**Goal LH**			**Goal HL**		
Round	Correct	Correct	Goal	Achieved	Correct	Goal	Achieved
1 (Personal)	10.3	11.32	10.15	76%	10.99	10.32	71%
	(2.36)	(4.03)	(4.54)	-	(3.71)	(3.10)	-
2 (Assigned)	10.20	12.12	10.00	78%	11.32	14.00	22%
	(3.17)	(4.19)	-	-	(3.72)	-	-
3 (Personal)	11.30	12.37	11.98	66%	11.02	12.05	32%
	(3.14)	(4.09)	(4.91)	-	(4.00)	(4.15)	-
4 (Assigned)	11.33	12.32	14.00	34%	10.95	10.00	71%
	(3.14)	(4.69)	-	-	(3.38)	-	-
	N=30	*N=41*			*N=41*		

[12] Using Kolmogorov-Smirnov's test for equality of distributions we look for a learning effect across time by splitting the experiment into two halves and comparing the distributions. We find that there are no differences across treatments, neither pooled not individually.

Result 1. *(Goal-setting). Goal setting increases workers performance relative to a control with no goals. Moreover, high goals are more effective than low goals. This positive effect of high goals is maximized in the LH treatment.*

4.2. The Interaction of Assigned and Personal Goals

In Table 3 we show two random effects regression models on the impact of goal setting on worker performance. Regression (a) compares performance in the Goal LH and Goal HL treatments with the control group. We confirm that worker performance is greater in both treatments, but the difference is only statistically significant for the Goal LH treatment. Regression (b) reports the effects on production of current and past goal levels in the LH treatment compared to the HL treatment. Therefore, regression (b) help us to understand what determines goal-commitment. We see that the number of correct answers is increasing in the level of the current goal, whether that be personal or assigned. This provides further support for our Hypothesis 1.ii that higher goals lead to higher performance. Moreover, when looking at the effect of previous goal levels, we can see that it too has a positive and highly significant effect on this period's performance. In fact, this effect is of greater magnitude than the current period's goal. This important observation is in line with our theoretical conjecture that previous goals affect current goal commitment, a key driving force of the interaction between assigned and personal goals.

Table 3. Random effects regressions for production

	(a) Correct	(b) Correct
Goal LH (d)	1.513*	1.299**
	(0.79)	(0.62)
Goal HL (d)	0.583	-
	(0.71)	
GMAT	0.766***	0.444**
	(0.22)	(0.18)
Current Goal	-	0.273***
		(0.06)
Lagged Goal	-	0.431***
		(0.08)
Prev. Goal Attainment (d)	-	1.336***
		(0.41)
Time trend	0.274***	-0.264
	(0.07)	(0.18)
Intercept	7.202***	1.792
	(0.92)	(1.37)
σ_μ	3.250	1.375
σ_ε	1.601	1.554
N	*448*	*246*

Coming back to Table 3, we can observe that round 3 is especially informative about the interaction between assigned and personal goals. While it is a personal goal round in both treatments, subjects in treatment LH have just received a low assigned goal in the previous round while subjects in treatment HL have just completed a round with a much more challenging goal. If previous assigned goals do not affect the agent's goal commitment, production levels in round 3 would be similar. We find, however, that agents production is 12% higher in treatment LH, and this difference is significant (p-value= 0.06). Interestingly, personal goals are also achieved twice as often in treatment LH than in treatment HL, despite the fact that the level of the personal goals set are not statistically different (p=0.942). These results corroborate our hypothesis that previous goals affect current goal commitment as long as they were successfully achieved, but they can significantly diminish goal commitment when previous goals were unattained, as it was the case for 78% of subjects in treatment HL.

In line with this argument, in Table 4 we show that attaining an assigned goal in round 2 has a significant positive effect on attaining the personal goal in round 3. Computing the marginal effects for round 3, we find that the probability of attaining the personal goal is 65% when subjects attained the assigned goal in the previous round, versus only 32% if subjects failed to reach the assigned goal.[13] This is additional evidence that previous goal attainments increase agents' commitment to current goals.

Table 4. Logit model showing how attaining a previous goal affects the current goal

	Current Goal Attainment	Marginal Effects
Prev. Goal Attainment (d)	1.354***	0.326***
	(0.50)	
GMAT	-0.153	-0.038
	(0.17)	
Intercept	-0.273	
	(0.54)	
N	*82*	

Finally, Table 5 reports regression results on how attaining the assigned goal in round 2 affects the performance under the personal goal of round 3. The first column aggregates both goal treatments with the while the second and third columns deal with these them individually. We can see that there is a strong and significant effect on performance from attaining the assigned goal in the previous round. Importantly, the magnitude is greatest for the minority subjects who were able to attain the high assigned goal. The failure to attain the goal, on the other hand, has a detrimental effect on performance in the following rounds.

[13] This is computed using the "margins" command in Stata and it is evaluated based on GMAT and the correct additions being held at their mean values.

Table 5. Effect assigned goal attainment on worker performance under a personal goal

	Current Goal Attainment	Marginal Effects
Prev. Goal Attainment	1.354***	0.326***
	(0.50)	
GMAT	-0.153	-0.038
	(0.17)	
Intercept	-0.273	
	(0.54)	
N	*82*	

Result 2. *(Interaction of Assigned and Personal Goals).*

i. Worker performance is maximized in Treatment LH. Performance is Treatment HL is not significantly higher than in the absence of goals.

ii. Personal goals do not seem to be affected by previous goals. However, attaining an assigned goal in the past increases the probability of attaining personal goals.

iii. Attaining a high assigned goal in the past maximizes goal commitment.

The previous results are in line with the idea of "enactive mastery" (Bandura 1997) that, as we emphasized in Section 2.3, is an important implication of our goal commitment function. In particular, we have shown that by Round 3 subjects in the LH group are able to significantly outperform subjects in the other two treatments because they previously received a goal that most of them were able to attain (see Table 4), increasing their goal commitment and hence production in future rounds (see Table 5).

Conclusion

In this paper we have shown that the interaction between personal and assigned goals is a crucial component of effective work motivation. We have provided theoretical arguments and experimental evidence that in an environment alternating personal and assigned goals, increasing assigned goals over time is most conducive for workers performance. By allowing workers to succeed with easy goals in early rounds, subjects are most committed to their goals in future rounds. Therefore, setting goals that facilitate workers' attainment trajectories increases goal commitment through enactive mastery.

Our results have important implications for organizational economics. They indicate that organizations that allow workers to experience success and build confidence at the beginning of the employment relation are able not only to increase performance, but also likely to make workers better at self-motivating through personal goals in the future. This highlights the importance of studying different types of incentives as well as their interdependences in order to provide effective guidance to practitioners.

References

Akın, Z., & Karagözoğlu, E. (2017). The role of goals and feedback in incentivizing performance. *Managerial and Decision Economics*, 38(2), 193-211.

Bandura, A. (1997). Self-efficacy: The exercise of control. Macmillan.

Brookins, P., Goerg, S., & Kube, S. (2017). Self-chosen goals, incentives, and effort. Mimeo.

Burdina, M., Hiller, R. S., & Metz, N. E. (2017). Goal attainability and performance: Evidence from Boston marathon qualifying standards. *Journal of Economic Psychology*, 58, 77-88.

Corgnet, B., Gómez-Miñambres, J., & Hernán-Gonzalez, R. (2015). Goal setting and monetary incentives: When large stakes are not enough. *Management Science*, 61(12), 2926-2944

Corgnet, B., Gómez-Miñambres, J., & Hernán-Gonzalez, R. (2018). Goal setting in the principal–agent model: Weak incentives for strong performance. *Games and Economic Behavior*, 109, 311-326.

Clark, D., Gill, D., Prowse, V., & Rush, M. (2017). Using goals to motivate college students: Theory and evidence from field experiments (No. w23638). *National Bureau of Economic Research*.

Dalton, P. S., Gonzalez, V., & Noussair, C. N. (2016). Self-Chosen Goals: Incentives and Gender Differences. Mimeo.

Fan, J., & Gómez-Miñambres, J. (2019). Nonbinding Goals in Teams: A Real Effort Coordination Experiment. *Manufacturing & Service Operations Management*, forthcoming. DOI: https://doi.org/10.1287/msom.2019.0793

Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics*, 10(2), 171-178.

Gómez-Miñambres, J. (2012). Motivation through goal setting. *Journal of Economic Psychology*, 33(6), 1223-1239.

Harding, M., & Hsiaw, A. (2014). Goal setting and energy conservation. *Journal of Economic Behavior & Organization*, 107, 209-227.

Heath, C., Larrick, R. P., & Wu, G. (1999). Goals as reference points. *Cognitive Psychology*, 38(1), 79-109.

Hsiaw, A. (2013). Goal-setting and self-control. *Journal of Economic Theory*, 148(2), 601-626.

Koch, A. K., & Nafziger, J. (2011). Self-regulation through goal setting. *Scandinavian Journal of Economics*, 113(1), 212-227.

Koch, A. K., & Nafziger, J. (2016). Goals and bracketing under mental accounting. *Journal of Economic Theory*, 162, 305-351.

Latham, G. P. (2000). Motivate employee performance through goal setting. In: Locke, E. (Ed.), *Handbook of Principles of Organizational Behavior*. Blackwell, pp. 107-119.

Locke, E. A. (1996). Motivation through conscious goal setting. *Applied and Preventive Psychology*, 5(2), 117-124.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, 57(9), 705.

Markle, A., Wu, G., White, R., & Sackett, A. (2018). Goals as reference points in marathon running: A novel test of reference dependence. *Journal of Risk and Uncertainty*, 56(1), 19-50.

Niederle, M., & Vesterlund, L. (2007). Do women shy away from competition? Do men compete too much? *The Quarterly Journal of Economics*, 122(3), 1067-1101.

Oswald, A. J., Proto, E., & Sgroi, D. (2015). Happiness and productivity. *Journal of Labor Economics*, 33(4), 789-822.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist*, 26(3-4), 207-231.

Smithers, S. (2015). Goals, motivation and gender. *Economic Letters*, 131, 75-77.

van Lent, M., & Souverijn, M. (2017). Goal setting and raising the bar: A field experiment (No. 17-001/VII). Tinbergen Institute Discussion Paper.

van Lent, M. (2019). Goal Setting, Information, and Goal Revision: A Field Experiment. *German Economic Review*.

Weick, K. E. (1984). Small wins: Redefining the scale of social problems. *American Psychologist*, 39(1), 40.

APPENDIX

A1. GMAT Results

Table A1 summarizes the average GMAT scores across treatments. Pairwise comparison shows that there is no significant difference between the GMAT scores of the treatments. This signifies that there are no significant differences between the mathematical ability of our participants.

Table A1. Summary of GMAT Scores by Treatment

	Aggregate	Control	Goal LH	Goal HL
Mean	3.089 (1.40)	3.333 (1.24)	3.073 (1.31)	2.927 (1.59)
Obs.	112	30	41	41

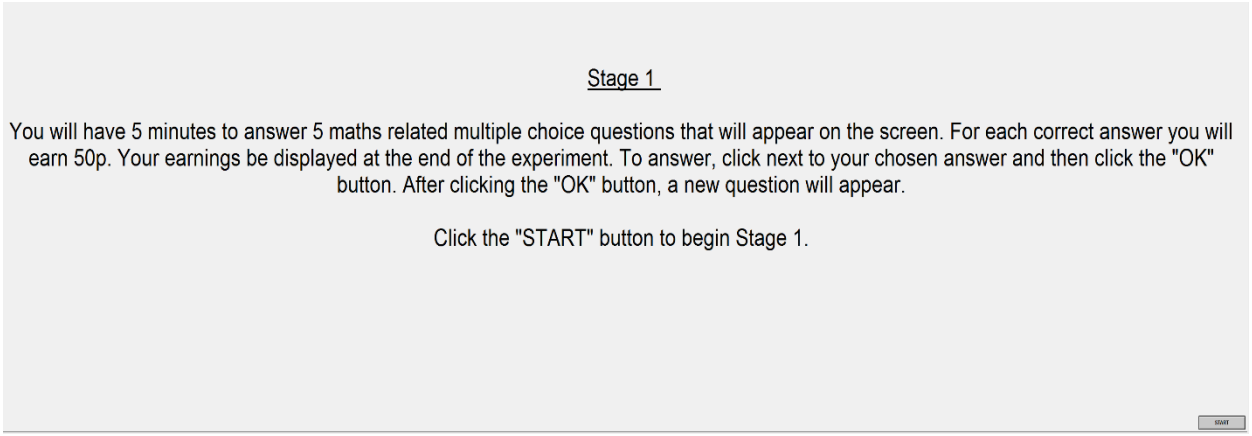
A2. Comparison to the practice round

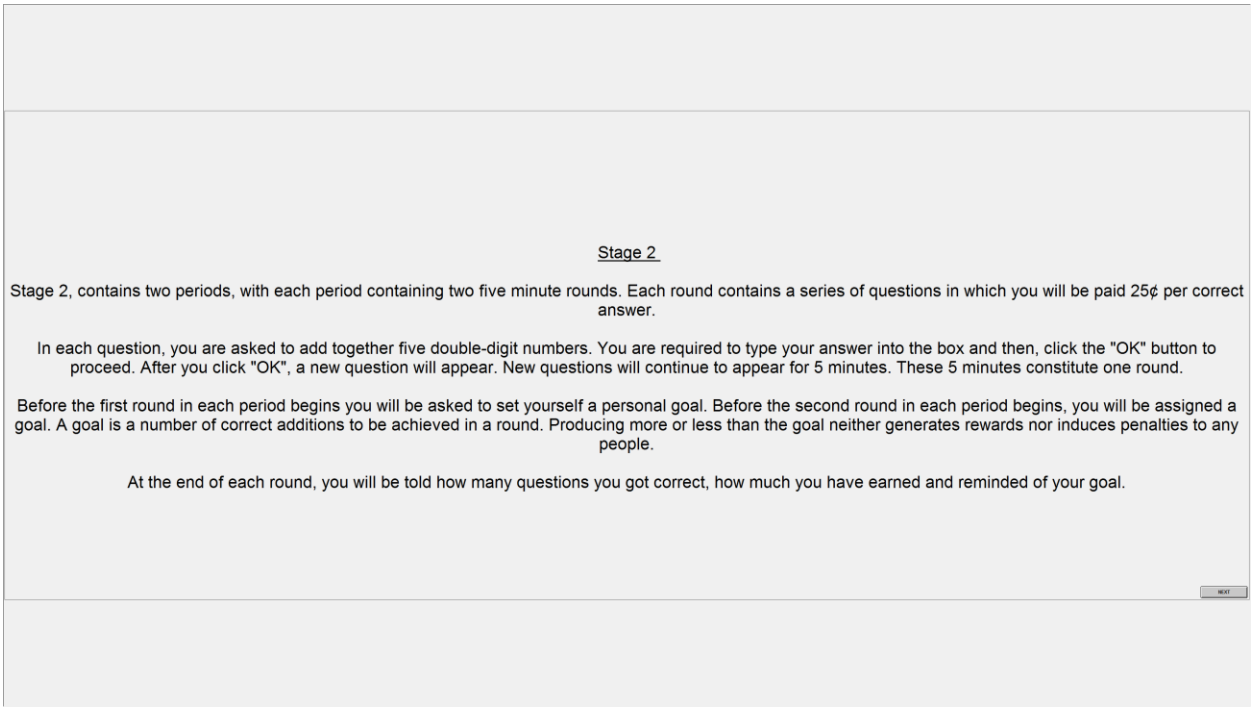
The table below summarizes how much the performance of the participants improved from the practice round by subtracting their round performance from their practice performance.

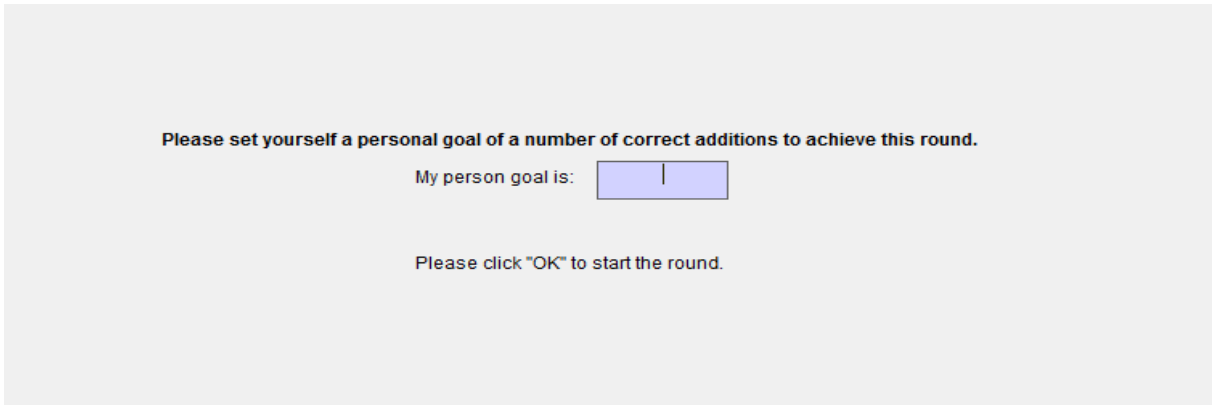
Table A2. Summary of Results by Round with Practice Performance Subtracted

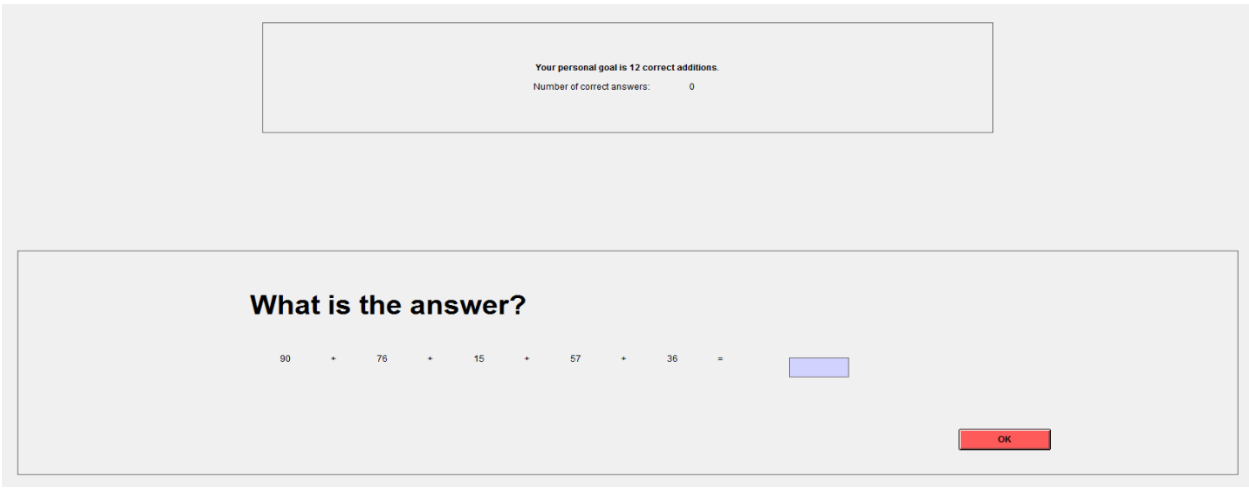
	Aggregate	Control	Goal LH	Goal HL
Round	Correct	Correct	Correct	Correct
P	-	-	-	-
	-	-	-	-
1	1.65	1.23	2.02	1.59
	(2.38)	(1.96)	(2.54)	(2.49)
2	2.23	1.40	2.83	2.24
	(2.80)	(2.39)	(2.67)	(3.10)
3	2.51	2.50	3.07	1.95
	(2.74)	(2.19)	(2.68)	(3.10)
4	2.47	2.53	3.02	1.88
	(2.72)	(2.62)	(2.86)	(2.59)
Obs.	112	30	41	41

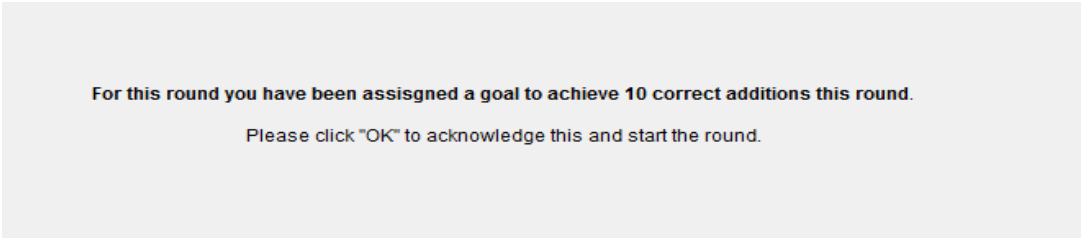
A3. Experiment Instructions (Goal Setting Treatments)

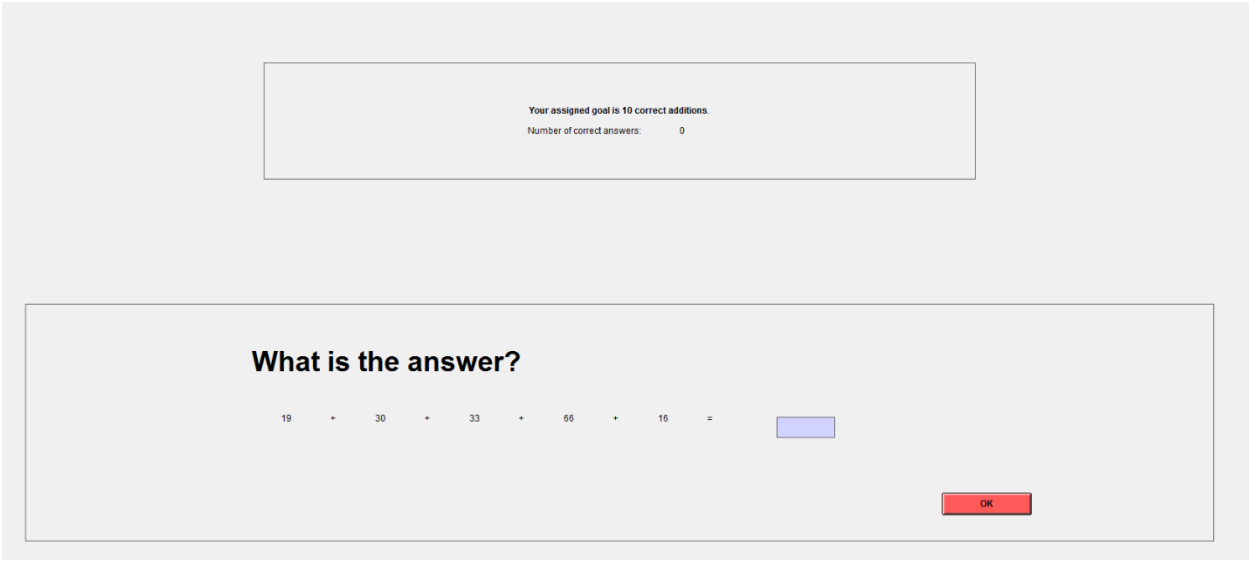












Stage 3

In this final stage, you will be asked to complete a questionnaire while we compute your earnings and prepare the payment. Once completed, your earnings will appear on screen and the experiment ends. Please wait for the experimenter to call your name and you will receive your payment in private.